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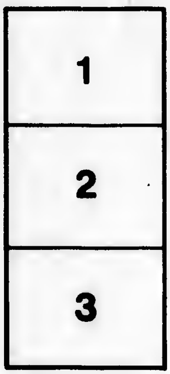

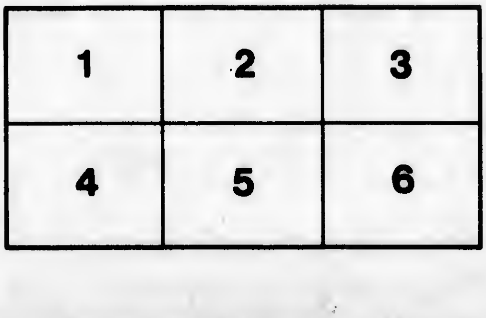

CHAMBERS'S

INFORMATION

FOR

THE PEOPLE;

BEING A SERIES OF TREATISES ON THOSE BRANCHES OF HUMAN KNOWLEDGE IN WHICH THE GREATER PART OF THE COMMUNITY ARE MOST INTERESTED, AND DESIGNED TO SERVE THE CHIEF USES OF AN ENCYCLOPEDIA, AT A PRICE BEYOND EXAMPLE MODERATE.

EDITED BY

WILLIAM AND ROBERT CHAMBERS,

EDITORS OF "CHAMBERS'S EDINBURGH JOURNAL."

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CHAMBERS'S

INFORMATION FOR THE PEOPLE.

CONDUCTED BY WILLIAM AND ROBERT CHAMBERS, EDITORS OF "CHAMBERS'S JOURNAL" AND "HISTORICAL NEWSPAPER."

INTRODUCTORY ARTICLE.

AN ACCOUNT OF THE EARTH—PHYSICAL AND POLITICAL.

No species of information can form so appropriate an introduction to general knowledge as that which describes the earth we inhabit: its dimensions and physical character, its relation to other planetary bodies, and its political divisions into states, empires, and kingdoms.* Until comparatively recent times, the earth was generally believed to be a large flat body floating upon or fixed in the ocean, on the remote boundaries of which the firmament rested, or was unaccountably lost in the waters. The sun, which gives us light, was at the same time considered to be a body which moved round the earth, rising every morning and setting every evening; but where it went to during the night, or how it got back from west to east, could not be explained. While these opinions prevailed, the earth was believed to remain always at rest; and it was a general opinion that no navigator dared or would be able to sail to any great distance on the ocean, for that he would either soon be enveloped in darkness, or, with his vessel, fall over the uttermost bounds of the waters, and be for ever lost.

The Egyptians studied the starry heavens, and the Grecian sages reasoned on the nature and figure of the earth; but none of them propounded a theory which has been found on investigation to be correct. The idea of the earth being a globe, bearing an affinity in character to the moon and the other planets; of being only one among perhaps millions of worlds floating in space, all under the guidance of certain laws organised by one universal Creator, was in a certain degree entertained by Ptolemy, the ancient geographer; but it is to modern science alone that we are indebted for this splendid discovery of the true planetary system. The proper theory of the earth was first made known by Copernicus and Galileo, betwixt the years 1500 and 1600, and afterwards improved and determined by Sir Isaac Newton.

According to the discoveries of these and other eminent men, as well as the experimental voyages round the globe performed by Cook and other navigators, it has been clearly proved that the earth is a sphere, or nearly round ball, in its figure. The cause of this sphericity is very evident, if we consider the earth to have been originally a yielding mass, capable of assuming any form; then, by the force of gravity, every particle contained in it tending towards the common centre, by which the globular form is produced as a necessary consequence. It has been imagined by superficial thinkers, that, if the earth were a sphere, and inhabited on all sides, those who were *undermost* in its diurnal revolution would fall from its surface. But this idea, which is quite natural, is completely answered by an explanation of the tendency which all bodies have to its centre. Properly speaking, there is neither *down* nor *up*, neither *under* nor *above*. The earth is not, however, an exact sphere, but is flattened at the northern and southern extremities, or poles. Philosophers were first led to observe this by the variation in the vibrations of the pendulum at the equator, or middle of the earth, and near the poles. It was found that the pendulum performed its vibrations slower the nearer it approached the equator, and hence was inferred the reasonableness of the force of gravity. This was easily explained in the theory just mentioned, because, the circle of daily revolution being greatest at the equator, all bodies revolve proportionally faster there than at the poles, so that the centrifugal force is greater, and the force of gravity less, than at other parts of the earth's surface; and because, at the equator, the centrifugal force is exactly opposed to that of gravity, but towards the poles, being oblique to it, produces less effect. From these observations it was justly inferred that the earth is a sphere flattened at the poles, or a spheroid; and this form was satisfactorily accounted for by the fact that the particles of a yielding mass, which revolves on its own axis, depart from the poles and tend to the centre, by which the poles are of course flattened, and the middle elevated. Various measurements have put this beyond all doubt.

Another important desideratum for a more intimate acquaintance with the earth, was to fix its magnitude. The labours of the ancients, in this respect, were all fruitless, owing to their want of suitable instruments. Accurate results were first obtained in the year 1615. Willibrord Snellius, a Dutchman, first struck into the only true way, and measured an arc of a meridian from Alcmaar to Leyden and Bergen-op-Zoom, by means of triangles. After him, the measurements of Picard, and the later ones of Maupertuis, approximated nearer the truth. These made the circumference of a great circle of the earth 25,000 miles. But it is to be remarked, that in this calculation the earth is regarded as a perfect sphere. Further measurements of all parts of the surface of the earth will be necessary to find, rigidly and accurately, the true magnitude of it.

If we take a view of our earth in its relation to the solar system, astronomy teaches us, that, contrary to appearances, which make the sun revolve about the earth, the earth and ten other primary planets revolve about the sun, and, being themselves opaque bodies, receive from the sun light and heat. The earth completes its revolution round the sun in about three hundred and sixty-five days and six hours, which forms our common year. The orbit of the earth is an ellipse, with the sun in one of its foci. Hence the earth is not equally distant from the sun in all parts of the year: its least distance is estimated at 93,336,000 miles, and its greatest at 95,484,572, making a difference of more than 2,000,000 of miles. In winter, we are nearest the sun, and in summer, farthest from it; for the difference in the seasons is not occasioned by the greater or less distance of the earth from the sun, but by the more or less oblique direction of the sun's rays. Besides the annual motion about the sun, the earth has also a daily motion about its own axis (according to mean time, in twenty-three hours, fifty-six minutes, and four seconds). This diurnal revolution is the occasion of the alternation of day and night. But as the axis on which the earth performs its diurnal rotation forms, with its path about the sun, an angle of twenty-three and a half degrees, the sun ascends, from March 21 to June 21, about twenty-three and a half degrees above the equator towards the north pole, and descends again towards the equator from June 21 to September 23; it then sinks till December 21, about twenty-three and a half degrees below the equator towards the south pole, and returns again to the equator by March 21. This arrangement is the cause of the seasons, and the inequality of day and night attending them, which, for all countries lying beyond the equator, are equal only twice in the year, when the ecliptic coincides with the equator. The moon, again, revolves about the earth, in a similar elliptical path, in twenty-eight days and fourteen hours. For a complete theory of the earth and heavenly bodies, we refer to the article ASTRONOMY.

MATHEMATICAL DIVISIONS OF THE EARTH

In order to facilitate the operations of the navigator and traveller, and with the view to mark the relative situation of every spot on the earth's surface, for a better understanding of geography, the globe has been made the object of divers measurements, by means of ideal lines drawn from north to south and east to west. The principal line which has thus been drawn, as will be perceived by an examination of maps of the earth, is the equator. It forms a circle round the earth, equally distant from the poles, and divides the globe into two equal parts, called the northern and southern hemispheres. From the equator to the north pole the earth is divided into ninety parts, by lines indicating degrees of latitude. From the equator to the north pole the same kind of division takes place into ninety degrees. Any place north of the equator is said to be situated in such a degree north latitude; and any part south of the equator is in the same way described as lying in such a degree south latitude. These degrees are composed of sections of sixty-nine and a half English miles each. When written, they are indicated by a small ° after the figures, as 22°, which means twenty-two degrees; and when odd miles over a degree have to be signified, it is done also by a small mark ′, as 12′, which means twelve miles or minutes. So much for the measurement of the earth north and south. In order to indicate spots eastward or westward on the surface of the earth, a similar division takes place. The globe is reckoned to contain one hundred and eighty parts, called degrees of longitude, measuring from one given spot to another. Most nations reckon from the capital city of their own country. The English reckon from the observatory at Greenwich. By a navigator or traveller ascertaining the degree of latitude and the degree of longitude of the spot on which he is placed, he can tell his relative situation on the earth's surface, and is enabled to proceed in the exact direction which will lead him to the place which he may desire to reach.

Besides being divided into degrees of latitude and longitude, the earth is sectioned into five zones or belts. A zone is a broad space included between certain degrees of latitude, and it takes its name from the peculiar heat or cold which prevails within its compass. The torrid zone, called so from its excessive heat, lies within twenty-three and a half degrees on each side of the equator. It is bounded on the north by an ideal line called the tropic of Cancer, and on the south by an equally ideal line called the tropic of Capricorn. That portion of the earth's surface between these distant circling lines is often familiarly said to be "within the tropics." Next to the north and south lie the two temperate zones, which similarly encompass the earth. It is within the northern temperate zone that Great Britain is situated. Next these, still farther north and south, lie the frigid zones—the cold regions—which extend round the poles to the distance of about twenty-three and a half degrees. The northern frigid zone is separated from the adjacent temperate zone by a line called the arctic polar circle; and the southern frigid zone in the southern hemisphere, is similarly bounded by the antarctic polar circle. The torrid zone is computed to contain 10,500,375 square miles; the two temperate zones 103,114,775; and the two frigid zones 79,328,600—altogether 196,943,750 square miles.

SURFACE OF THE EARTH AND OCEAN.

To the physical knowledge of the earth belongs especially the consideration of its surface and interior.

* This introductory article is chiefly confined to notices of those countries which are not treated separately in the body of the work, and is written more with the view of giving a familiar general illustration than a precise statistical account. It also comprehends many particulars which were not of sufficient volume or importance to form distinct treatises. The Editors embrace this opportunity of stating, that they have spared neither pains nor expense to make the present work complete and accurate in its details, so as to fit it for very general use among all classes of the community, particularly those who cannot encounter the expense of an encyclopædia. They have much pleasure in mentioning, that, in the course of its publication, they have derived very valuable assistance from Mr John Francis Smith, one of the individuals permanently engaged upon the new edition of the Encyclopædia Britannica. The articles furnished by this able young gentleman are "Astronomy," "Geological Account of the Globe," "Natural Philosophy," "Hydrostatics," "Pneumatics," "Optics," "Electricity," "Chemistry," "Chemistry applied to the Arts," &c.

The earth's surface contains, as is said, 196,943,750 square miles, of which scarcely a third part is dry land; the remaining two-thirds are water. The land is composed principally of two large masses or tracts, one of which comprehends the continents of Europe, Asia, and Africa; the other comprehends the continent of America. Australia, which lies in the ocean in a southerly direction from Asia, is so extensive as to be entitled to the name and character of a fifth division. All the detached and smaller masses of land, called islands, when taken together, are computed to contain as much land as the continent of Europe. In reference to maps of the earth, Europe, Asia, Africa, and Australia, with their islands, are distinguished as lying in the eastern hemisphere; while America, with the West Indian and other islands, are comprehended in the western hemisphere. The seas which encompass these extensive tracts of land have locally various names; but the two principal expanses of water are the Atlantic and Pacific Oceans—the former separating Europe, Asia, and Africa, from America on the west, and the latter lying betwixt the western shores of America and the eastern shores of Asia. The extensive oceans surrounding the north and south poles are called the Polar Seas, which have not been explored sufficiently for us to be able to say whether any large tracts of land lie in these remote quarters of the globe. Great diversity of opinion prevails with respect to the depth of the ocean. By numerous investigations, it does not appear that the depth is any where much more than two or three miles, generally it is a great deal less; and it might be argued, that, notwithstanding the large surface of the ocean, the body of its waters can only be considered as lying like lakes in the hollows of the land; for the earth is eight thousand miles in diameter, and to that huge mass of dense matter the sea bears no proportion in its depth. While the surface of the land exhibits a variety of mountain ranges, hills, vales, and plains, so also is the bottom of the sea varied in its configuration, abounding in sandbanks, hills, rocks, and reefs, dangerous to the mariner; and the islands which rear their heads above the surface are only the tops of the highest hills and mountains in the sea. The waters of the ocean, as every one knows, are salt, to a greater or less degree—a quality which is considered necessary to preserve them from putridity; but how this saltness is produced, no one is yet able to tell correctly, although, as is generally conjectured, it must arise from the abundance of saline substances at the bottom of some parts of the ocean. The cause of springs on the land, from which rivers draw their sources, is also acknowledged to be still very doubtful. Some consider they originate from the rains which the earth has imbibed; some allege that they rise from subterranean lakes by means of capillary attraction; and others say that they are outlets for the water accumulated in higher parts of the country, which water has found its way through seams of rock, as if carried by pipes: but to all these suppositions there appear different objections. The most enlightened men are likewise unable to give any rational account of the existence of volcanoes or burning mountains. Whether they derive their action from a depth of only a few miles, or from the centre of the globe, or what it is that feeds their combustion, are questions which have never yet been satisfactorily solved. It is, however, known that they are connected with earthquakes, and in that respect of extensive subterranean influence. The most interesting of all the phenomena connected with our globe, are the tides of the ocean, which have been the subject of much scientific disputation, and are generally attributed to the influence of the moon. We believe they will be found to be elucidated agreeably to the best received ideas, in the article ASTRONOMY.

THE ATMOSPHERE.

The earth—the surface of which is so beautifully diversified by water and dry land, mountains and vallies, extensive forests and tracts of open country—is on all sides surrounded with air, without the presence of which, not even the humblest being in the scale of organisation could support its own existence. The ancients were not unacquainted with the vast importance of this agent in the great economy of nature; but they possessed no just idea of its properties, and it remained for Galileo and his pupil Toricellius to make us acquainted with the nature of atmospheric pressure. The air is generally described as a fluid, because all bodies move through it with facility; and in a state of rest, it does not oppose the passage of the minutest winged insect, or the transmission of the most delicate odour. Its whole mass, surrounding the earth, may be regarded as a great aërial ocean, at the bottom of which, man, and a vast variety of animals, live; while winged tribes alone rise into its higher regions. How high it extends, has not been yet satisfactorily determined; but from the length of time during which the sun's rays continue to be reflected from its upper regions back to the earth, after its orb has sunk below the horizon, there is reason to infer that it extends, in a state of extreme tenuity, to a very considerable height; nay, it has been conjectured that, in this attenuated condition, it may pervade all space, accumulating round the sun, moon, and stars, and forming an atmosphere round each of them, of greater or lesser density, according to their respective powers of attraction. By the experiments of Toricellius, it is ascertained that the pressure of the atmosphere on the earth and bodies upon it, is equal to a pressure of mercury to the depth of thirty inches, or of water to the depth of thirty-four feet. It has since been calculated that the pressure of air amounts on an average to fourteen pounds and a half on every square inch of the earth's surface, so that the human body is held down under a weight of from fifteen to twenty tons. This burden, which is serviceable in preventing bodies from flying off from the surface of the earth, is, however, unfelt, because our persons and the bodies of all living things are permeated or saturated with air to such an extent as to neutralise the incumbent influence of the atmosphere. The pressure of the atmosphere, or its density, diminishes as we ascend high mountains, and it is only in these extremes that we are sensible of its character by the difficulty experienced in breathing.

The atmosphere requires a certain quantity of moisture for the support of the vegetable creation, and this end is attained by a constant evaporation of the watery particles of the seas, rivers, lakes, &c. which, when carried into mid-air under a particular temperature, assume the appearance of masses of vapour or clouds. More vapour rises in maritime countries, and those interspersed with lakes, than in inland situations; more rises during hot than cold weather, and during a brisk wind than during a calm. As long as the air holds this moisture in solution or suspension, so as not to exceed its capacity of saturation, it remains invisible; but if the temperature diminishes, the quantity of vapour which surpassed the degree of saturation condenses, and, according to its degree of condensation, resumes the liquid state, descending in the shape of fogs and rain. In certain conditions, the atmosphere becomes charged with electric matter, by the agency of which, thunder and lightning are produced.—See articles ELECTRICITY and AERONAUTICS.

INTERIOR OF THE EARTH.

The interior of the earth, beyond the depth of a few hundred feet, is entirely unknown to us. We can only judge of it by an examination of its exterior, and by penetrating below its surface to a certain depth. From these examinations, it appears that the upper coating of the globe consists of a variety of layers of different descriptions of rock or stone, with a covering of beds of sand, clay, and other kinds of soil. The nature of these encrustations, and the order in which they lie, are sufficiently explained in the article GEOLOGY; and we need here only advert to the remarkable fact of all these various layers or strata of rock, with only one exception, abounding in the petrified remains of vegetables and animals, and which usually receive the name of fossils, or organic remains. By these remarkable indications we learn that the earth has undergone several extraordinary revolutions since its origin. But what is still more curious, we learn, by the absence, on all occasions and in all places, of the remains of human beings as well as the monkey tribes, that these are of a much later creation than other animals. It would seem that there have been several great eras, each distinguished by a peculiar class of vegetables and animals, rising successively up and up in excellence of configuration, to that which we now discover in the present day. On this subject, Bakewell, in his "Introduction to Geology," observes—"The fossil remains of animals not now in existence, entombed and preserved in solid rocks, present us with durable monuments of the great revolutions which our planet has undergone in former ages. We are carried back to a period when the waters of the ocean have covered the summits of our highest mountains, and are irresistibly compelled to admit one of two conclusions—either that the sea has retired and sunk far below its former level, or that some power operating from beneath has lifted up the islands and continents, with their hills and mountains, from the watery abyss, to their present elevation above its surface.

These organic remains present also undeniable proofs of another fact equally interesting. Every regular stratum in which they are disseminated was once the uppermost rock, however deep it may be below the present surface, or with whatever rocks it may now be covered. This inference is not the less conclusive, whether we suppose that the animals lived and died where their remains occur, or whether they were aggregated and carried by marine currents into their present situation. Hence we learn that the secondary strata were formed in succession over each other, and thus these fossil remains preserve the records of the ancient condition of our planet, and the natural history of its earliest inhabitants. The unknown causes by which zoophytes and different genera and species of testaceous animals, of reptiles, vegetables, and mammiferous quadrupeds, were buried in different strata, have operated in succession at distant intervals of time; for we do not find the remains of different classes confusedly intermixed together, except in beds of clay or gravel, near the surface, or in fragments of various rocks which have been broken down and subsequently united. Bones of vertebrated animals, or such as had a brain and spinal marrow, have never been found in the lower strata, except of a few species of fish; nor have the bones of large mammiferous quadrupeds ever been discovered below the chalk. Hence we acquire a perfect certainty that the different beds which form the crust of our planet were deposited in distant epochs, and under different conditions of the globe. The animal remains in some of the strata are so delicate, and so regularly deposited, that we can have but little doubt that the animals lived and died tranquilly where their remains are now found: in other strata the remains are dispersed and broken, and the animals appear to have perished by some sudden convulsion.

The absence of human bones in stratified rocks or in undisturbed beds of gravel or clay, indicate that man, the most perfect of terrestrial beings, was not created till after those great revolutions which buried many different orders and entire genera of animals deep under the present surface of the earth. That man is the latest tenant of the globe, is confirmed by the oldest records or traditions that exist of the origin of the human race. The great convulsions which here at distant periods changed the ancient surface of the globe, and reduced it from a chaotic to its present habitable state, were not, it is reasonable to believe, effected by the blind fury of tumultuous and conflicting elements, but were the result of determined laws, directed by the same wisdom which regulates every part of the external universe. Compared with the ephemeral existence of man on the earth, the epochs of these changes may appear of almost inconceivable duration; but we are expressly told, 'that with the Creator a thousand years are as one day, and one day as a thousand years.'"

Having given an account of the various races of men now found on the earth, in the article HISTORY OF MANKIND, in the present work, we proceed to notice those territories and nations which have not elsewhere engaged our attention.

EUROPE.

Europe is the smallest of the great divisions of our globe, but distinguished above the rest by the character of its population, the superior cultivation of the soil, and the flourishing condition of arts, sciences, industry, and commerce, the multitude of large and well-built cities, and its power and influence over the other parts of the world. Of the origin of its name and its inhabitants, history furnishes no certain account. It is most probable that the first inhabitants emigrated from Asia, the cradle of the human race. Greece was first peopled by the emigrants. In that country, about 1400 years before our era, grew up the Hellenes, who soon outstripped the civilisation of Asia. The most flourishing period of that nation, commonly called the Greeks, was about 300 B. C. Equally distinguished in action and speculation, adorned by the arts and sciences, rich in the noblest productions of cultivated minds, it will be, as long as civilisation endures, an object of admiration, and its remains the foundation of our knowledge and taste. But with the dissolution of Alexander's empire, which had been raised on the ruins of Grecian freedom, Greece sunk into insignificance.

At the same time, another nation was rising in Italy, the Romans, who appeared, indeed, at an earlier period, but made no figure in history till they had become masters of Italy, and had proved victorious in their struggle with the Carthaginians. From that period their power began to extend over all Europe. They subdued the divided Greeks, and transplanted their arts and refinement to the Italian soil. By the progress of the Roman arms, Spain, Portugal, France, the coast of England, Belgium, Helvetia, the part of Germany between the Danube and the Alps, the Hungarian provinces (then called *Pannonia*, *Illyra*, and *Dacia*), became known, and received the Roman manners, language, and refinement. Agriculture was introduced, and flourishing cities rose among the wandering tribes. The Christian religion, which spread throughout the wide Roman empire, was also a powerful instrument in the civilisation of most of the European nations. Germany alone resisted the overwhelming power of Rome, and thereby prevented the spreading of Roman civilisation in the north of Europe, which still remained unknown in history. With the fall of the Roman empire, occasioned chiefly by its separation into the Eastern and Western empires, a great change in the political constitution of Europe was produced, by the universal emigration of the northern nations. These nations poured down upon the beautiful and cultivated countries of the Roman empire, now in the weakness of decline, and Roman art and science were obliged to give place to the barbarity, the deep ignorance and superstition, of the middle ages.

The Ostrogoths and Lombards settled in Italy, the Franks in France, the Visigoths in Spain, and the Anglo-Saxons in South Britain, reducing the inhabitants to subjection, or becoming incorporated with them. The empire of the Franks was enlarged, under Charlemagne, to such an extent that the kingdoms of France, Germany, Italy, Burgundy, Lorraine, and Navarre, were afterwards formed out of it. About this time, the northern and eastern nations of Europe began to exert an influence in the affairs of the world. The Slavi, or Sclavonians, founded kingdoms in Bohemia, Poland, Russia, and the north of Germany; the Magyarians appeared in Hungary, and the Normans agitated all Europe. The establishment of a hierarchy was now undertaken by the Popes, and finally carried to its completion by Gregory VII. and Innocent III. The power of the Popes was increased by the crusades. Nevertheless, this struggle between Asia and Europe had the effect of forming a middle class, of leading the peasant gradually to throw off the chains of bondage, and of introducing the arts and sciences through the Arabs and Greeks into Europe. The revival of letters, by the Greeks fleeing from Constantinople, gave an entirely new impulse to Europe. The establishment of universities, the invention of printing, and the Reformation, served to cherish and develope these seeds of improvement. The feudal contests, the struggle of privileges, led eventually to the acknowledgment and establishment of the rights of the individual.

Out of the chaos of the middle ages, arose the states of Germany, France, Spain, Portugal, England, Scotland, Switzerland, the Italian powers, Hungary, Bohemia, Poland, Denmark, Sweden, Norway, and Russia. By the capture of Constantinople (1453), the Turks, with their fanatical military despotism, became an European power. Austria, Holland, Prussia, and Sardinia, were also added to the number of European states; and Russia, from the time of Peter I., was changed from an Asiatic into an European empire. The attempts of Charles V. and Louis XIV. to become masters of Europe, failed; but in our own times, Napoleon conceived the project of forming, from the European states, an universal monarchy, and pursued it for ten years. Since the formation of the states of Europe, the following have disappeared from the list of independent powers: Hungary, Poland, the German empire, Scotland, Bohemia, Venice, Genoa, and Milan. The following have been added: the states of the German confederacy, the Italian states, the republic of the Ionian Islands, and that of Cracow. A natural consequence of the general diffusion of intellectual cultivation, and the decay of the feudal system, has been the gradual developement of the ideas of equal right and individual liberty; bloody struggles have naturally ensued between the adherents of the new and old opinions, and Europe is still convulsed by them.

Europe is washed on three sides by the sea, which is called by different names, and belongs either to the Northern Arctic or the Atlantic Ocean. A narrow strait of the Mediterranean separates it from Africa. On the east alone it joins the main land, being there separated from Asia by an imaginary line. Europe is situated in the northern frozen and the northern temperate zones, between 10° and 63° east longitude, and 36° and 71° north latitude. Including the islands, which contain about 317,000 square miles, the whole extent of Europe amounts to about 3,250,000 square miles, of which Russia comprises nearly one-half. The greatest length, from Cape St Vincent, in Portugal, to the northern extremity of the eastern boundary, at Waygatt's, is about 3500 miles. The greatest breadth, from Cape Matapan, in the Morea, to the North Cape, in Norway, is about 2500 miles. Europe is remarkably well watered, although its rivers have not so long a course nor such large cataracts as those in other parts of the globe, particularly in America. The principal rivers are the Ebro, the Rhone, and the Po, running into the Mediterranean; the Danube, the Dnieper, and the Dniester, into the Black Sea; the Don, into the Sea of Asoph; the Wolga, into the Caspian; the Dwina, into the Arctic Ocean; another Dwina or Duna, the Vistula, and the Oder, into the Baltic; the Elbe, Weser, and Rhine, into the North Sea; the Seine, into the English Channel; the Thames into the German Ocean; the Loire and Garonne, the Duoro and Tagus, the Gaudiana and Gaudalquiver, into the Atlantic. The Wolga and Danube are the longest. Of its numerous lakes, the largest, which, however, bear no comparison with the North American, are in the north of Europe; viz. in Russia, Lakes Ladoga (the largest in Europe), Onega, and Tchudskoe, or Peipus; in Sweden, Lakes Maler, Wener, and Wetter. On the borders of Germany and Switzerland is Lake Constance; on the borders of Italy and Switzerland is the Lake of Geneva (Lake Leman); in Hungary are Lakes Platten and Neusiedler.

A great part of Europe is mountainous; the southern more so than the northern. The most elevated region is Switzerland, from which there is a descent, which terminates, on the side of the North Sea and the Baltic, in low plains. The lowest and most level parts are Holland and Northern Germany, Denmark, Russia, and Prussia. The highest mountains are the Alps, in Switzerland and Italy, which spread from those countries in various directions, extend westwardly into France, and are connected by the Cevennes with the Pyrenees, which separate France from Spain. One chain of the Alps stretches south towards the Mediterranean; then, taking an easterly course, runs through Italy, under the name of the Appenines. Several branches run eastward from the Alps, through the south of Germany, as far as the Turkish provinces. Another chain, the Jura, runs to the north, and separates Switzerland from France. In the east of Europe are the Carpathian mountains, which on one side meet the Sudetic range, and on the other the mountains of Turkey in Europe. The highest mountain in Europe is Mont Blanc, in Savoy, one of the Alps, which is said to be 15,766 feet above the level of the sea.

Several of the European mountains are volcanoes; as Ætna, Vesuvius, and Hecla. It is a fact worthy of notice, that none of the volcanoes of Europe are to be found in any of the great chains of mountains which have just been enumerated. The only one on the continent is Vesuvius, and this is too much detached to be considered as properly forming one of the Appenines. Ætna, in the island of Sicily, rising to the height of ten or eleven thousand feet above the level of the sea, is the largest European volcano. The Lipari Islands, anciently called the *Æolian*, a few miles to the north of Sicily, bear evident marks of a volcanic origin; and in several of them, subterranean fires are still in operation. The volcano of Stromboli is in almost incessant activity, and differs in this respect from any other with which we are acquainted. The Azores, in the Atlantic Ocean, are doubtless indebted for their formation to the same circumstance as the Lipari Islands; and indeed new rocks have risen from the sea in their vicinity, within a recent period. An eruption took place at St George, during the present century. Iceland, too, though lying under 65° of north latitude, presents the most abundant tokens of the presence of volcanic fire, and has often suffered under its devastations. Mount Hecla is the most noted, though not the only source of the eruptions on this island. To the possession of many inland seas, and, consequently, of a line of coast very extensive in proportion to its area, Europe is greatly indebted for the great advancement of its inhabitants in civilisation; these circumstances being favourable to that intercourse without which nations never make great advances. The peninsulas are six: Scandinavia, Jutland, Crimea, Italy, Spain, and Greece. The soil of Europe, though not equal in luxuriance to that of the tropics, is almost throughout fit for cultivation. The tracts in the northern zone are almost the only exception.

With respect to climate, Europe may be divided into three parts—the warm region, where the lemon-trees grow wild, as far as 48° north lat., having a pleasant spring, a hot summer, and short winter; the temperate, as far as 65° N., in which grain ripens; and the cold region, to the extreme north, where nothing will grow but reindeer moss, and no domestic animal can live except the reindeer. The products are not so various as in other parts of the world, and many of them were originally brought from foreign countries and naturalised; but, on the other hand, Europe can boast of a more perfect cultivation. Among the animals are horses, some of which are of the noblest breeds, horned cattle, sheep in Spain, Saxony, and England, of the finest wool, asses, goats, swine, dogs, reindeer, wild beasts of different kinds, valuable for their flesh or fur, whales, sea-cows, sea-dogs, abundance of wild and tame fowl, large quantities of fish in the seas, lakes, and rivers, among which the herring, in particular, affords sustenance to many of the inhabitants: useful insects, such as bees, silkworms, kermes, gall-flies, and Spanish flies. Oysters and pearl mussels also abound. It produces all kinds of grain, and sufficient for its consumption; beautiful garden plants; abundance of fruits, including those of southern climates, such as figs, almonds, chestnuts, lemons, oranges, olives, pomegranates, dates; also flax, hemp, cotton, madder, tobacco, the best kinds of wine, and a great variety of wood for fuel, and for house and ship building. The birch and the willow best endure the cold of the northern polar circle. Europe produces all the varieties of metals and minerals in great excellence and abundance. In gold and silver, Hungary and Transylvania are the richest; in iron, the northern countries, Sweden, Norway, and Russia. Salt of all kinds, rock, sea, and spring salt, is also abundant in Europe.

The inhabitants, estimated by Malte-Brun at 200 millions at least, are unequally distributed; in Russia and Sweden there are from fifteen to eighteen to a square mile; in the Netherlands, where the population is most dense, Italy, France, Great Britain, and Germany, the same extent supports from one hundred and fifty to two hundred and fifty persons. The inhabitants consist of several different races, speaking distinct languages. The stocks to which the principal languages belong, are—the Teutonic, which is the mother of the German, Dutch, English, Swedish, and Danish; the Latin, or Roman, now spoken only by the learned, but the mother of the Italian, French, Spanish, Portuguese, and Wallachian; the Sclavonic, to which belong the Russian, Polish, Bohemian, Bulgarian, Vandal, and the Servian, or Illyrian. Besides these, there are the modern Greek; the Turco-Tartaric; the Finnish and Hungarian; the Celtic in Wales and the north-west part of France (Bretagne); the Highlands of Scotland and Ireland; the Basque, among the Pyrenees. The most widely spoken is the German, with its kindred languages, formed by a union of the Roman with the Sclavonic.

The prevailing religion is the Christian, which includes several churches, viz., the Roman Catholic, which is the most numerous; the Protestant (Lutheran, Calvinistic, and Anglican), consisting of numerous sects—Anabaptists, Mennonites, Quakers, Unitarians, Methodists, Moravians, and the Greek church. A part of the inhabitants profess the Jewish, a part the Mahommedan religion. Among the Laplanders and Samoeides, there are also some heathens, but their number is small.

Agriculture has made great advances in Europe, and is daily improving. In this respect, those countries are particularly distinguished where the Teutonic languages are spoken, as also are France and a part of Italy. In no part of the world are manufactures carried to such perfection as in several of the European countries, especially in Great Britain, France, the Netherlands, and Germany. The inhabitants work up not only native European, but also foreign products, and supply all the wants and luxuries of life. Commerce is not less active, and is promoted by well-constructed roads and canals, by well-organised posts, banks, insurance companies, commercial companies, and fairs. The commerce of Europe extends to all quarters of the world, and every sea is filled with European ships. In this respect, Great Britain is most distinguished. Europe is the seat of art and science; to her belongs the honour of discovering the most important truths, of giving birth to the most useful inventions, the finest productions of genius, the improvement of all the sciences. In intellectual progress, the Teutonic races, and those who speak the languages derived from the Latin, have surpassed the Sclavonic nations. The Turks have remained strangers, in many respects, to the literary and scientific improvement which has marked the other European nations. Eighty-five universities provide for the higher branches of education; numerous gymnasia and academies for the preparatory studies, and a great number of lower schools, particularly in Germany, are employed in educating the common people. In many places there are academies of science, and societies of all kinds, for the cultivation of the arts and sciences.

By its physical situation, Europe is divided into East and West Europe. West Europe comprises the Pyrenean peninsula (Spain and Portugal), the country west of the Alps (France), the countries north of the Alps (Switzerland, Germany, and the Netherlands), the country south of the Alps (Italy), the islands of the North Sea (Great Britain, Ireland, and Iceland), and the countries on the Baltic (Denmark, Norway, Sweden, and Prussia). East Europe contains the countries north of the Carpathian mountains (Russia and Galicia), and the countries south of the Carpathian mountains (Hungary, in its more comprehensive sense, and Turkey). The following are the political states of Europe: the three empires of Austria, Russia, and Turkey; seventeen kingdoms, viz. Portugal, Spain, France, Great Britain, Holland, Belgium, Denmark, Sweden, Norway, Sardinia, the Two Sicilies, Greece, Prussia, Bavaria, Saxony, Hanover, and Würtemberg; one ecclesiastical state, the papal dominions; seven republics, namely, Switzerland, the Ionian Islands, San Marino, Hamburg, Lubeck, Bremen, and Frankfort; one electorate, Hesse; six grand-duchies, Baden, Hesse-Darmstadt, Saxe-Weimar, Mecklenburg-Schwerin, Mecklenburg-Strelitz, and Tuscany; twelve duchies, viz. Oldenburg, Gotha, Meiningen, Altenburg, Brunswick, Nassau, Dessau, Bernburg, Cöthen, Modena, Parma, and Lucca; one landgraviate, viz. Hesse-Homburg; one grand principality, Finland, and twelve principalities, viz. Hohenzollern-Hechingen, Hohenzollern-Sigmaringen, Schwarzburg-Rudolstadt, Schwarzburg-Sondershausen, Waldeck, Lippe-Detmold, Schaumburg-Lippe, Lichtenstein, Reuss-Greiz, Reuss-Schleiz, Reuss-Lobenstein, and Reuss-Ebersdorf.

CONSTITUTIONAL GOVERNMENTS.

We consider that it will be advantageous in a work of this popular nature, to present a short notice of those European states which have in the course of time obtained constitutions, with the dates when they came under this improved mode of government. Nevertheless, such are the changes constantly effecting in this respect, that all we can hope to ascertain is an approximation to correctness. It will also be difficult to point out distinctly what is sometimes the nature of the constitutions we allude to, for, however free in appearance, they are occasionally under the immediate influence of armed intervention, and the apparent restraints on the rulers, as well as the security of the subjects, are in many instances little else than a mockery.

The first kind of constitutions to be noticed are those founded on the feudal estates of the middle ages, and on the system of corporations: for instance those in the Austrian monarchy, as follows:—In the archduchy of Lower Austria, in Stiria, and Carinthia, in Bohemia, Moravia, and, since 1810, also in Galicia and Lodomeria with Bukowine, the estates are still kept up, comprising the four orders—the clergy, nobility, gentry, and citizens; the latter being represented by the magistrates of the royal cities. In the Tyrol, we find again, since March 24, 1816, the estates of peasants, citizens, nobility, gentry, and clergy. But notwithstanding their gallant struggle against the French and Bavarians, they have not even received from Austria the right of a voice in the imposition of their own taxes, which formerly belonged to them; but the constitution allows them the right of making representations, in the name of the country, to the emperor! In the imperial part of Silesia, the estates are composed only of the dukes and princes, with the lords and gentry, who are immediately under the emperor. In the Lombardo-Venetian kingdom, the estates are founded, according to the constitution of April 24, 1815, on the system of corporations. Two central congregations exist at Milan and Venice: the different provincial congregations in the Lombardic part of the kingdom consist of deputies appointed by the king; in the Venetian part, of deputies elected by the central congregation and the *gubernium* (the Austrian designation of the government). All these deputies are from among the noble and not noble landed proprietors, and from the royal cities, under the sway of the imperial governors or delegates. The privileges of these estates consist almost solely in the right of granting the royal *postulates*, and in the distribution and collection of the taxes. Some have also the right of advising the government, and that of petitioning. In Hungary the four orders of the estates

—the high clergy, the barons and *magnates*, the gentry, and royal free cities—have important privileges. The nobility or gentry and the cities elect their deputies, and give them instructions. In Transylvania, the grand-prince exercises certain rights of sovereignty, assisted by the representatives of the three nations (the Hungarians, Szeklers, and Saxons) whom he convokes. These representatives consist partly of royal officers, partly of deputies appointed by the regent or elected by the corporations.

2. Sardinian monarchy.—On the island of Sardinia, the clergy, nobility, and deputies of the cities and boroughs, exercise, together with the king, the right of legislating and taxing. 3. In the kingdom of Sweden, there exist, according to the latest constitution of June 7, 1809, the old estates, comprising four orders—the nobility, clergy, citizens, and crown-peasants. The diet has the right of legislation and taxation, and the superintendence of the finances, bank, and mint. The king has an unconditional veto.

4. In the kingdom of Saxony, the estates are composed of three orders. The first order consists of the higher clergy, or prelates, princes, counts, and lords, with the deputies of the university of Leipsic. The second order embraces the gentry, to which, since 1820, twenty-nine deputies also have been joined from the possessors of noble estates. The third order consists of deputies from the magistrates of the cities. The business of granting and fixing the taxes, and of receiving the accounts connected therewith, belongs to the diet; important laws of a general character must also be laid before them for consideration. 5. A similar constitution exists in the duchy of Saxe-Gotha, in which the legislative body consists of the estates of the counts, the gentry, and the citizens. Each of these estates has only one vote. The principality of Altenburg has two estates—the gentry and the citizens.

6. In the kingdom of Hanover, the estates were, according to a decree of December 7, 1819, divided into two chambers. The old system of corporations was retained. 7. In the principality of Liechtenstein, a constitution a. .r the Austrian fashion was introduced, Nov. 9, 1818. The estates consist of the clergy and the deputies from the communities, appointed by the magistrates. Their power is simply to make propositions. 8. In the two grand-duchies of Mecklenburg-Schwerin and Mecklenburg-Strelitz, the estates consist of the *Ritterschaft* and deputies of the corporations. They have very great privileges, which the former particularly maintains with great strictness. 9. In the principalities of Reuss, the old estates also exist, as, likewise, 10. in the Danish duchy of Saxe-Lauenburg.

11. The republic of the seven Ionian Islands was erected March 21, 1800, and governed according to the aristocratic constitution, established under Russian influence, Dec. 6, 1803. When the republic was placed under the protection of Great Britain, the lord-commissioner, Maitland, dissolved the senate, which had existed at Corfu since 1803, and established a new constitution Jan. 1, 1818, according to which the legislative body consists of deputies of the nobility, and the senate is chosen from among the legislative body.

The second description of constitution is that of Great Britain, which is founded jointly upon hereditary monarchy, estates of nobility, and that of a general national representation. The British constitution, which has been greatly modified by a strong democratic infusion consequent on the reform acts of Parliament, being well known to our readers, needs no illustration here.

The third kind of constitution consists of a government composed entirely through the medium of national representation. The first government erected of this kind was that of the United States of America, which began in 1787. Constitutions in which the aristocratic element was excluded were soon after established in France. Several other states then shook off the fetters of the feudal system, and introduced more or less of the democratic element into the constitutions which they adopted. During the last half century, there have been one hundred and fourteen new written constitutions established in Europe and America: thirty-one of them have been abolished, but the remainder still exist, and about one hundred millions of people are ruled by them.

France has seen, since the revolution, nine different constitutions:—1. The monarchical-representative constitution of 1791. 2. The republican-democratic constitution of June 24, 1793. This never went wholly into operation, much power being given, for the time, to dictatorial bodies. 3. The constitution of September 23, 1795, which established the directorial government, and divided the legislative body of the national convention into the council of the ancients and the council of the five hundred. It vested the right of electing the representatives immediately in the primary assemblies. 4. The constitution of December 13, 1799, established a first consul for ten yea[rs] with the right of proposing laws, and two other consuls. The first consul (Bonaparte) was surrounded by a council of state and ministers. A triple election was at the same time established. The citizens of each commune chose one-tenth of their number as persons qualified for public office; the aggregate of the persons thus named in all the communes of a department chose also one-tenth of their number; and from the whole body of persons thus nominated by all the departments, forming the national list of persons eligible to official situations, the conservative senate chose the legislators, tribunes, consuls, the members of the court of cassation, and the commissioners of accounts. In this instrument the principles of the liberty of the press, and others of a similar kind, which had been guaranteed in the former constitution, were omitted. 5. Many essential changes were soon after made in this constitution by the various *senatus-consultes organiques*, so called. These decrees of the senate, of August 2 and 4, 1802, gave the first consul, Napoleon Bonaparte, his dignity for life, and invested him with several monarchical prerogatives. 6. At last, the *senatus-consulte* of May 18, 1804, elevated the first consul to the dignity of emperor of the French, and the succession was made hereditary in his family.

France had now a monarchical constitution with some democratic forms; one of these—the tribunate—was abolished by the *senatus-consulte organique* of August 19, 1807. The equality of all citizens, in the eye of the law, was a principle preserved in all the French constitutions, and even the Bourbons were obliged to make it a prominent feature in the *Charte Constitutionnelle*. 7. After the downfall of Napoleon, the senate drew up a new constitution, of April 6, 1814, in which an aristocracy, hereditary in the families of the senators, was established. It guaranteed, however, in several respects, the liberties of the people. But Louis XVIII., as it is well known, adopted, at St Ouen, May 2, 1814, only certain principles of this constitution, relating to the representative system in two bodies, the responsibility of the ministers, the judges' tenure of office during good behaviour, the irrevocability of the sale of the national property, the capacity of every Frenchman for all civil and military appointments, and, as before mentioned, the equality of all citizens in the eye of the law. 8. After this, the king promulgated, June 4, 1814, the present constitution, the *Charte Constitutionnelle*, which had been drawn up by a committee appointed by him. It established a chamber of peers, to be elected by the king, and a chamber of deputies, to be chosen by electoral colleges. These two bodies, together with the king, were to form the legislature. But this instrument left many points unsettled, which allowed full play to machinations of all kinds. 9. After the return of Napoleon from Elba, the emperor promulgated a new constitutional instrument, as an addition to the imperial constitution, April 22, 1815. This was adopted by the people, in June, on the occasion of the celebrated *Champ de Mai*.

When Louis XVIII. returned to Paris, the *Charte* went again into operation. By the electoral law of June 28, 1820, the democratic element of this fundamental law, as respects the representation of the people, has been essentially weakened, or rather thrown out; as, in a population of 35,000,000, there are only 70,000 electors, and only five or six thousand who can be elected. The law of June 9, 1824, established septennial elections of the chamber of deputies, though the *Charte* had limited their term of office to five years. The constitution of France was subsequently improved at the installation of Louis Philip in 1830.—See FRANCE, under.

The kingdom of the Netherlands was established under a constitutional form of government in 1815, but this conjoined nation has recently been dismembered by civil war, and now Holland, under King William I., and Belgium, under King Leopold, have been erected into independent states, each with constitutions of a peculiar nature. It is not less difficult to speak of those nations than of Spain and Portugal, both of which are at present undergoing important changes in their forms of government. It is sufficient to say, that both in Spain and Portugal the powers of the sovereigns are now, at least nominally, restrained by the influence of the cortes or estates and people. Of late, also, considerable modifications are understood to have taken place in the constitution of Norway, by which the ancient aristocratic body is divested of authority.

We now pass to a notice of the constitutions of those various states composing the empire of Germany. The constitution of the former German empire was founded entirely on the principles of the feudal system and the old corporations. The states were independent to a considerable extent of each other; but for purposes of war or other aggregate movements, they submitted to one head, an emperor, who was at the same time ruler of a special district. Napoleon abolished the empire, and established the confederation of the Rhine in 1806. This confederation was practically of no avail, yet it led to the introduction of constitutional governments into some of the states between 1806 and 1815. 1. The kingdom of Westphalia, which lasted from 1807 to 1814, received a constitution modelled after the French representative system. This served as a model for the constitutions of several other states belonging to the confederation of the Rhine. It expired with the kingdom. 2. The grand-duchy of Frankfort had a similar constitution, from August 16, 1810, to 1813, which met with a like fate. 3. In the kingdom of Bavaria, which belonged also to the confederation of the Rhine, a national representation was established in May 1808, by a formal constitution and six constituent edicts; but by the decree of December 2, 1811, the owners of *majorates* (entailed estates) and the possessors of noble fiefs, were declared representatives of the Bavarian nation by right of birth. At last, the king, Maximilian, granted the constitution of May 26, 1818, accompanied by ten edicts. May 17, 1818, a regulation for the communities had been already promulgated. The constitution establishes two houses—one of peers, the other of commons—the former to hold their places by right of birth, or by appointment of the king, the latter by election. This election, however, is not made by the people collectively, but by the different estates—nobility, clergy, and scholars, citizens and peasants. This constitution nominally provides for the chief points of civil liberty, freedom of conscience and of the press, equality of all the citizens in the eye of the law, the equal capacity of all citizens for all appointments in the service of the state, also the equal distribution of taxes, the responsibility of public officers, &c. 4. Würtemberg.—King Frederic abolished, in 1806, the old constitution, founded on a compact concluded between the estates and the sovereign, and governed absolutely, according to the decree of organisation of March 18, 1806. January 11, 1815, he issued a proclamation, by which he intended to prepare the way for the establishment of such a constitution as he wished; but the assembly convoked by him in March 1815 refused the proposed constitution, asking for the re-establishment of the old one. At last the constitution of September 25, 1819, was established by way of compact. It provides for two houses of legislature.

5. The grand-duchy of Baden, after several preliminary decrees, received a constitution, August 22, 1818, which provides for two houses of legislature. The first is composed of peers, of the deputies of the gentry and the universities, a Catholic bishop, a Protestant prelate, and eight members nominated by the monarch, without reference to their birth or station. The lower house consists of deputies, chosen with reference to the population. 6. The grand-duchy of Hesse-Darmstadt received a constitution, providing for two houses, May 18, 1820. 7. The principality of Waldeck and Pyrmont received a constitution January 28, 1814. This was changed, however, April 19, 1816, when a constitution was established, by which only the landowners and corporations of the cities are represented. 8. The duchy of Nassau received a constitution by the ordinance of September 2, 1814, which establishes two houses, one of hereditary peers, the other of representatives, chosen for a limited time. July 1, 1816, a new organisation of the government was proclaimed. It is founded, for the most part, on the division of estates. 9. Saxe-Weimar received a constitution September 20, 1809, while she belonged to the confederation of the Rhine. Another constitution was adopted May 5, 1816, founded on the estates of the nobility, citizens, and peasants, each of which sends ten deputies, while the university of Jena sends one. There is only one house of legislature. The elections are free, and the liberty of the press is guaranteed. The diet, opened December 17, 1820, exhibited the remarkable instance of a representative body refusing publicity to its deliberations, and allowing only the publication of portions of its proceedings. The liberty of the press has been long since suspended. It is hardly necessary to mention how utterly insufficient a basis of representation the ancient estates are in our times, since the important classes of the learned (who were formerly represented in the clergy), artists, mechanics, merchants, and manufacturers, remain, on this system, unrepresented.

10. Saxe-Coburg received a constitution from its sovereign, August 21, 1817, founded on the estates. When the diet is not sitting, a permanent committee watches over the maintenance of the constitution, and the execution of the laws. A further constitutional regulation was given December 15, 1820, and the diet first assembled in 1821. 11. Saxe-Hildburghausen received a constitution, January 7, 1818, founded on the estates. A permanent committee of the nobility, the cities, and clergy, represents the diet when it is not sitting. 12. The principality of Schwarzburg-Rudolstadt received a constitution, April 21, 1821, founded on the estates. 13. The principality of Lippe-Schaumburg received a constitution by a decree of January 15, 1815. It is founded on the estates. 14. Lippe-Detmold received a constitution, June 8, 1819, from the princess regent Paulina, drawn up by herself; but this instrument was too liberal for the old estates of the nobility and the cities, which protested against it, as did also the prince of Schaumburg as agnate. 15. The duchy of Brunswick-Wolfenbüttel received a constitution, January 19, 1820, founded on the estates and corporations. It provides only one house of legislature. In respect to the granting of taxes, the old constitution was retained.

16. The free city of Frankfort, during the reign of Napoleon, received a liberal organisation, October 10, 1806. July 18, 1816, an act was passed by the senate, supplementary to the old constitution of the city, when it was an imperial free city, which was accepted by the citizens. The former privileges of the patrician families do not exist any longer. 17, 18, 19. The three Hanseatic cities have re-established, since 1814, their old constitutions, founded on the ancient corporations, and, like several others, little in unison with the demands of the age. 20. The duke of Saxe-Meiningen established a constitution, September 4, 1824, founded on the estates. The Swiss confederacy was transformed, by the French directory, in 1799, into the Helvetic republic, with a democratic form of government. This gave rise to bloo[d]y contests. Bonaparte, by the act of mediation, Fe[b]ru[ar]y 19, 1803, gave a new federative constitution to th[is] country, combining ancient and modern elem[ents]

September 8, 1814, the cantons convened again, and received into the confederacy of the nineteen cantons three new ones—Valais, Geneva, and Neufchatel. Each canton has its own representative constitution, founded on the elements of the old system, together with the principles of the act of mediation. In some, the aristocratic principle prevails; in others, the democratic. Some cantons are purely democratic, as Valais, Coire, Zug, &c. Neufchatel has a constitution in which aristocratic, democratic, and monarchical principles, are combined. The king of Prussia, the sovereign of this canton, established this constitution, June 18, and December 28, 1814.

Having thus enumerated the European states which have received constitutions, it may not be uninteresting to take a survey of those European states which are governed by sovereigns entirely absolute. Austria was mentioned among those countries in which constitutions founded on the old feudal estates exist; but although this may be the case in point of form, yet the Austrian monarchy is virtually one of the most absolute governments that can exist, and has systematically pursued, for a long series of years, so arbitrary a course in many respects (including the administration of the finances and the intellectual cultivation of the people), that we can hardly find any thing parallel in governments which claim to be purely absolute; as, for instance, in Prussia. The following governments are without constitutions:—1. Piedmont, Savoy, and Nice. 2. Tuscany, Parma, and Modena. 3. The Two Sicilies. 4. The States of the Church. 5. Prussia, with the exception of Neufchatel. 6. The electorate of Hesse-Cassel. In 1815, the elector, having resumed possession of the electorate, after the abolition of the kingdom of Westphalia, convened not only the old estates, those of the nobility, clergy, and citizens, but also that of the peasants, which gave rise to animadversion; and on the assembly's disagreeing to the new constitution which he presented to them, the elector dissolved the body; since which time the government has been entirely absolute. 7. The landgraviate of Hesse-Homburg. 8. The duchy of Anhalt. December 28, 1810, this little country received from the reigning duke a constitution, modelled entirely on that of the French empire; but the guardian of his successor suspended the constitution, October 24, 1812. 9. The principalities of Hohenzollern-Hechingen, and Sigmaringen. 10. The principality of Schwarzburg-Sondershausen. 11. The duchy of Oldenburg. 12. The duchy of Holstein. Both the latter, however, are about to receive, according to public report, constitutions founded on the estates. 13. The kingdom of Denmark, in which the ancient constitution was abolished in 1660. The people co-operated with the government in the overthrow of the old system, as it was favourable only to the nobility and the privileged corporations, the former of whom greatly abused their powers. Lastly, Russia, which is under the rule of an emperor, and exhibits a perfect specimen of a despotic government.

THE BRITISH ISLANDS.

These islands, the most important belonging to Europe, lie at a short distance from the north-west coast of France, betwixt the Atlantic Ocean on the west, and the German Ocean on the east. From their southernmost boundary upon the British Channel to the most northerly of the Shetland group, is a distance of very nearly eleven degrees, measuring from the 50th to the 61st degree of north latitude. The main island, which since the Union has been called Great Britain, is composed of two portions, with considerably distinctive features, under the names of England and Scotland. England forms the larger, the most southerly, and much the finest portion of the island, and lies betwixt the 50th and 55th degree. Scotland lies on the north of this division, and reaches the 58th degree. Ireland is a large and beautiful island lying to the west of England, from which it is separated only by a channel half a day's sail in breadth, and extends in length from 51° 10′ to 55° 20′ north latitude. Its greatest length, measuring from N. E. to S. W. is about 300 miles; the greatest breadth about 60 miles. The chief of the minor islands are the Isle of Man, lying in the Irish Channel; Anglesea, on the coast of Wales; the Hebrides, a series of large and small isles on the west coast of Scotland; the Orkney Islands, separated from the north point of Scotland by the Pentland Firth; and the Shetland Islands, lying considerably north of the Orkneys. Besides these, there are some islands in the British Channel, near the coast of France, called Guernsey, Jersey, Alderney, &c. Reckoning large and small, the British islands amount to at least five hundred in number, but many of the smallest are not inhabited.

England, or South Britain, is triangular in form, and measures from north to south 400 miles; and in some places it is 300 miles broad. Towards the north, at its junction with Scotland, it is greatly contracted. Within its western verge lies Wales, once an independent kingdom, but now politically, and in every other respect, associated with England. By the best surveys, it appears that England and Wales contain 57,960 square miles, or 37,094,400 imperial acres. England is divided into 40 counties and 9860 parishes; Wales into 12 counties and 833 parishes. The general aspect of England is varied and delightful. In some parts verdant plains extend as far as the eye can reach, watered by copious streams, and covered by innumerable cattle. In others, the pleasing vicissitudes of gently rising hills and bending vales, fertile in vegetable products, waving with green woods, and interspersed with meadows, offer the most delightful landscapes of opulence and beauty. Over the whole of these level regions there wind innumerable artificial canals and roads, every where giving token of the commercial character of the country. The chief elevations in England are in the southerly counties of Westmoreland and Cumberland, where the hills rise to upwards of 3000 feet in height. The general aspect of Wales is bold, romantic, and mountainous. It consists of continued ranges of lofty mountains and impending crags, intersected by numerous and deep ravines, with extensive vallies, and affording endless views of wild mountain scenery. The Welsh hills are also often green and pastoral, and feed an immense number of sheep and black cattle.

The most considerable rivers of England and Wales are the Thames, Severn, Medway, Trent and Ouse forming the Humber, Tyne, Tees, Wear, Mersey, Dee, Avon, Eden, and Derwent, which, aided by the extensive system of canal navigation, afford an easy access into the interior of the country, and enable the most inland districts to communicate readily with the sea, as well as with one another. Among the mountains of Westmoreland and Cumberland there are a number of beautiful lakes, of which Windermere is the chief, and is the most extensive piece of water in England, being upwards of ten miles in length, and from one to two miles in breadth. The coasts of England are among the finest in the world for maritime traffic. Generally speaking, the western coast of the island is rugged and precipitous, while the eastern coast is almost wholly level. The main channels for the shipping trade of Great Britain are the Thames, the Humber, the Tyne, the Forth, and the Tay, on the east coast, and the Severn, the Mersey, and the Clyde, on the west. The climate of England and Scotland is variable, inclining to moisture and cold; in the northerly part of the island especially, the east winds are occasionally piercingly cold and most destructive to health. The mean average heat of England is about 52°; in summer, the heats rise to upwards of 80°, though only for a few days; the common winter cold is a little above the freezing point, or varying from 30° to 40° of the thermometer. During some winters, no snow is ever seen on the low hills or vallies. The worst feature in the British climate is its variableness, which baffles all calculation.

By the latest census, it appears that there are in England and Wales about 170 cities and towns, each with a population above 5000 in number; 60 having above 10,000; 25 with above 20,000; 7 with above 50,000; and three with above 100,000; that is, including the dependencies of each. London, the capital, along with Westminster, the borough of Southwark, and parishes both within and without the bills of mortality, according to the returns of 1831, comprised a population of 1,470,000; that is, nearly a million and a half of inhabitants. At present, this huge city is daily increasing, and it is impossible to say to what extent it will soon reach. After London, the most flourishing cities in England are Manchester and Liverpool, both the seat of trade and commerce, and of comparatively modern date as places of importance. Manchester, with Salford and environs, has now a population upwards of 270,000 in number; Liverpool reckons 165,000 inhabitants. For an account of the trade and commerce of these great marts, as well as for England generally, we beg to refer to the article upon the British Empire and its Resources, and that upon the Cotton, Silk, and Woollen Manufactures, as well as that upon the Trade and Commerce of the World, in this work.

Scotland, or North Britain, is separated from England by a line formed by the Tweed, the Cheviot mountains, and some streamlets falling from them into the Solway. From this boundary to the most northerly point, the country extends 280 miles in length; its greatest breadth is 160; but its form is very irregular, and the coast is so deeply indented by large arms of the sea, that it is difficult to describe its dimensions. Nearly all that portion that has figured in history lies betwixt the borders of England and the Firth of Tay, or perhaps within the narrower limits of the Firths of Forth and Clyde. It is within this section that Edinburgh, the capital, is situated; also Glasgow, now the most populous city in Scotland. The entire extent of the country is estimated at 29,600 square miles, or upwards of 18,000,000 acres, of which only five millions are cultivated, and the remainder consisting of uncultivated lands, woods, and plantations.

Scotland consists of two districts, quite distinct in character—the Highlands and Lowlands. Those unacquainted with the country personally, very frequently misapprehend this division, and somehow consider that the whole of Scotland partakes of Highland character. The Highlands compose a rugged mountainous district in the north and north-west part of the kingdom, including the counties of Sutherland, Ross, Inverness, Perth, Argyle, and Dumbarton, upon the mainland, together with Bute, and other islands, besides a considerable portion of the counties of Nairn, Elgin, Banff, Aberdeen, Forfar, and Caithness. In this district, which includes fully a half of Scotland, Gaelic was or is the vernacular tongue, and the manners and dress were or continue to be Celtic. The Lowlands consist of the southern shires, and a broad stripe of land on the east coast of the Highland counties. In this district the English tongue has been spoken for nearly eight hundred years, and every species of civilised usage and institution prevails, as well as the usual English garb. Indeed, to the Lowlanders, the genuine Celt of the mountains is as much a curiosity as he would be in the centre of England. The Hebrides, or Western Isles, belong to the Highland division; but the northerly islands of Orkney and Shetland are essentially Lowland in manners, language, and institutions of the inhabitants, all of whom are of Gothic origin.

While the Highlands are nearly altogether mountainous and pastoral in character, the Lowlands are by no means flat, but are distinguished by a great variety of hill and dale. There is indeed little perfectly flat ground in any part of Scotland. In general the land has an inclination to the beds of rivers or streamlets, or to the sea; the uplands being mostly pastoral, and the low grounds chiefly under culture for grain or green crops. The most fertile and level counties are Berwickshire, in its lower division, and East Lothian, which is adjacent. What are called the carse grounds, that is, large tracts of alluvial soil on the borders of the Tay and upper Forth, are, however, more of a dead level, and are exceedingly beautiful and productive. Scotland abounds in rivers of various extent, but they are generally so rapid in their descent as to be of no use in navigation. The Clyde in its lower parts is the only navigable stream. The Forth and the Tay are only navigable in their firths or estuaries. The firths of these rivers, and the Moray Firth on the north-east coast, are of great consequence to the shipping trade, and also for fishing. The Tay is the largest river in Scotland, and after the Clyde and the Forth are ranked the Spey, Findhorn, Dee, Tweed, Ness, Nith, and Lochy. The Earn is a fine river, falling into the lower part of the Tay. Almost all these rivers have their origin in obscure rivulets among clusters of inland mountains. The northern rivers, Spey, Findhorn, Dee, &c. draw their sources from the groups of Highland hills, chiefly in Aberdeenshire and Inverness-shire. In this latter county rises the lofty Ben-Nevis to the height of 4370 feet above the level of the sea, and forms the tallest of the Scottish mountains. In the bosom of the Highland country there lie many beautiful and extensive lakes, the most noted of which, Loch Catrine and Loch Lomond, are found in Dumbarton and Stirling shires.

Within the last sixty or seventy years, Scotland has undergone an almost entire change of character, both physically and morally. It is now extensively and well cultivated and enclosed, intersected by excellent roads and two or three canals, and as nearly as may be resembles England in appearance. From having almost no trade or commerce, it is now deeply engaged in trade, in manufactures of divers kinds, and possesses a large amount of shipping. But perhaps the greatest improvement is observable in its chief towns, which have all been modernised, and greatly extended in size and population. Its principal cities and towns are as follow:—Edinburgh, the capital, with Leith and suburbs, with a population of 162,156 (without Leith, 136,294); Glasgow and suburbs, 202,426—(this being the third town in the empire); Aberdeen, new and old, 58,019; Paisley, burgh and abbey parish, 57,466; Dundee, 45,355; Greenock, 27,571; Perth, 20,016; Inverness, 14,324; Montrose, 12,055; Dumfries, 11,606; Arbroath, 6660; Kirkaldy, 5034. Scotland is divided into 33 counties, which are or were lately subdivided into 910 parishes; the population of the whole, by the census of 1831, amounted to 2,365,807, which was more than double what it was thirty years before. Politically, Scotland is now thoroughly incorporated with England; nevertheless, it still possesses its own peculiar usages and legal code, it being only some of the acts of the Imperial Parliament which affect its laws. The system of administration of justice also differs a good deal from that of England, and its supreme courts are settled at Edinburgh. Ecclesiastically, it is likewise peculiar in its institutions, as has been elsewhere described in this work.

Ireland, which now forms a portion of the United Kingdom, and is under the same kind of institutions as England, though naturally a fine country, has hitherto been the least prosperous of the British islands. It is computed that it contains more than 30,000 square miles, or nearly 30,000,000 acres. Politically, it is divided into the four provinces of Leinster, Ulster, Munster, and Connaught, which compose 32 counties. Dublin, the capital, by the returns of 1831, had a population of 204,155; Belfast, in the northern part of the island, is a flourishing town and seaport, with a population of 53,000; Cork, on the south-east coast, has a population of 107,016. Ireland contains about sixty towns, each with above 2000 of a population. The total population of the country in 1831 was 7,767,401.

FRANCE.

After Great Britain, France is usually reckoned the most powerful and influential country in Europe. In point of territorial extent and amount of population, it stands much higher than Great Britain, which is but a small country, and it likewise possesses a finer climate; nevertheless, such have been its unfortunate political and religious dissensions and misarrangements, that it has permitted itself to be outstripped in the race of improvement by England. Yet under all its backwardness, in many points France forms a great nation, well deserving of the sympathy and respect of its neighbours; and it is greatly to be desired that in future a good understanding should subsist betwixt it and Great Britain.

France is situated between latitude 42° 20′ and 51° 5′ N., and longitude 3° 51′ E. and 9° 27′ W., comprising an extent of 213,800 square miles, with a population, according to official returns, in 1827, of 31,851,545. It is bordered on the north-east by the Low Countries, the Prussian province of the Lower Rhine, and Rhenish Bavaria; on the east, it is separated from Baden by the Rhine, and touches Switzerland and Sardinia; on the south, its boundaries are the Mediterranean, the Pyrenees, and the Bidassoa; the ocean bounds the rest. The island of Corsica, and the Hières, in the Mediterranean, and the Isles of Oleron, Ré, Noirmoutier, Belle-Isle, Dieu, and Ouessant (Ushant), in the Atlantic, belong to France. The foreign possessions are of little value. They are, in Asia, Pondicherry and Karical on the Coromandel coast, Yanaon in the Northern Circars, Chandernagore in Bengal, Mahe on the Malabar coast, a factory at Surat, and some factories in Arabia, in all 179,000 inhabitants; in Africa, Senegal, Goree, the Isle of Bourbon, and some factories, containing 90,000 inhabitants; in America, Martinique, and Gandaloupe with its dependencies, Guiane, and the small islands of St Pierre and Miquelon, near Newfoundland, containing 275,000 inhabitants. The territory is divided into 86 departments, which generally derive their names from the rivers. They are subdivided into 363 arrondissements, 2844 cantons, and 38,339 communes. Each department is governed by a prefect, and each arrondissement by a subprefect. The cantons have no administrative powers. The communes are under a mayor. All these officers, with the counsellors of departments, arrondissements, and communes, were, before the recent changes, appointed by the king. The empire under Napoleon comprized about 300,000 square miles, with 42,500,000 inhabitants, of which 28,000,000 were French, 6,500,000 Italians, 4,500,000 Flemish and Dutch, and 4,000,000 German.

The principal mountains of France are, 1. The Vosges on the north-east. They are of a rounded outline, with gentle slopes, and afford much open pasturage. The highest summit is not more than 4500 feet high. 2. The Jura mountains lie to the south of these, and their summits rise to the height of 6000 feet. 3. Many Alpine branches intersect Dauphiny and Provence. In the centre of the kingdom are, 4. The mountains of Auvergne, of volcanic origin, of which the Puy de Dome, the Monts d'Or, and the Cantal, are the principal groups. 5. The Cevennes lie to the south-east of the range last mentioned. Their highest summit is Mont Lozère (about 6510 feet). 6. The Pyrenees form the principal part of the boundary between France and Spain. These mountains divide the country into four great basins, the form and exposure of which necessarily have a great influence on their climate and productions. The narrow valley of the Rhine runs from north to south, while the open basins of the Seine, the Loire, and the Garonne, stretch in a north-western direction. The Adour rises in the Pyrenees, and washes the walls of Bayonne. The other rivers are principally tributaries. The Marne and the Oise fall into the Seine; the Allier, the Loire, the Sarthe, and the Mayenne, into the Loire; the Rhone receives the Saône, the Isère, the Durence, the Ain, and the Sorgue; the Tarn and the Dordogne join the Garonne. The numerous branches of these rivers are joined by canals, which form an extensive internal water communication.

In respect to soil, the richest part of France is the north-west division, comprehending the provinces of Flanders, Artois, Picardy, Normandy, and the Isle of France, where there is a deep rich loam; about 18,179,590 acres in extent. The valley of the Garonne is composed of a friable sandy loam, with a calcareous mixture, and moisture sufficient for every purpose. This district contains 7,654,561 acres. The great valley of Languedoc is extremely prolific, though the soil is not so fine as that of the preceding districts. The Limagne, a valley of Auvergne, is considered to have one of the finest soils in the world. It consists of beds of earth, said to be twenty feet deep, formed from the decomposition of soft basalt. The calcareous and chalk formations are extensive. The chalk provinces are unfruitful in grain, but the genial influence of the sun allows them other riches. The calcareous loam on the borders of the chalk formation is more productive. In Bretagne, Anjou, and Maine, are immense heaths. The *landes* are extensive tracts of sandy deserts, producing nothing but broom, heath, and junipers. The most extensive are the landes of Bordeaux, twenty leagues in length by twelve in breadth. In the remaining provinces, gravel, or a gravelly sand, is the predominating soil. The woods and forests are estimated to cover a space of 18,795,000 acres. The principal are those of Ardennes, Orleans, and Fontainebleau. The northern and western coasts are formed in a great proportion by immense downs or sandbanks, and where the shores are formed by cliffs, they are seldom bold enough to be approached with safety. The harbours are therefore few. On the Mediterranean, the coast of Languedoc is very dangerous, but Provence abounds in good harbours. The culture, throughout the northern half of the kingdom, consists of wheat, barley, oats, pulse, and of late, much more than formerly, of potatoes; in the southern half, corn (particularly maize), vines, mulberries, and olives. The eastern parts, being more elevated than the western, have more rigorous winters and more ardent summers. Coal and iron are found in abundance. The most common fuel is wood.

The superficial extent of France has been recently estimated by Baron Dupin at 53,533,428 hectares, or 132,694,000 English acres. The value of capital vested in agricultural pursuits is estimated at 37,522,001,476 francs; the gross annual produce at 4,678,708,885 francs; the expenses of cultivation at 3,334,005,515; leaving a profit of 3½ per cent. on the capital. The produce of wheat in the best cultivated districts, and on the best soil, hardly exceeds eighteen bushels per acre: an English farmer expects twenty-five on the same extent. In 1812, the number of horses in France was 2,176,000; but in 1819, the horses and mules together amounted only to 1,657,671; at present the number is estimated at 2,500,000. The number of horned cattle is 6,973,000; of sheep, about 45,000,000. The total number of all kinds of poultry is about 51,600,000. The French are the best wine-makers in the world. The Champagne, Burgundy, Claret, Hermitage, are drunk all over the world. For a long time, the choicest growths were in the hands of the church; and in the frequent changes of property which have taken place since the revolution, many vineyards have deteriorated in consequence of bad management. The brandies of France are the best in the world. The value of the whole produce of wine and brandy is about 800,000,000 of francs. The culture of the vine is supposed to have increased nearly one-fourth since the revolution, owing principally to the small proprietors, each of whom endeavours to supply his own consumption by a little patch of vineyard. M. Dupin says that many hectares of French territory are yet uncultivated, merely for want of cattle to stock and manure them; that two-thirds of the inhabitants are without animal food; that more than one-third subsist entirely on oats, buckwheat, rye, chestnuts, or potatoes, and that the agricultural population is too great for the prosperity of France. Two-thirds of the population is agricultural.

France possesses a soil and climate capable of furnishing her with all the raw materials of manufacture except cotton. The manufacture of fine woollen cloths at Sedan was introduced under the auspices of Colbert. The machinery used was very defective until M. Chaptal engaged an English machinist to instruct the French artizans. Steam-engines are rare; the spinning mills being worked chiefly by water or by horses. The quantity of native wool manufactured in 1819 was 38,000,000 kilogrammes (of about 2⅕lbs. each), and, in 1826, 42,000,000, with 8,000,000 of imported wool: the value of the manufactured articles was 265,000,000 francs; of the raw wool, 105,000,000: the quantity exported was about one-thirteenth of the whole quantity manufactured. By the exertions of Henry IV., the mulberry-tree was cultivated in all the southern provinces. At Tours, silk stuffs for furniture are chiefly manufactured; at Ganges, and other places in the Cevennes, silk stockings. Lyons is the principal place for silk manufactures of all kinds. Paris ranks next after Lyons. In 1812, the value of the raw material amounted to 45,560,000 francs, of which 22,000,000 were the price of imported silk. The value of manufactured goods, at the same period, was 107,500,000 francs, of which less than one-third was exported. Forty years ago, the spinning of cotton by machinery was hardly practised in France. Cotton mills have been established within that period, and the manufactures of Alsace are now superior to those of England in the brilliancy of their colours. In 1812, 10,362,000 kilogrammes of cotton were spun by machinery, and, in 1825, 28,000,000 of greater fineness. The cambrics, gauze, and lawn of St Quentin, Valenciennes, and Cambray, are among the most valuable products of French industry. Lace is made in great quantities.

The whole produce of the linen and hemp manufactures is estimated at 200,000,000 francs. In 1814, 100,000,000 kilogrammes of cast-iron were produced; in 1825, 160,000,000. Gilding and watch-making are carried on, chiefly in Paris, to the annual value of about 38,000,000 francs each. Printing also employs a great number of persons at Paris. In 1814, the number of printed sheets was 45,675,039; in 1820, 80,921,302; and in 1826, 144,561,094. Notwithstanding the low price of labour in France, the industry of that country cannot enter into competition with that of England. One of the circumstances which depress it is the want of internal communication by roads and canals. The practicable roads of France are not more than one-third of the extent of those of England. The cross-roads are few, and the great roads are seldom kept in good order. The length of the canals in France is not more than one-eleventh of those of England. Another point in which France is inferior is in the use of steam-engines, attributable in part to the deficiency of coal, or the difficulty of transporting it. The total force of steam-engines in France, according to Dupin, is equal to that of 480,800 men; that of England is equal to a power of 6,400,000 men. All the power derived from machinery of every sort, or from constructive ingenuity, and applied to purposes of industry in France, is only one-fourth of the similar power employed in England.

The commerce of France has been very much diminished by the loss of her colonies. The value of the colonial imports, in 1788, was 227,000,000 francs; in 1824, it was only 50,000,000. The exports for 1788 amounted to 119,000,000; in 1824, to 44,000,000. The total value of exports from France, in 1824, was 440,542,000 francs; of which 163,056,000 were productions of the country, and 277,486,000 manufactured articles. The amount exported to the United States was 55,000,000, being more than that to any other country. The imports for the same year were of the value of 454,861,000 francs; of which 272,873,000 francs were raw materials for manufacture, 121,957,000 natural productions for consumption, and 60,030,000 manufactured articles. In 1824, the number of sailors in French ships was 328,489; of whom 26,649 were engaged in foreign commerce, 47,283 in the fisheries, and the remainder in the coasting trade. The navy, according to the budget of 1828, consisted of 36 ships of the line, 35 frigates, 8 steam-boats, and 186 other vessels, and 14,963 officers and sailors. The army in 1828 amounted to 233,770 men, and was recruited by voluntary enlistment and annual levies, every Frenchman of twenty years of age being bound to serve for a term of eight years. The receipts of 1828 were 1,037,104,491 francs; the expenditure, 1,035,415,552 francs.

As we have given the history of the French Revolution of 1789 in another portion of the present work (No. 8), nothing need here be said of that event. It is sufficient to state that the military character which was engrafted upon the nation by subsequent events still predominates, and may be described as one of the main causes for the deficiency of France in manufactures, commerce, wealth, and many comforts of social life. The character of the French, however, is fast undergoing an improvement under the constitution which the country has enjoyed since 1830, when Louis Philip was placed on the throne, by the events of what are termed the "three days," or the revolution which deposed the elder line of the Bourbons. The present reigning family, or house of Orleans, is a collateral line of the former branch, being derived from the only brother of Louis XIV., Philip Duke of Orleans. The following are the eras of the reigning princes of France:—1. *Capet Dynasty:* Hugh Capet (987), died 996; Robert, died 1031; Henry I., died 1060; Philip I., died 1108; Louis IV., died 1137; Louis VII., died 1180; Philip II. (Augustus), died 1223; Louis VIII., died 1226; Louis IX. (the Saint), died 1270; Philip III. (the Bold), died 1285; Philip IV. (the Fair), died 1314; Louis X. (Hutin), died 1316; Philip V. (the Long), died 1321; Charles IV. (the Fair), died 1328.—2. *Branch of Valois:* Philip VI., died 1350; John (the Good), died 1364; Charles V. (the Wise), died 1380; Charles VI., died 1422; Charles VII., died 1461; Louis XI., died 1483; Charles VIII., died 1497.—3. *Branch of Orleans:* Louis XII., died 1515; Francis I., died 1547; Henry II., died 1559; Francis II., died 1560; Charles IX., died 1574; Henry III., died 1589.—4. *Branch of Bourbon:* Henry IV., died 1610; Louis XIII., died 1643; Louis XIV., died 1715; Louis XV., died 1774; Louis XVI., died 1793; Louis XVII., died 1795. [French republic, from 1792 to 1804; Napoleon (Bonaparte), Emperor of the French, from 1804 to 1814.]—Bourbons restored by foreign arms: Louis XVIII., from 1814, died 1824; Charles, to 1830, when he was dethroned.—5. *New House of Orleans:* Louis Philip I., with the title of King of the French (*roi-citoyen*). Of the dethroned Bourbon family, there are living the ex-king, Charles X.; his son, Louis Antoine, Duke of Angoulême (late dauphin), born August 6, 1775; married his cousin, Marie Therese, daughter of Louis XVI. The second son of Charles X., Duke of Berry, born Jan. 24, 1778; married to Caroline, Princess of Naples (born Nov. 5, 1798); was assassinated by Louvain, Feb. 14, 1820. His children are Marie Louise (Mlle. d'Artois, born Sept. 21, 1819), and Henry (Charles Ferdinand Marie Dieudonné), Duke of Bordeaux, born Sept. 29, 1820, after the death of his father, late heir-presumptive. Charles and the dauphin abdicated in his favour, calling him King Henry V. Louis Philip has a family of five sons and three daughters; the eldest son, Ferdinand Philip Louis Charles Henry, now Duke of Orleans, was born in 1810.

France is a limited monarchy, hereditary in the eldest male line. If the late changes become permanent parts of the system, it will be the most limited monarchy in Europe. The charter has undergone several important alterations. The principal are, that the Roman Catholic religion has ceased to be the religion of the state; the 14th article, which the Polignac ministry cited in their late attempt to overthrow the constitution, has been changed, so as to stand as follows:—"The king is the supreme head of the state; he commands the land and sea forces, declares war, makes treaties of peace, alliance, and commerce; appoints to all offices of the public administration, and makes all the regulations and ordinances necessary for the execution of the laws, under the responsible advice of his ministers;" any of the three branches of the legislature can propose laws; the Chamber of Peers may sit without that of the Deputies only as a court of justice; peers may speak in the house at the age of twenty-five years; princes of the blood may sit in the House of Peers without a special summons from the king; the deliberations of the peers are public; the renewal of one-fifth of the deputies every year is abolished; persons are eligible as deputies at the age of twenty-five years; the deputies elect their president without the concurrence of the king; and the electors choose the officers of the electoral colleges without the interference of the king; articles 46 and 47 of the old charter, respecting amendments, and the adoption of the tax acts by the deputies, previously to being sent to the peers, are repealed; as is also article 56, exempting the ministers from impeachment, except for treason or extortion; the *prevôtal* courts are abolished; the king takes the constitutional oath, not at the time of the coronation, but on his accession, as in England. Besides this, provision is to be made, by separate laws, for, 1. The trial of offences of the press by a jury; 2. The responsibility of ministers and other agents of power; 3. For the re-election of deputies promoted to offices with salaries; 4. The annual vote of supplies for the army; 5. The organisation of the national guard; 6. The settling the rank of all naval and military officers; 7. Departmental and municipal governments founded on the elective system; 8. Public instruction provided for; liberty of teaching allowed to all; 9. The abolition of the double vote, and of the electoral candidates and their eligibility. The charter is entrusted to the protection of the national guard and the patriotism of the nation. The charter, with the "changes and modifications expressed in the declaration of the Chamber of Deputies," was presented to Louis Philip, who, on the 9th of August 1830, took the constitutional oath; and thus the *constitution octroyée* was changed into a real contract between the ruler and the people.

France possesses a considerable number of towns, with populations of from five to thirty thousand, and more particularly about twelve thousand, but not many of any consequence with a larger amount of inhabitants. Paris, the capital, in 1827, had a population of 890,531, which is about half the amount of the population of London. The other chief towns are Lisle, with a population of 69,860; Rouen, 90,000; Strasburg, 49,708; Nantes, 71,739; Boulogne, 19,314; Havre, 21,049; Rheims, 34,862; Brest, 26,655; Cambral, 17,031; Lyons, with suburbs, 170,875; Marseilles, 115,943; Toulon, 30,171; Aix, 23,132; Grenoble, 22,149; Clermont, 30,010; Besançon, 28,795; St Etienne, 30,615; Dunkirk, 24,517; Amiens, 42,032; and Orleans, 40,340. The chief port in the north of France is Havre, on the English Channel, and Marseilles and Toulon are the principal outlets on the south. In point of capability for maritime trade, France is far inferior to Great Britain, from its want of good harbours, though perhaps that circumstance is of less consequence than the peculiar genius of the people, which is adverse to naval adventure.

SPAIN AND PORTUGAL.

Spain, or the Peninsula, as it is frequently called, is an extensive country, occupying the south-western extremity of Europe, between latitude 36° and 44° N. and is surrounded by the Atlantic Ocean and the Mediterranean Sea, except on the north-east, where part of the Pyrenean chain of mountains form its boundary with France. In its dimensions, this country extends 700 miles in length by 500 in breadth, forming an area of 45,000 square miles. Portugal, afterwards to be mentioned, lies like a patch on the side of the Peninsula, facing the Atlantic. Spain, proper, is divided naturally into two unequal compartments, one of which includes the central region, and the other that of the coast. Spain is essentially mountainous. It consists chiefly of extensive plains traversed by lofty ridges, towering to a height of from eighteen hundred to two thousand feet. There are comparatively few trees in the country, and the air being dry, the number of rivers is not great. The principal are the Ebro, Duoro, Tagus, Guadiana, and Guadalquivir; but from the bad system of things, they are not put to their full uses for navigation and trade. In the lower parts of Spain, particularly on the coast, the climate is delightful, but in the high central plains the heat is as intense in summer as the cold is piercing in winter. The productions of Spain are rich and various. Iron, tin, copper, quicksilver, and indeed every valuable mineral, abound in the Peninsula. There are also a number of coal and salt mines. Wheat of the finest quality is produced in most of the provinces. The other principal productions of the soil are oats, barley, maize, rice, oil, honey, sugar, hemp, flax, cork, cotton, silk, and barilla; the wool, as is well known, is of a very superior quality. There are many fine fruits grown, as figs, oranges, pomegranates, lemons, &c. Among the animal productions, the horse of Andalusia, a province on the Mediterranean, opposite Africa, is esteemed among the finest in the world. The sheep are millions in number. The sea-coasts supply abundance of fish. In a word, nature seems to have exhausted her bounty on this favoured land; and had not ungrateful man laboured but with too successful perversity to counteract her beneficence, Spain, instead of being the poorest and most degraded, would now be the richest, happiest, and most prosperous country in Europe.

About the beginning of the present century, the population of Spain amounted to 10,409,879 individuals, among whom were the following classes:—Beginning with the religious bodies, there were 140,242 clergy and monks, and 32,000 nuns, exclusive of about a fourth of the population living on their property without doing any thing; there were 100,000 individuals existing as smugglers, robbers, pirates, and assassins, escaped from prisons and garrisons; about 40,000 officials appointed to capture these, and having an understanding with them; nearly 300,000 servants, of whom more than 100,000 were unemployed and left to their shifts; 60,000 students, most of whom begged, or rather extorted charity at night; and if to this melancholy list we add 100,000 beggars, fed at the doors of monasteries and convents, we shall find that there existed in Spain nearly 860,000 persons who were of no use in agriculture or the mechanical arts, and who were only calculated to prove dangerous to society. Having made these, we find there then remained 964,571 day-labourers, 917,197 peasants, 310,739 artizans and manufacturers, and 34,339 merchants, to sustain by their exertions upwards of ten millions of inhabitants. These results, which are as applicable at the present day, when the population has increased to about 14,000,000, as at the time when they were deduced, exhibit a state of society so radically corrupt and debased, as to render all hopes of its regeneration very nearly desperate. Lately, on the death of Ferdinand, the reigning monarch, the queen, in the capacity of regent, made a powerful attempt to establish constitutional government, which is the first step towards practical reform of abuses; but as yet little has been done by the Cortes, or estates, to put the affairs of the kingdom on a steady and prosperous footing.

Portugal, which lies on the western frontier of Spain, facing the Atlantic, and measures 41,500 square miles in extent, is an ancient small kingdom, intimately resembling Spain in almost every particular, and at present in much the same unsettled condition. The country possesses two fine rivers, the Duoro, which forms the great maritime emporium of Oporto, and the Tagus, which is that of Lisbon. Portugal is rich in natural productions, but wants the cultivation of industrious hands. The rich mines of precious metals are now neglected on account of want of hands and fuel. The chief source of profit is in the fruits, which are exported in abundance, particularly the orange and grape. Wines of several sorts, both dry and sweet, are produced; the red port wine is exported, but in less quantities than formerly, and chiefly to England. Agriculture, commerce, the arts, every thing, in short, is neglected in Portugal, which in the present day is a miserable poverty-struck country. Like Spain, it is eaten up by clergy, secular and regular, and these classes have moreover rendered at least a third part of the year holidays, greatly to the loss of the nation. The late Don Pedro, father of the present queen Maria, had the address to abolish the monastic institutions, and to sequestrate the property to the state, which was an important measure of national regeneration. The population of Portugal was stated in 1826 at 3,214,000.

ITALY.

Italy, once the seat of universal empire, but which, since the overthrow of the Roman power, has never formed an independent whole, the pride of its inhabitants and the admiration of foreigners, on account of its delicious climate and former renown, is a narrow peninsula, extending from the Alps (46° to 38° N. lat.) into the Mediterranean Sea, which, on the east side of Italy, is called the Adriatic, on the west, the Tuscan Sea. The Appenines, rising near the maritime Alps, are the principal chain of mountains, and stretch through the country, dividing Lombardy from the Genoese territories and Tuscany, and Tuscany from Romagna, intersecting the States of the Church, and running through the kingdom of Naples to the Strait of Messina. Upper Italy (Lombardy) is remarkably well watered. The Po, which receives a great number of rivers from the large lakes at the foot of the Alps (Lago Maggiore, di Lugano, di Como, d'Iseo, and di Garda), and the Adige, are the principal rivers. They both rise in the Alps, and flow into the Adriatic sea. In Middle Italy (Tuscany and the States of the Church) are the Arno and the Tiber, which rise in the Appenines, and flow into the Tuscan Sea. In Lower Italy (Naples) there are no large rivers, on account of the shortness of the course of the streams from the mountains to the sea; the Garigliano is the principal. The climate is warm, without excessive heat, and generally salubrious. The winter, even in Upper Italy, is very mild; in Naples it hardly ever snows. The abundance and excellence of the productions of the soil correspond with the beauty of the climate. In many places both of the north and south, there are two and even three crops a-year. The volcanic character of the coasts of Lower Italy is particularly remarkable in a geological point of view, especially in the region of Puzzuoli and Vesuvius. The neighbouring islands of the Mediterranean are distinguished by the same character. The present number of inhabitants is much inferior to the former population of this delightful country, the total amount being 21,397,600.

The national character of the Italians, naturally cheerful, but always marked by strong passions, has been rendered, by continued oppression, dissembling and selfish. The Italian, moreover, possesses a certain acuteness and versatility, as well as a love of money, which stamp him for a merchant. In the middle ages, Venice, Genoa, Florence, and Pisa, were the chief marts of the European commerce with the East Indies; and Italians (then called Lombards, without distinction, in Germany, France, and England) were scattered all over Europe for the purposes of trade. The discovery of a passage by sea deprived them of the India trade, and the prosperity of those republics declined. The Italian, restricted almost solely to traffic in the productions of his own country, has nevertheless always remained an able and active merchant. Before Rome had (2100 years ago) absorbed all the vital power of Italy, this country was thickly inhabited, and for the most part by civilised nations. In the north of Italy alone, which offered the longest resistance to the Romans, dwelt a barbarous people, the Gauls. Farther south, on the Arno and the Tiber, a number of small tribes, such as the Etrusci, the Samnites, and Latins, endeavoured to find safety by forming confederacies. Less closely united, and often hostile to each other, were the Greek colonies of Lower Italy, called Magna Grecia. The story of the subjection of these nations to the Roman ambition, belongs to the history of Rome. Italy, in the middle ages, was divided into Upper, Middle, and Lower Italy. The first division comprehended all the states situated in the basin of the Po; the second extended between the former and the kingdom of Naples, which formed the third.

Italy is in modern times cut up into a number of distinct states, partly independent with native princes, partly under the rule of Austria, and a portion under the civil sway of the head of the Romish church. Throughout the greater part of this fine country the system of police is wretched, and robbery is exceedingly common; commerce, agriculture, and the useful arts, are in a low condition; bigotry prevails, and the national character is reduced to the lowest moral standard. The most civilised and best governed part of Italy is Tuscany, which differs very materially from the adjacent states. In the present day, Italy is only celebrated for its music, and its collections of works in the fine arts. The following sketch gives a view of the amount of population in the five great divisions into which Italy is partitioned:—

The population of the States of the Church is about 2,000,000. The capital is Rome, the seat of empire of the ancient Romans, but now greatly altered in figure and appearance, and completely changed in character; this venerable city possesses a population of 150,000. The other chief towns are Bologna, with a population of 65,000; Ancona, 30,000; Perugia, 30,000; Ferrara, 24,000; and Ravenna, 24,000. There are other eight towns with a population of from 7000 to 14,000.

The duchy of Tuscany, in 1826, had a population of 1,275,000 inhabitants. The capital of this state is Florence, the population of which amounts to 80,000. The other chief towns are, Leghorn, 66,000; Pisa, 20,000; Sienna, 18,000; Prato, 10,000; Pistira, 9000; Avesso, 7000; and Costona, 5000.

Austrian Italy, or the Lombardo-Venetian kingdom, which consists of the great plain of the Po, is subdivided into the governments of Milan, Venice, Parma, and Modena. The chief towns of the state of Milan are, Milan, 151,000; Brescia, 31,000; Cremona, 26,000; Mantua, 25,000; Pavia, 21,000; Lodi, 18,000; and Como, 7600. The chief towns in the state of Venice are, Venice, 101,000; Verona, 48,000; Padua, 35,000; Vicenza, 19,000; Udina, 18,000; Treviso, 15,000; Bellinno, 8000; and Rovigo, 7000. The state of Parma has the town of Parma, 30,000; Placentia, 28,000; and Guastalla, 5000. The state of Modena possesses the town of Modena, 27,000; Reggio, 18,000; and Mirandola, 6000.

The Sardinian states are composed of Piedmont, Genoa, Savoy, and the island of Sardinia, the whole of these divisions having a population of 3,831,350. The principal town and sea-port in this district is Genoa, which possesses a population of 80,000 inhabitants.

The fifth division of Italy is composed of the states of the kingdom of Naples, or, as it is sometimes called, the Two Sicilies. This forms the southern, and perhaps the finest portion of the Italian peninsula, and branches out into the two smaller peninsulas of Otranto and Calabria. Naples is the chief town, with a population of 354,000 inhabitants, being thus the largest city in Italy. Naples is famed for the beauty of its environs, particularly the bay on which it is situated, and for the exceeding fineness of its climate. Sicily, an island belonging to the kingdom of Naples, measures 180 miles long by 150 in breadth, and is one of the most beautiful islands of Europe. It is chiefly distinguished for its celebrated volcano, Mount Etna. Malta, an islet in the Mediterranean, about fifty-four miles to the south of Sicily, now belongs to the British government.

RUSSIA.

The Russian empire stretches over the half of Europe, and the whole of Northern Asia, from the Baltic to the Pacific, and includes vast territories on the north-western coast of North America. It lies between lat. 38° and 78° N. It is bounded on the north by the northern or Icy Ocean, west by Norway, Sweden, the Baltic Sea, Austria, and Prussia, and south by Turkey, the Black Sea, Persia, the Caspian Sea, Independent Tartary, and China. The total superficial area is estimated at 8,000,000 square miles, of which about 1,500,000 are situated in Europe, and 5,500,000 in Asia. The Russian dominions compose about one-seventh of the habitable globe. The surface of Russia is generally level, and some tracts of land of this flat nature, frequently bleak and barren, are called steppes. The country also possesses chains of lofty mountains in different quarters. Russia raises vast quantities of corn, which it exports; and it produces fruits and wine in abundance. The forest also yields important articles of export. Cattle of all kinds, horses, and sheep, are likewise bred in immense numbers, chiefly for the exportation of their skins. The mines of the country are productive of platina, silver, copper, quicksilver, alum, and salt, all which are continual sources of revenue. Russia possesses various rivers of the first magnitude, and canals are in the course of establishment on a considerable scale.

The population of Russia, including Poland and Finland, is 57,000,000, of nine different races:—1. Sclavonians 44,000,000, including the Russians (42,000,000, among whom are the Cossacks, about 600,000 capable of bearing arms) and the Poles; 2. Finns, who are scattered over the country, from Tornea and the Niemen to the Obi (3,000,000); 3. Tartars, from the Dniester to the Caucasus (2,000,000), mostly under their own government, without agriculture or firearms; 4. Georgians and Circassians (2,000,000); 5. Samoiedes; 6. Mantchoos; 7. Mongols, to whom belong the Calmucks; 8. eastern tribes (including Tchutsches, Kuriles, and Aleutians); 9. Jews, particularly in the Polish provinces. Besides these races, there are natives of almost all countries of Europe and Asia, as Greeks, Arabs, Hindoos, Gypsies, French, English, and Danes. There are among these Russian subjects eighty tribes, differing in language, religion, and manners, from the rudest state of barbarism to the highest degree of European civilisation. The population is divided into four classes, the nobility, clergy, common people or freemen, and peasants or serfs. In 1811, the number of persons subject to do military duty was as follows: 643,135 persons engaged in trade; 6,389,269 crown peasants; 10,113,177 peasants belonging to individuals; 1,077,636, appanage peasants; 112,453 freemen; in all, 18,335,730 men. We find manufactures of leather, tallow, candles, soap, felt, coarse linen, mats of the bark of the linden tree, hardware and the art of dyeing, among the Russians before the time of Peter the Great; but since his reign these have been carried to much greater perfection, and many new manufactures have been introduced. In 1815, Russia contained 3253 manufacturing establishments; twenty-three of these deliver to the government annually cloth of 700,000 roubles in value, and there are, besides, one hundred and eighty-one private establishments. Drugs are prepared in forty-five laboratories; and there are distilleries of brandy, of which 120,000,000 gallons are consumed in the country. Ship-building is carried on in the large villages on the Wolga and in the sea-ports.

The government is an unlimited monarchy; the emperor is autocrat of all the Russias; the state is indivisible; the ruler cannot be, at the same time, ruler of any other country (since 1815, however, he has been king of Poland), and must be of the Greek religion. In 1797, the succession was settled in the male line, by the rules of primogeniture, and, in failure of males, in the female line. All the princes of the blood are called grand-princes. By the ukase of March 20, 1820, it was declared that only the children of a marriage acknowledged by the emperor are capable of succeeding to the throne. The highest councils are, 1. the imperial council, under the presidency of the emperor, erected Jan. 1, 1810, with four departments—that of legislation (the supreme tribunal in civil and ecclesiastical suits), that of war, that of civil and ecclesiastical affairs, and that of finance; 2. the senate, for home affairs (a deliberative body, consisting of eight departments, three of which have their seat in Moscow); 3. the holy synod; 4. the ministry of state. The ministers have a seat and voice in the imperial council and in the senate. The ministry is divided into three sections—that of foreign affairs, war, the marine, the home department, ecclesiastical affairs, education, and finance; that of the imperial treasury; and that of the public accounts, roads and canals, and justice. The whole state is divided into fifty-one governments and several provinces; of these, forty are in Europe, exclusive of the Cossacks of the Don, the Cossacks of the Black Sea, and the kingdom of Poland. The military force of Russia is exceedingly great, yet nothing to excite any dread. By some accounts it is stated as having totally amounted to 670,000 men; but a vast proportion of this force is composed of irregular militia, or armed slaves. It is considered by recent writers on the subject that the utmost amount of regular force which Russia can bring into the field is 150,000 men, infantry, cavalry, and artillery. It is indisputable that Russia has no pecuniary resources to support a large army long in the field, and therefore any fear expressed by European powers on this score is ridiculous. The principal dependence of Russia is upon England, and a quarrel with the British government would most likely lead to a serious commotion in the state. The prevailing religion is that of the Greek church, with a full toleration of all religions. The state of society is a strange mixture of refinement and barbarism. The population is composed of four different classes, as has already been mentioned. The boors or peasants are the property of the crown or of individuals; they amount to about 35,000,000, and are in a state of great poverty. They are sometimes emancipated by their owners, and are sometimes permitted to purchase their freedom. The noble families are about 150,000, comprising 750,000 individuals, and enjoy some privileges and exemptions. The freemen, not nobles nor clergymen, are divided into six classes—the inhabitants of cities, the three guilds (capitalists, according to their income tax), the trades, foreigners or strangers, the notable citizens (savans, artists, bankers), and the colonists. In regard to rank, these classes form fourteen gradations; and all who can claim either of the eight highest are considered as noble. Distinction of any kind, however, is only gained by the possession of a superior military rank.

Debased as Russia is, it has recently made great advances in civilised usages. Science, literature, and the arts, are highly cultivated and liberally endowed. The Russians, it seems, have not much original genius, but they are the best imitators in the world, and quickly adopt foreign manners, language, and improvements. The wretched system of territorial slavery is gradually disappearing, and the peasants are now more protected by the laws than formerly. The punishment of criminals is also becoming more lenient. Russia possesses a number of towns of from 10,000 to 30,000 inhabitants. Petersburg, the capital, has a population of 425,000, and Moscow 240,000. Petersburg, which is built upon the flat banks of the Neva, is considered to be in appearance the most splendid city in the world.

GERMANY.

Germany is a term of wide and not very definite meaning. It is familiarly applied to a large territory extending from the Baltic Sea on the north, to the Gulf of Venice on the south, having Hungary and Russia on the east, and France and the Netherlands on the west. At its south-west corner it is touched by Switzerland. This immensely large territory occupies the bulk of the centre of Europe, and consists of an area of 250,000 square miles. The most remarkable circumstance about Germany is its being composed of a considerable number of states, each less or more independent within its own bounds, but externally dependent on the other states of the confederation, as is mentioned already under the head Constitutional Governments. Altogether there are thirty-four monarchical states, and five free cities, which enter into a confederation as equal sovereigns. For mutual safety they compose a diet or congress, at which each state has a certain number of votes. The principal states of Germany are Prussia and Austria; Saxony, Bohemia, and Hanover, are of lesser dimensions and importance. The others do not require any notice.

In the days of Roman greatness, Germany, or Germania, as it was then called, was inhabited by a barbarous but powerful people, reckless of control, and ambitious of securing the spoils of richer nations. They broke loose at different periods, overrunning Italy and other fair portions of Europe, and, under the general appellation of Goths, finally prostrated the empire of Rome. The term Goth is now used in a contemptuous sense, but it has to be remarked that modern Europe stands indebted for its liberties to the Goths. The free institutions of Germany were carried into England and other countries, where they have since grown and flourished; and in later times the world has received various useful arts from the same source, in particular the art of printing, which transcends all other inventions. In the tenth century, Otho the Great united the Roman imperial crown (a thing merely so in name) with the German empire, and the great territory we are speaking of was thenceforward called the Holy Roman empire of Germany. This empire lasted till its dissolution in 1806; but long before that era Germany had been broken up into states, by the enterprise of its native dukes and princes, and the name empire was little else than nominal. In 1815, the states entered into the confederation which now binds them.

This large confederated country is watered by 500 rivers, of which the principal are the Rhine, the Danube, the Weser, the Elbe, and the Oder. The most southern chain of German mountains is formed by the Tyrolese Alps, the Alps of Algau, the Camic and Julian Alps, running from east to west. To the south-west are the Carpathian mountains, to the north-west the Bohemian forest. There are also alpine regions on the Upper Rhine. In Northern Germany there are sandy heaths and moors, and many districts contain fertile strips only along the large rivers. On the whole, the soil is fertile, and the climate in general is temperate and healthy. The number of inhabitants is estimated at 34,343,900 in 2390 towns, of which 100 have over 8000 inhabitants; 2340 market villages; 104,000 villages, and numerous small settlements. Of the inhabitants, there were, in 1825, Germans, 27,705,855; persons of Slavonic origin, 5,325,000; Walloons and French, 309,000; Jews, 292,500; Italians, 188,000; Gipsies, 900; and Armenians and Greeks, 900. In the same year, the number of persons of different religious persuasions was as follows:—Roman Catholics, 18,370,300; Protestants, 15,150,500; Jews, 292,500; Greeks and Armenians, 900. It should, however, be stated, that in this enumeration there are in all likelihood many religionists who are altogether unsettled in belief, although ostensibly belonging to some communion; for in no country in the world is there such latitude in thinking upon points of faith. Germany contains 24 universities, which are attended by about 30,000 students—a class of wild young men, having habits and an appearance very different from what usually characterise attendants at colleges in Great Britain. The reading and publishing of books is carried to a great height in Germany, which is essentially literary in its tastes. There are public libraries in 150 places, with about six millions of volumes. Ten thousand authors produce annually from about 3300 to 5000 new books. There are about 100 political journals, 220 other journals, and at least 150 periodical publications. Most of the best English productions are regularly translated and printed in Germany. It is curious that, with all this abundance of literature, and the prevalence of education, with also freedom of religious opinion, Germany is far from being a free country. It is despotically ruled by great or petty sovereigns, has only here and there the mockery of representative government, and the people in the mass are destitute of the power to better their condition. Germany, from which all our freedom sprung, is itself ranked among the least free of the nations of Christendom.

One of the chief of the small German kingdoms is Saxony, lying at the centre of Europe, and consisting principally of the plain of the river Elbe, in its upper part, with a population of 1,400,000 inhabitants. It is rich in agricultural produce, and feeds about a million and a half of sheep, the wool of which is remarkably fine and valuable. Saxony has various flourishing manufactures, linen and woollen goods being the staple. It also carries on a brisk trade with various parts of the world. The grand centre of its commerce, and indeed that of all Germany, is at Leipsic, one of its chief towns. Here annually a great fair is held, which is attended by merchants from all parts of Europe, and at which, in particular, the sale of books is very great. The most elegant town in Saxony is Dresden, situated upon the banks of the Elbe.

Germany possesses four free cities, acting as independent states within their own bounds, and individually entitled to vote in the Germanic diet; namely, Hamburg, Lubeck, Bremen, and Frankfort on the Mayn. The independence of these towns is a remnant of a confederacy of cities which took place in the thirteenth century, and was called the Hanseatic league. Besides these four free cities in Germany, Cracow was likewise declared a free city by the general act of the congress of Vienna, and is under the protection of Russia, Austria, and Prussia. Hamburg, situated upon the Elbe, which flows into the North Sea, is one of the chief commercial and maritime cities of Europe. It possesses a population within its territory of 150,000 inhabitants.

AUSTRIA.

Austria is a monarchy now forming one of the leading powers of Europe, and is usually esteemed the principal of the German states. Only a portion of the territory, however, belongs to Germany. In a general sense, Austria is composed of a large tract of country in the southern part of Europe, immediately north of Italy and European Turkey. Properly speaking, Austria is composed of a number of states conquered and joined together by a series of unprincipled sovereigns, and now, as a whole, ruled by a despotic prince with the title of emperor, as being the head of the Germanic body. The various states which have in this way been added together are what are called Upper and Lower Austria, Bohemia, Moravia, with the alpine regions of Styria, Carinthia, and the Tyrol; several of the Polish provinces, now called Gallicia; the kingdom of Hungary, and the Lombardo-Venetian kingdom in Italy. The whole Austrian monarchy contains more than 256,309 square miles, and upwards of thirty-two millions of inhabitants. Of these it is reckoned that there are twenty-two millions of Roman Catholics, three millions of the Greek church, two millions of Protestants, and half a million of Jews. The military force of the monarchy in 1819 amounted to 270,000 men, independent of militia. Austria numbers 777 cities, 2224 market towns, and 69,105 villages. The most populous cities are Vienna, Milan, Venice, Lemberg, and Padua. The principal sea-ports are Trieste, Venice, and Fiume; other places of trade are Vienna, Prague, Pest, Lemberg, Brody, and Gratz. The bank of Vienna affords the most important support to the commercial interests of the state.

PRUSSIA.

Prussia is one of the most remarkable kingdoms in Europe. It has risen from nothing at the beginning of last century to be one of the principal continental nations. The increase of its size from its original dimensions, as the duchy of Brandenburg, to the condition of a first-rate kingdom, has been effected by the intrepidity of its people and the military character of its sovereigns, particularly of Frederick II., or the Great. Prussia, as now constituted, lies in the northern quarter of Europe, with the Baltic Sea on the north, and Russia on the east. It comprises the districts or provinces of East and West Prussia, Posen, Pomerania, Brandenburg, Silesia, Westphalia, and the Rhenish provinces; which divisions include the portion of Poland which was taken by Prussia at the partition of that unfortunate kingdom. In 1827, the aggregate extent of these territories amounted to 106,852 square miles, with a population of 12,605,078, upwards of ten millions of which inhabitants were Germans. Prussia is considered to be greatly weakened as a power by its large scattered extent of territory. The kingdom has three vulnerable parts, towards Russia, Austria, and France; hence its situation is dependent. It is compelled to keep up a large military force, which in 1829 amounted to 165,000 regular troops. The king of Prussia is an absolute monarch, yet he is surrounded by a spirit of freedom, which necessarily influences his actions. One of the most striking features of this monarchy is the care which it bestows on science and education. The sciences are nowhere fostered with more care, and there are few countries in which common schools are more widely diffused.—See our article History and Present State of Education. Prussia carries on some maritime trade by means of the Baltic, and its inland trade is promoted by the rivers Oder, Vistula, Elbe, and Saale, the Rhine, Memel, Pregel, Warta, Netze, Hanel, Spree, Weser, Moselle, &c., which either flow through Prussia or belong to it. See article COMMERCE AND MANUFACTURES. Most of the inhabitants of Prussia are of the reformed churches.

SWITZERLAND.

Switzerland is a mountainous territory, occupying the alpine regions betwixt France and Germany, and having Italy on the south. This beautiful and romantic country has, from time immemorial, been inhabited by a hardy and independent race of inhabitants, mostly attached to republican forms of government, and always ready to defend their rights and their country from the aggression of the great powers in the neighbourhood. Switzerland measures about 300 miles in length by 140 in breadth, and is supposed to contain 19,000 square miles. Politically, the country is divided into twenty-two small states or cantons, generally independent of each other, but confederated for purposes of mutual protection. Some states are more free in their forms of government than others. The total population amounted, in 1827, to 2,037,030 persons, of which upwards of one-half were Protestants, and the remainder chiefly Roman Catholics and Jews. The German language is most commonly used. Geneva is the smallest but most populous state in proportion to its size, and in this canton is situated the town of Geneva, upon a beautiful lake of about fifty miles in length and eight or ten in breadth. The highest mountains of Switzerland are found in the cantons of Uri, Berne, Underwalden, and Grisons. Of about sixty Swiss mountains which have been measured, the highest is Monte Rosa, 15,535 feet high; the lowest, Chalet, is 3000 feet high. Mont Blanc, within the limits of Savoy, is the highest mountain in Europe, being 15,668 feet high. The mountains of Switzerland are pastoral in their lower parts, and often covered with snow at their summits. The glaciers, more than 400 in number, are either the barren parts of the mountains, or heights which consist only of snow and ice. The continual alternation of hill and dale affords the most striking natural scenes in every part of Switzerland. In some places, within a short distance, one may see at the same time all the seasons of the year; and it is often possible to stand between spring and summer, so as to collect snow with one hand, and to pluck flowers from the soil with the other. Every mountain has its waterfalls; and as their sources are sometimes lost in the clouds, the cataracts seem to descend from the skies. Switzerland abounds in lakes and rivers, the fisheries of which are valuable, and which serve to embellish the landscape; but none of the rivers are navigable. Small steam-vessels now ply on the lake of Geneva, and are a great convenience to travellers. The chief rivers are the Rhine, the Reuss, the Rhone, and the Tesino. The cultivation of the vine is carried on to a considerable extent in Switzerland; the breeding of cattle is, however, the chief employment of the inhabitants. Swiss cheeses are imported in great numbers into Germany, France, and Italy. Manufactures of silk, cotton, and linen, have of late years greatly increased in Switzerland, which is rivalling England in some kinds of goods, particularly printed calicos. Recently great improvements have been made upon the roads through this attractive territory, and travellers are now well accommodated on all the main routes.

NORWAY, SWEDEN, AND DENMARK.

These, with the province of Finland, form the north-western frontier of Europe facing the North Sea or German Ocean, and reaching to the shore of the Baltic on the south. Norway lies on the shore of the North Sea, Sweden is behind it with its southern extremity to the Baltic, and Denmark is formed by the peninsula of Jutland projected northwards from the Netherlands and kingdom of Hanover into the mouth of the Baltic. Norway and Sweden are now erected into a kingdom, under one sovereign, much in the same manner as England and Scotland are united. Bernadotte, one of Bonaparte's commanders, has for a number of years been the reigning monarch. The united kingdom measures 1550 miles in length by about 350 in breadth. The country is mostly mountainous and pastoral, and covered with dense forests, producing the finest timber in the world. The climate is dry and cold, but that of Sweden is warmer than that of Norway. The mineral kingdom is rich, particularly those of iron, copper, and silver. The inhabitants of these countries are of the ancient Scandinavian races; hardy, honest, industrious, and kind-hearted. In the sciences, the Swedes have shown a sound and penetrating mind. The two kingdoms, Norway and Sweden, had, in 1825, a population of nearly four millions of inhabitants. Stockholm, the capital, had a population of nearly 80,000; Gottenburg, the principal commercial city, had 24,000; Christiana, the capital of the Norwegian division, had 20,000; and Bergen, the chief commercial city in Norway, 20,800. Few towns, however, number more than 4000 inhabitants, and many have scarcely 500.

The Danish monarchy is composed of the peninsula already mentioned, with some islands and detached portions. The principal of the attached territories are the duchies of Holstein and Lauenburg; likewise the Feroe Islands, in the North Sea; Iceland; the western coast of Greenland; some places in Guinea; and the city and territory of Tranquebar, in the East Indies. The exact measurement of so scattered a territory is of little moment; and it is sufficient to state, that Denmark proper and the duchy of Sleswick contain 17,375 square miles. Denmark proper is estimated to contain 1,230,000 inhabitants; Holstein and Lauenburg, 370,000; and the total population under the monarchy amounts to something under two millions. The people are partly Danes and partly Germans. Denmark is a level country. The coasts are low, and protected from the sea by dykes. The soil consists partly of marshes and heaths, and is on the whole but moderately fruitful. By the improvident extirpation of the woods, which protected the north and north-western coasts of Jutland against the sea, vast extents of fruitful territory have become barren and sandy deserts. The staple productions are grain, rapeseed, and tobacco; and the breeding of cattle forms a principal source of profit. Denmark now contains, without including Iceland and the Feroe Islands, 100 cities, 73 boroughs, 2305 parishes, and 5500 villages. The government is an absolute monarchy. Copenhagen, situated on the east coast of the island of Zealand, is the capital, and contains a population of 105,000 inhabitants.

HOLLAND AND BELGIUM.

These countries, under the general appellation of Netherlands, occupy a large flat territory stretching southward from the confines of Denmark on the north, to France on the south; having Prussia and the small kingdom of Hanover on the east, and the North Sea or German Ocean on the west. They therefore form that part of the continent of Europe which lies opposite the east coasts of Scotland and England. The entire extent of the Netherlands amounts to 24,870 square miles. Through the centre, from east to west, flows the Rhine, one of the finest rivers in Europe, and which parts into a number of channels before pouring its waters into the ocean. On the lower part of one of these channels stands Rotterdam, a large and flourishing commercial city. The surface of the Netherlands is flat, and rich in the luxuriance of vegetation. So low is the land that it has to be protected from the sea by dykes or embankments. The country is every where intersected with canals, which are of prodigious use for commercial and general intercourse. Locally, the Netherlands are divided into a number of districts, among which the old Flemish or Flanders provinces find a place. The whole territory is nearly equally divided into the two distinct states of Holland and Belgium. Except in respect of geographical resemblance, these states, till lately united, are totally dissimilar in character. Holland is inhabited by the Dutch, who are an exceedingly industrious, quiet, honest, and painstaking people. Belgium is peopled by a race who, except in particular districts, are neither industrious, honest, nor orderly. The Dutch are Protestants; the Belgians are Roman Catholics, and deplorably sunk in bigotry. Never was there so preposterous an attempt made as that which was intended to cement these opposite races of inhabitants. As elsewhere mentioned, the Netherlands were disjoined by the revolution of 1830, and now form independent kingdoms. In 1810, the total population of the Netherlands amounted to 5,401,945, being 2,476,159 for the northern provinces, or Holland; 3,249,841 for Belgium; and 225,045 for the duchy of Luxembourg. Some of the largest towns on the Continent are situated in these low countries; the principal in Holland are Rotterdam, with a population of 63,033; Amsterdam, 201,000; Hague, 45,144; Middleburg, 20,800; Utrecht, 34,087; Leyden, 29,045; besides a number of towns with from six to twenty thousand inhabitants. In Belgium the chief cities are Brussels, the capital, population 72,800; Antwerp, 65,000; Ghent, 81,941; Bruges, 36,000; Mons, 18,400; Liege, 45,300; besides several with from three to ten thousand inhabitants.

TURKEY.

Turkey is a territory partly in Europe and partly in Asia, and is inhabited by an Asiatic-Tartar race called Turks, who in the year 1453 conquered that portion lying within the confines of Europe, formerly the metropolitan part of the western empire of the Romans, and have there ever since, at Constantinople, held a barbarous sway of this beautiful district of Europe. Turkey in Europe is separated on the south-west from Asia only by a long range of straits called the Dardanelles, and by the Black Sea, and is bounded on the northern side by the dominions of Austria and Russia. On the west it has the Adriatic Sea, which in part separates it from Greece, till lately a portion of itself. The Turkish monarchy nominally possesses Egypt and some other possessions in Africa; but, not computing these distant territories, it may be estimated that Turkey in the present day measures in Europe 176,928 square miles (but including the insecure provinces of Moldavia, Wallachia, and Servia), with a population of upwards of nine millions of inhabitants; and in Asia 425,000 square miles, with a population of above ten millions. The bulk of the population in both regions is Mahommedan, and uncivilised. The climate of Turkey is among the most delicious in the world; its soil is generally productive, and its natural appearance is beautiful. Constantinople, situated on the Dardanelles, is a large and populous, though crowded and inconvenient city, excellently situated for trade, communications being carried on with it by the Mediterranean on the west, and the Black Sea on the east. Every region in Turkey yields its productions in abundance. The staple articles of export are wheat, rice, cotton, tobacco, silk, figs, and other fruits; hair, wool, and opium. Mining is totally neglected; and there is in general little manufacturing industry in the country. The inhabitants are at once extremely ignorant, proud, and slothful, and the commerce carried on is chiefly in the hands of Jews and Christians. The spread of knowledge is sedulously prevented; printing, till lately, was carried on only by Armenians, Jews, or Greeks; and transcribing books with the pen is pursued as a common employment. Painting and sculpture are neglected, because the Koran, or Bible of the Mahommedans, forbids the imitation of the human form. A great effort has lately been made by the sultan or reigning monarch to introduce some civilised usages, and among other improvements he has established a newspaper at Constantinople, in French and Turkish. The sultan padishah, as caliph, or successor of Mahommed, enjoys the character of Pope to the Mahommedan world, and unites the highest spiritual dignity with the supreme secular power. He has unlimited control over the property and lives of his subjects, especially of the highest officers of state, whom he can remove or put to death at will. They kiss the bowstring which he sends them, and it is what they may all look forward to. The sultan makes laws without being himself subject to them. The Koran and the fear of public opinion, when it speaks by the voice of rebellion, alone restrain his will. All his subjects are equal in his eyes, for they are all slaves. The people have no rights. Merit, or favour, or intrigue, can raise the lowest to the highest stations. There is no hereditary nobility. The succession to the throne is hereditary in the family of Osman; the will of the people and of the janissaries has often decided upon the individual. On the extinction of the male posterity of Osman, the right to the throne passes into the family of the former Tartar khan. Women are excluded from the succession. The padishah is not crowned; he is merely girded with the sword of Osman, after he has sworn to uphold the religion of Mahommed. The women of his harem are for the most part Circassians or Georgians. Since Ibrahim, the sultans have been accustomed to choose from among them seven wives. She who first bears a son is called *chakessi sultana*; the other mothers of the princes have the name of *sultona chassecki*. The mother of the reigning sultan enjoys great privileges. She is not confined in the apartments of the Eski seraglio, and has a yearly pension of 600,000 piasters. The princes are usually brought up in confinement among the eunuchs and women. Each learns a mechanic art or handicraft, but they never acquire the knowledge which would fit them to rule. They have no prospect but the throne or death in prison. The daughters of the sultan have the title of *sultana*, and, while yet in the cradle, are married to viziers, pachas, and other great officers; but their male posterity, by a law of the empire, are condemned to death from their birth.

The court establishment, with all the eunuchs, women, guards, &c., includes 10,000 persons. The external court consists of the attendants of the grand master of the seraglio, seven chamberlains, the court officers, a body-guard of about 2000 men, the confidants or titular dignitaries, to which class belong the mutes, the dwarfs, the musicians, the masters of audience, the masters of the stirrup, and the viziers of the shoulder. The inner court establishment consists of the harem, with its women, white and black eunuchs (whose chiefs, the kislar and capi aga, possess great influence), the grand vizier, and the sublime porte, which form the two cabinets of the Kiaga Beg, or Minister of the Interior, and of the Reis Effendi, or Minister of Foreign Affairs. The title of the present padishah is "Sultan, son of a sultan, Chakan, son of a chakan, sultan Mahmoud II., khan, son of the victorious Abd-ul-Hamid, by the infinite grace of the Creator of the world and the eternal Being, and through the mediation and great miracles of Mahommed Mustepha, the greatest of prophets, upon whom rest the blessing of God, servant and master of the cities of Mecca, Medina, and Kods (Jerusalem), towards which all men turn their faces when they pray, padishah of the three great cities of Istambul, Edreneh (Adrianople), and Bursa, which all princes regard with envy," &c. The arms assumed by Mahmoud II., after the conquest of Constantinople, are a silver crescent in a green shield. Selim III., in 1790, after Nelson's victory of the Nile, founded the order of the crescent, in three classes, for Franks, which has been conferred on Nelson, Sebastiani, and other foreigners. The administration of government is also Oriental. The grand vizier rules in the name of the sultan, or in his absence, the caimachan. The intrigues of the women and the eunuchs in the seraglio have also much influence. The supreme council of state, the divan, is held in the second hall of the seraglio, under the presidency of the grand vizier.

The source of all civil, political, and criminal law, is the Koran. In addition to the code of laws, the interpretations of the ulema have great weight in the tribunals. The mufti is not only the chief of the priests, but the highest interpreter of the laws. His decisions (fetvas) are collected. The highest tribunal, the divan chaneh, is held four times a-week by the grand vizier in his palace, or in his absence by the tchaush-baschi. In the lower tribunals of the large cities, the mollas sit; in those of small towns, the cadis. The moslems are, under them, the executors of the sentences. The administration of justice is as simple as it is prompt and energetic. The common punishments are the bastinado, hanging, drowning, strangling, and impaling. Bearing false witness is the greatest crime. At the head of the church stands the sultan, as caliph, and in his name the mufti, who is appointed and deposed by the grand seignior. In the larger cities, the mufti appoints under muftis.

The land forces were until recently organised on a miserable Asiatic system, and amounted, according to Marsigli, to 220,000 men; of whom 74,000 were mercenaries, 59,000 infantry, topshis, or artillery, and others, and 15,000 cavalry. There were, besides, in time of war, the bands of feudal vassals, amounting to 126,000 men; the contingent of the Tartars, 12,000; and that of the Moldavians and Wallachians, 8000. The grand vizier is commander-in-chief; the separate corps are commanded by agas, the provincial troops by pachas and sangiacs. The present sultan, with more success than Selim III., has begun, since 1814, to form an army on the European plan; and, in the year 1826, dissolved the body of janissaries throughout the kingdom. Selim III. formed a mathematical school for the officers of the navy, which consists of ten ships of the line, twenty frigates, and thirty smaller ships, commanded by the capudan pacha.

GREECE.

The north-eastern part of the Mediterranean is divided into two large bays or gulfs, which run far up into the European continent; that towards the west being called the Adriatic, and the other the Egean Sea. The peninsula, or tongue of land which lies between the two, is the original country of the Greeks; colonies of the same nation have, from time beyond the reach of history, occupied the whole coasts and islands of both these gulfs, from Sicily almost to Cyprus; but the parent states of the middle peninsula are those to which the Grecian name is indebted for all its splendour; and it is this country only which is properly called Greece. From the situation of the Greeks in a region whose bays, headlands, and islands, present a great extent of sea-coast, habits of adventure and mutual intercourse were produced among them in the earliest times, which had the greatest influence in cherishing a national activity of character, and making each community eager to rival the prosperity of the others. The people were early accustomed to make voyages, sometimes for traffic, sometimes for war, betwixt the opposite coast of their gulfs, guiding themselves by the stars from island to island. The early period of Grecian history, it is presumed, is already in some measure known to the reader. The country with its already much debased inhabitants was latterly conquered by the Turks, from whom it was in part only recently wrested by a skilful rebellion or revolution. In the present day, Greece comprises in its northern parts the districts of Albania and Macedonia; next, in a southerly direction, Epirus and Thessaly; the Morea (anciently Peloponnesus) is an island-like peninsula, almost cut off from the latter divisions by a strait called the Gulf of Lepanto. Altogether, modern Greece measures about 400 miles in length, and little more than 100 in general breadth. Greece is a mountainous and romantic region, with several beautiful rivers. Its agriculture is in a very rude condition, but its commerce is increasing; and the long-exhausted nation is gradually assuming a settled powerful character. A constitutional monarchy, not very well organised, has been imposed on the newly erected nation by the European powers. The population of the continental part of Greece is stated at three millions, and nearly half a million for the islands adjacent.

ASIA.

Asia—the cradle of the human race, of nations, religions, and states; of languages, arts, and sciences; rich in natural gifts and historical remembrances; the theatre of human activity in ancient times, and still exhibiting, in many places, the characteristic traits which distinguished it many centuries since—forms the eastern and northern part of the old world, and is separated from Australia by the Indian and the Pacific Oceans, including the Gulfs of Bengal, Siam, and Tonquin; from America, on the north-east, by Behring's Straits, and on the east by the great Eastern or Pacific Ocean, including the Gulf of Corea, the Seas of Japan, Tongou (Yellow Sea), and Okotsk; from Africa by the Arabian Sea (with which is connected the Persian Gulf) and by the Arabian Gulf, or Red Sea, with the Straits of Babelmandel; from Europe by the Sea of Azoph, with the Straits of Caffa, by the Black Sea with the Bosphorus, by the Sea of Marmora and the Dardanelles, and by the Grecian Archipelago. On the other hand, it is united with Africa by the desert Isthmus of Suez, and with Europe by the waters of the Wolga, which rises near the Baltic, and falls with the Ural into the Caspian Sea.

The area of Asia is about 16,175,000 square miles. It extends from 26° to 190° E. lon., and from 2° to 78° N. lat. Its greatest breadth, from north to south, is 4140 miles, and its greatest length about 8000. It is four times larger than Europe. It is divided into 1, Southern Asia, comprehending Natolia, Armenia, Curdistan, Syria, Arabia, Persia, Hindostan, Farther India, Siam, Malacca, Annam, Tonquin, Cochin China, Laos, Cambodia, China, Japan; 2, Middle or Upper Asia, containing Caucasus, Tartary, Bucharia, Mongolia, Tungusia; 3, Northern or Russian Asia, from 44° N. lat., containing Kasan, Astrachan, Orenburgh, Kuban, Kabarda, Georgia, Imireta, Siberia, with the Alpine regions of Dauria and Kamschatka. The centre of this continent, probably the oldest ridge of land on the earth, is called Upper Asia. Here the Bogdo (the majestic summit of the Altai) forms the central point of all the mountains of Asia. Upper Asia comprises perhaps the most elevated plain on the surface of the earth—the desert of Kobi, or Shamo, on the northern frontiers of China, 400 leagues long, and 100 leagues broad; barren, dry, and waste; visited alternately by scorching winds and chilling storms, even in summer, and affording, besides its deserts, only rivers and lakes; as the Caspian, the Lakes Aral and Baikal, and several situated among the mountains. From the northern and southern declivities of this region, the first tribes of man set out in all directions, following the course of the rivers in four chief lines of descent (north, east, south, and west). Nature has spread over Asia all the treasures of the earth, most abundantly in India; her bounties are distributed, by imperceptible gradations, through all its three zones. In the torrid zone, whose genial warmth converts the juices of plants to spices, balsams, sugar, and coffee, with which Asia has enriched the West Indies, the palms (sago, cocoa, date, and umbrella-palms) reach a height of 200 feet, and the white elephant attains a size surpassing that of all other quadrupeds. From hence the silk-worm was brought to Europe. This region conceals in its bosom the most beautiful diamonds, the finest gold, the best tin, &c., whilst the waves flow over the purest pearls and corals. The temperate zone has given to Europe the melon, the vine, the orange, and many of its most agreeable garden fruits, as well as the most productive farinaceous grasses, and the most charming flowers; and unites, in its productions, symmetry with richness, particularly in the western regions. Here the oldest traditions place Paradise; here lie the enchanting Cashmere and the Garden of Damascus; here blossoms the rose of Jericho, near the cedars of Lebanon. The eastern countries in the same latitude possess the tea-shrub and the genuine rhubarb. The camel, the Angora goat, the Thibetan sheep, the pheasant, and the horse, are natives of this zone. In the north blossoms the Alpine *flora* of Dauria, and from the icy soil grows the dwarf-like Siberian cedar, till, at 70°, vegetation mostly ceases. Here lives the smallest of quadrupeds—the shrew-mouse of the Yenisey. Sables, ermines, foxes, otters, &c. afford the finest fur. The mineral kingdom furnishes rich ores, rare precious stones, and remarkable fossil remains of the mammoth, in high northern latitudes.

The inhabitants (amounting to 300,000,000; according to some, to 580,000,000) are divided into three great branches:—The Tartar-Caucasian, in Western Asia, exhibits the finest features of our race in the Circassian form; the Mongolian race is spread through Eastern Asia; the Malay in Southern Asia and the islands. The north is inhabited by the Samoiedes, Tchooktches, and others. Twenty-four tribes, of different language and origin, may be distinguished, some of which are the relics of scattered tribes of Nomades: Kamtschadales, Ostiacs, Samoiedes, Koriacks, Kurilians, Aleutians, Coreans, Mongols, and Kalmucks, Mantchoos (Tungoos, Daurians, and Mantchoos Proper), Finns, Circassians, Georgians, Greeks, Syrians and Armenians, Tartars and Turks, Persians and Afghans, Thibetans, Hindoos, Siamese, Malays, Annamites (in Cochin China and Tonquin), Birmese, Chinese and Japanese, besides the indigenous inhabitants of the East Indian islands, Jews and Europeans. The principal languages are the Arabian, Persian, Armenian, Turkish, Tartar, Hindoo, Malayan, Moogol, Mantchoo, Chinese, and Sanscrit. All the forms of society are displayed in the existing Asiatic nations, from the savage state of the wandering hordes to the most effeminate luxury; but liberty founded on law and the moral and intellectual education of man, is wanting. Priests and conquerors have long decided the political character of the East, amidst frequent revolutions and changes of dynasties, ever maintaining the principles of blind obedience. Asia has been subject, at different times, to the Assyrians, Medes, Chaldeans, Persians, Greeks, Syrians, Parthians, Arabians, Mongols, Tartars, Seljooks, Turks, Afghans, &c. Ancient forms are preserved most rigidly, and the intellect is least progressive in China and Japan. Slavery still prevails in this continent. Woman yet remains degraded to a slave of man.

The prevailing government in Asia is despotism. Hence those artificial forms of a rigid etiquette which are kept up in all the public relations, and that apathy of the people, in regard to fate, connected with cruelty, and produced partly by opium, partly by superstition, which is almost an universal characteristic of the Asiatics, notwithstanding the violence of their passions. There are, however, some tribes with a republican form of government; and relics of the patriarchal authority of the heads of families still are found. Near the colonies of the Europeans in Southern and Northern Asia, the civilisation of the Christian world has been introduced. The astronomy and astrology, poetry, morals, theology, laws, and the rude empirical medicine of the Asiatics, are mostly confined to the priests, and united with deeply-rooted superstition, which leads even to child-murder and self-sacrifice in the flames. The Mahommedan religion, the central point for instruction in which is at Samarcand, prevails in Western Asia. Over all Central and the Eastern part of Northern Asia, prevails the religion of the Lama. The religion of Brama, the head-quarters of which is Benares, is confined chiefly to Hindostan, and Shamanism, to the tribes in Northern Asia, and to the Russian Archipelago. The ancient doctrine of Zoroaster is confined to single families in India and Persia; whilst the Mosaic has numerous adherents through all Asia, except the Russian part. Physical and mechanical cultivation is carried to a higher degree of perfection than intellectual and moral; namely, by the Indian jugglers and Chinese mechanics. Remarkable skill has been acquired by certain classes of Hindoos in the weaving of silk and cotton. The shawls of Cashmere, the leather of Persia and Syria (morocco, cordovan, shagreen), the porcelain of China and Japan, the steel of Turkish Asia, the lackered wares of China and Japan, &c. are well known. The internal commerce is still carried on by caravans, as in the most ancient times, before Abraham and Moses, when merchandise was transported from India, through Bactria, to Colchis, as at present to Makariev, Moscow, and Constantinople.

The religious, civil, and social condition of the Asiatics, proves, that, where the free developement of the higher powers of man is subject to the restraints of castes, and to the tyranny of priests and despots, and where the adherence to established forms has become a matter of faith, law, and habit, the character of society must degenerate, and the energies of man become palsied. Hence the Asiatic, notwithstanding the richness of his imagination, never attained the conception of ideal beauty, like the free Greek; and, for the same reason, the European, whose mental improvement and social activity have been unimpeded, has shaken off the control which the East formerly exercised over the West, and has obtained dominion over the coasts and territories of his old lord and master. Greece led the way, and, after having transformed the obscure symbols of the East to shapes of ideal beauty, shook off the spiritual fetters of priests and oracles, and, at the same time, the temporal yoke which the Persian Darius had prepared for Athens and Sparta. After a struggle of fifty years, the triumphs of Cimon (in 449 B. C.) first enabled Europe to prescribe laws to the East. Grecian civilisation then spread over the whole of Western Asia, to India, and even the military despotism which succeeded has not been able to extinguish the light entirely. In later times, the Romans and Parthians fought for the possession of the Euphrates, and the Persians, under the Sassanides, attempted to tear the dominion of the world from the hands of Rome. Since that period, Asia has four times taken up arms against Europe. The nations of Upper Asia, driven from the frontiers of China to the Irtish, crowded upon the West. Huns, Avari, Bulgarians, and Magyars, successively issued from the Caucasian gates, and from the wildernesses of the Ural, to subdue Europe; besides those later hordes, which were mingled and confounded with each other in Southern Russia and on the Danube. But the rude power of Attila and of the grandsons of Arpat was broken in conflict with the Germans.

Next, the Arabians attacked Constantinople, Italy, and France, but their fanatical impetuosity was checked by Charles Martel, in 732, and the chivalrous valour of the Gothic Christians rescued the peninsula within the Pyrenees. The West then armed itself against the East, to recover the holy sepulchre from the sultan of the Seljooks, and Christian Europe became better acquainted with Asia; but the sword alone cannot conquer a continent. Finally, the Tartars and Ottoman Turks invaded Europe. In 1453, they took the Bosphorus and Greece from the feeble hands of the eastern Romans. In succeeding times, Europe has been defended against Asia, on this side, by Germany. The intellectual progress of the European, since that period, has raised him above the most ancient nations of the East—Persians, Arabians, Indians, and Chinese. Gunpowder, the mariner's compass, and the art of printing (which the last-mentioned nation possessed, but could not apply to much use), have become powerful in his hands. Hence Russia has gained the Wolga, explored Siberia, kept watch over the seat of the ancient and modern Scythians, the mountains of the Altai, and finally conquered the tribes of the Caucasus; whilst (since Vasco da Gama discovered the way by sea to the East Indies, in 1498) the Portuguese, Dutch, and French, and particularly the English, by their universal commerce, have made the rich countries of Southern Asia acquainted with European laws, and Europe with the condition and luxury of those countries. Persia is already entangled in the European international policy, which is principally owing to the efforts of Sir Harford Jones, Sir Gore Ouseley, Mr James Morier, and the Russian general Yermaloff. The diplomacy of the court of China, now more than ten centuries old, still resists European encroachments. Japan alone yet denies all approach to Europeans; and her jealousy is as effective as the polar ice which blocks up the passages of the frozen seas. The most interesting country of Asia, PALESTINE, or the Holy Land, as it is termed by Christians, is described at length in the present work; and here also will be found accounts of CHINA and the EAST INDIES.

AFRICA.

Africa, one of the five divisions of the globe, mentioned in history thousands of years ago, is still to us what it was to the ancients—the land of mystery. Only a small extent of sea, namely, the Mediterranean, separates Africa from Europe; its coasts lie in sight of the most civilised countries, and yet we know nothing more than its outlines; into the interior the foot of a European has lately, for the first time, penetrated. Whether the Africans are descended from a negro Adam, or whether a descendant of Noah conducted thither from Asia its first inhabitants, who received their black complexion from the fierce heat of the African sun, is a problem which can never be solved. Under the same name which it now bears, the valley of the Nile was, in the earliest ages of history, the cradle of commerce, the arts, and sciences. But even in the period of Egypt's greatest prosperity, deep night seems to have enveloped the surrounding countries, which were called Negroland. Subsequently, the Greeks and Romans became better acquainted with the Mediterranean coast of Africa, and penetrated into the interior perhaps as far as the river Joliba; but their knowledge never reached beyond the confines of Numidia, and they were totally ignorant of the southern part of Africa. How vague was the conception which Ptolemy himself formed of this portion of the earth, though it appeared to him a large peninsula! Its outlines were not determined till the fifteenth century. Henry, the navigator, sailed round the formidable Cape Non (*non plus ultra*), Dias and Vasco de Gama discovered the Cape of Good Hope, and both the western and eastern coasts were examined by European navigators.

Africa is a vast peninsula, forming a triangle, with its vertex towards the south, containing 12,256,000 square miles; situated between 18° W. and 51° E. lon., and from 34° S. to 37° 30′ N. lat.; bounded on the north by the Mediterranean, on the east by Asia, the Red Sea, and Indian Ocean, and on the south and west by the Southern and Atlantic Oceans. It has a great breadth from east to west. The northern portion is much larger than the southern; the greatest breadth, from west to east, from Cape Negro to Cape Guardafui, is 69°. Under the equator, the breadth is 4500 geographical miles. The internal structure of Africa is marked by many peculiarities. It possesses immense chains of mountains, extending, perhaps, from the Cape of Good Hope to the Mediterranean, in many parallel ranges. Such are the Atlas mountains, the mountains of the Moon, of Kong, and Lupata; those of the Cape, 5000 feet high, and covered with continual snows; but, on the whole, it is more level than any other quarter of the globe. In none other do we find such boundless deserts; and the Cobi, in the centre of Asia, is not to be compared with the Sahara. These deserts appear like oceans of sand, by no means destitute of fertile islands. These islands are the Oases, peculiar to Africa.

Among the mighty streams of Africa, we can now follow the Egyptian Nile to its sources. The courses of the other great rivers have not yet been satisfactorily explored. We know, indeed, where the Congo or Zaire, Coanza, and Cuama or Zambeze, terminate, but not where they rise. The Joliba (the Niger of Herodotus), Mungo Park has informed us, flows from west to east. The Senegal, the Gambia, and the Orange, are also important rivers. Africa contains several large lakes, such as the Dembea, Wangara, Maravi, Tschad, and Aquilunda. The climate is various, but in general extremely hot. In the lifeless atmosphere of the tropics, which have but two seasons, the wet and the dry, the heat of the sun is terrible; and Adanson tells of eggs being roasted in the sands of Guinea, and the naked feet of the negroes blistered. On the coasts, the heat is mitigated by the breezes from the sea and the mountains, and by incessant rains; but the atmosphere is not so healthy and pure as in the interior, which has a higher elevation. The whole tract of Barbary is warmer than the more southerly regions, and all Africa, compared with Europe, is a hot country. Of its winds, the dry parching harmattan is peculiar to Africa; it has the simoom in common with Asia, and the sirocco with Europe.

To the naturalist, this wonderful country seems the first favourite of nature, as far as it respects the riches of the organic world, and the number of giant forms of animals and plants. It can enumerate five times as many species of quadrupeds as Asia, and three times as many as all America. It excels Asia in the size of its colossal river-horse (hippopotamus), gigantic giraffe, and large antelopes and apes. That giant of birds, the ostrich, is exclusively indigenous to Africa. But the most beneficent gift of nature to the African is the camel, the constitution of which is in every respect adapted to the country and climate. Among the other animals are the elephant and rhinoceros, the lion, panther, leopard, ounce, jackal, hyæna, wolf, fox, dog, cat, mongus, bat, rat, marmot (*cavia capensis*), hare, rabbit, jerboa, porcupine, hedgehog, mole, civet-cat, ichneumon, bear, horse, ass, zebra, sheep (some with hair and large fat tails), argalis (*capra ammon*), goat, innumerable varieties of the gazelle, the buffalo, fallow-deer. In Guinea are found the roe, swine, engalos, babyroussa, and other quadrupeds, whose natural history has been as yet by no means sufficiently investigated; even the problematical unicorn is still said to exist in the interior.

The varieties of birds are equally numerous; among which is the crown-bird, the most beautiful of the feathered tribes; the flamingo, kingfisher, pelican, and many kinds of parrots; the peacock, partridge, pheasant, widow and cardinal-bird; the cuckoo, the cuculus indicator, turtle-doves, pigeons, ducks, geese, &c. The class of reptiles comprises the crocodile and boa-constrictor, with many other serpents, some innoxious, some highly poisonous. The bays and rivers abound in fish, but the variety of the species is not so great as in the northern seas, and many of the most useful are entirely wanting. The shrubs and earth swarm with termites, ants, scolopendras, spiders, and caterpillars, while passing armies of locusts obscure the sun like clouds. The most beautiful insects abound. Still more extraordinary is the force of vegetation. The earth renders back the seed to the cultivator increased a hundred-fold, and produces those immense trees, among which the baobab, or monkey bread-tree, whose crown of branches sometimes forms a circle one hundred and thirty feet in diameter, holds the first rank; the splendid white trunk of the ceiba grows almost perpendicularly from the root to the branches sixty feet, and, with its fine round crown, rises to a height of one hundred and twenty feet.

Our information respecting the mineral kingdom is the most limited. Of gold, Africa has more than any other portion of the globe; and iron is found in most parts of this continent, but it wants the other metals. Of other minerals, it has only saltpetre, sal ammoniac, some fullers' earth, and emery in abundance; ambergris is found on the coasts. The want of salt, except in a few regions, is most severely felt.

The African races of men offer many points of interest to the inquirer. The majority of them are distinguished from the rest of the human family, not only by their black complexion and curly hair, but also by peculiarities in the construction of the bones of the head and even of the nerves. This seems to imply that the negro is originally a distinct race. It is thought that traces of this primitive race may still be detected here and there; for example, of the original Egyptians in the Copts, and of the Guanches (the original inhabitants of the Canaries) in the natives of Barbary. The population is probably between a hundred and a hundred and ten millions. The interior of the country must be very populous, since, within two centuries and a half, it has contributed forty millions of vigorous men to the slave trade, and, notwithstanding, is any thing but depopulated. Even the countries along the coast are thickly peopled. Jackson computed the population of Morocco alone at seventeen millions, and the Barbary states, with Egypt, which constitute but an eighth part of the continent, contain twenty millions. The torrid Guinea has, on the whole, a numerous population; and large cities are situated on the Joliba, of which we hardly know the names. The inhabitants belong to two branches of the human family; to the black or Ethiopian race, which extends from the Joliba to the southern extremity, comprising, notwithstanding their tawny complexions, the Hottentots; and to the Caucasian race, which includes the natives of Barbary, Copts, the Arabs or Moors, the Agaziones or Abyssinians, and the nations of Nubia. The Arabs are not to be regarded as aborigines of Africa, but they have scattered themselves, and become occupants of the greater part of the north and west.

On the islands and some points of the sea-board, we find Portuguese, Spaniards, French, Dutch, British, and even Jews, in particular spots; but the Falasches in Tigre, though they profess the religion of Moses, seem not to be of Hebrew descent. The Arabic is the leading language throughout all the north, and as far as the Joliba, where it is understood, in some degree at least, by those nations who revere the Koran. The Berberd and Shelluh tongues are spoken in the Barbary states, and along the Atlas mountains. The Mandingo language is used from the Senegal to the Joliba. On the western coast, a corrupt Portuguese is heard; in the regions of Abyssinia, the Tigre and Amhara tongues prevail. The languages of the blacks are as multifarious as the nations. In Sahara alone, forty-three dialects are said to be spoken. But of all the hundred and fifty languages (this conjectural number was adopted by Seetzen) of the African nations, we are hardly acquainted with seventy. Equally manifold are the modes of worship. Mahommedanism has diffused itself over the north to the Joliba, and most of the eastern coast; the Christian religion is professed by the inhabitants of Tigre and Amhara, by the Copts, the Nubians, and European strangers, though with great diversity of forms. The most disgusting Fetichism prevails among most of the negro nations, demanding, from many of its votaries, human sacrifices.

We must not look to Africa for the triumphs of science, not even to the country which was its cradle in the infancy of men. All that the Pharaohs and Ptolemies had ever effected, was swept away by the storms which broke upon this unhappy region in the middle ages. Schools, however, are still maintained by the Mahommedans in the cities of Barbary, by the Maraboots, in the countries where they have settled, and here and there by the Copts and Monophysites in Tigre and Amhara. The arts are exercised only on the northern coasts, where the Moors manufacture much silk, cotton, leather, and linen; an active commerce is carried on by them with the maritime nations of Europe, and, by means of caravans, a traffic, full as important, with the interior, to which they convey their own products and those of Europe.

The blacks stand on the verge of absolute barbarism, even where they are united into states. Their wants are exceedingly simple, and every article used by them is prepared by themselves; the cloth which surrounds their loins, the hut which protects them from the weather, the bow and arrow necessary for the hunt and self-defence, as well as all their household furniture, are manufactured by themselves; the gold which they collect from the surface of the earth is wrought by them into ornaments, and iron into arms. Commerce, however, with Europeans has taught them many wants, and increased their list of necessaries; among which may now be reckoned fire-arms, powder, brandy, tobacco, different kinds of cloth, glass beads, coral, &c.; for which they barter slaves, ivory, gold, and gums, the staples of Africa. The slave-trade is yet of such importance, that, although most of the European and American nations have agreed to prohibit it, nearly 50,000 negroes are yearly torn from the interior by the Mussulman, Portuguese, French, American, and even British dealers. Formerly, 105,000 slaves were annually introduced into the West Indies, besides those who were transported into Asia by the Kermanians, and by the North Americans into the southern states of the Union. The exports of ivory, gold dust, and gums, are also important; those of ostrich feathers, tiger skins, hides, and other natural productions, are of less consequence. Of all the states of Africa, Barbary alone uses coin; in the rest not frequented by Europeans, money rarely serves as the medium of exchange; in some, on the western coast, cowries are made to answer the purpose of coin; in others, pieces of salt.

The tropic of Cancer and the equator divide Africa into three principal parts:—1. Northern Africa, comprising Egypt, the piratical states of Tripoli (including the coast of Barca), Tunis, and Algiers, the empire of Morocco, Fezzan, and the northern part of Soodan or the Sahara, with the Azores, Canary and Madeira islands. 2. Central Africa, comprising, on the eastern coast, Nubia, Tigre, Ambara, Efat, Adel, Ajan, the southern part of Soodan, with Darfur and the countries of the Gallas; and, on the western coasts, Benin, Owhere, Senegambia, and Guinea, besides the Cape Verd islands, those near Guinea, the sixteen Bissao islands, Socotora, &c. 3. Southern Africa, with all the south-east and south-western coasts and interior, the Cape of Good Hope, and the island of Madagascar, the Comoro islands, with those of Mascarenhas, Amirante, Tristan d'Acunha, St Helena, and Ascension.

The following description, from the Edinburgh Cabinet Library, conveys a luminous view of the character of the African continent:—

"Vegetable life, in consequence of the absence of moisture, is scantily diffused over a great extent of the continent. In the heart of the mountains, however, and in the kingdoms along their border, the soil is most profusely watered, and, under the influence of a tropical sun, produces, perhaps, beyond any other part of the world, that luxuriant growth, and those gigantic vegetable forms, which distinguish the equatorial regions. The baobab, or great calabash, appears to be the most enormous tree on the face of the earth. Adanson assures us that the circumference, in some cases, is equal to thirteen fathoms, as measured by his arms clasped round the trunk, that is, varying from seventy-four to seventy-seven feet. Branches extending horizontally from the trunk, each equal to a large tree, make the baobab a forest, as it were, in itself. The mangrove, too, which rises on the borders of rivers or inundated spots, diffuses itself in a manner truly remarkable. The branches, dropping down upon the watery bank, strike root and grow; hence the original plant, spreading farther and farther, forms over the stream a species of natural arcade. These mighty trees do not stand alone, but have their interstices filled up by numberless shrubs, canes, creeping and parasitical plants, which intersect and entwine with each other till they form a thick and impenetrable mass of underwood. As we approach the confines of the desert, these giants of the wood disappear, and vegetation presents a different and more pleasing aspect. It exhibits now the light and gay form of the acacia, whole forests of which rise amid the sand, distilling those rich gums that afford an important material of African commerce. The lotus, a celebrated and classical shrub, the tamarisk, and other small and elegant trees, afford agreeable and nutritive berries, which constitute the food of several nations. Various flowering shrubs, of the most delicate tints, rising into wild and spontaneous beauty, embellish the precincts of the waste. Thus the desert, in its first approaches, and before vegetable life begins to expire, does not assume its sternest character, but wears even a peculiarly pleasing and smiling aspect.

The animal world in Africa changes equally its nature as it passes from one to another of its opposite regions. In those plains which are inundated by the great rivers, it multiplies at an extraordinary rate, and often assumes huge and repulsive forms. Throughout all this continent, the wild tribes exist in large and formidable numbers, and there is scarcely a tract which they do not either hold in full possession, or fiercely dispute with man. Even the most densely peopled countries border on wide forests and wastes, whose savage tenants find their prey occasionally in men himself, as well as in the domestic animals which surround him; and when the scent of human slaughter is wafted on the breeze, bands of hungry monsters hasten from every side to the feast of blood. These ferocious creatures hold indeed so commanding a position, that the colonist scarcely makes any attempt to extirpate them, or even to keep down their numbers. He wages against them only a defensive war, and employs his courage and skill chiefly in hunting the elephant, the antelope, and other peaceful species, by whose spoil he may be enriched. The lion, that king of the desert, that mightiest among the tribes which have the wilderness for their abode, abounds in Africa, and causes all her forests to re-echo his midnight roar. Yet both his courage and his fierceness have, it is said, been overrated; and the man who can undauntedly face him, or evade his first dreadful spring, rarely falls his victim. Wider ravages are committed by the hyena, not the strongest, but the most ferocious and untameable of all the beasts of prey. These creatures, by moving in numerous bands, achieve what is beyond the single strength of the greater animals: they burst with mighty inroad into the cities, and have even carried by storm fortified enclosures. The elephant roams in vast herds through the densely-wooded tracts of the interior, disputing with the lion the rank of king of the lower creation; matchless in bulk and strength, yet tranquil, majestic, peaceful, led in troops under the guidance of the most ancient of the number, having a social and almost moral existence. He attacks neither man nor beast. The human being is more frequently the aggressor, not only with the view of protecting the fruits of the earth, but also in order to obtain the bony substance composing his tusks, which, under the name of ivory, forms one of the most valued articles of African trade. The prodigious strength of the elephant, his almost impenetrable hide, his rapid though unwieldy movements, render him a most perilous object of attack even to the boldest hunters; so that pits and snares of various kinds are the usual modes by which his capture is effected. Instead of the tiger, Africa has the leopard and the panther, belonging, however, only to certain of its districts. In the large and broad rivers of Africa, and through the immense forests which overshadow them, a race of amphibious animals of monstrous form and size display their unwieldy figures. The rhinoceros, although not strictly amphibious, slowly traverses marshes and swampy grounds, and almost equals the elephant in strength and defensive powers, but wants his stature, his dignity, and his wisdom. The single or double horn with which he defends himself is an article of commerce in the East, though not valued in Europe. A still huger shape is that of the hippopotamus, or river-horse, fitted alike to stalk on land, to march along the bottom of the waters, or to swim on their surface. He is slow, ponderous, gentle: yet when annoyed, either by design or accident, his wrath is terrible; he rushes up from his watery retreat, and, by merely striking with his enormous tusks, can overset or sink a loaded canoe. But the most dreaded of all the inhabitants of the African rivers is the crocodile, the largest and fiercest of the lizard tribe. He lies like a log upon the waters, watching for his prey, attacking men and even the strongest animals, which, however, engage with him in obstinate and deadly encounters.

We have not yet done with all the monstrous and prodigious forms which Africa generates. She swarms with the serpent brood, which spread great terror, some by their deadly poison, others by their mere bulk and strength. In this last respect, the African serpents have struck the world with amazement; ancient history records that whole provinces were overrun by them, and that one, after disputing the passage of a river with a Roman army, was destroyed only by the use of a battering-engine. Emerging from these dank regions, where the earth, under the united influence of heat and moisture, teems with such a noxious superabundance of life, we approach the desert. Here a change takes place, equally singular and pleasing as in the vegetable world. Only light, airy, and fantastic forms trip along the sandy border; creatures innocent, gentle, and beautiful—the antelope of twenty different species, all swift, with bright eyes, erect and usually elegant figures—preying neither on men nor animals, but pursued by all on account of the delicate food which they afford. Here, too, roams the zebra, with its finely-striped skin wrapped round it like a robe of rich cloth; and the camelopard, the tallest and most remarkable of animal forms, with its long fore-legs and high-stretching neck, of singular and fantastic beauty, crops the leaves of the African forest. Though a rare species, he is seen occasionally straying over a great proportion of that continent. The insect race, which in our climate is generally harmless, presents here many singular, and even formidable characteristics. The flying tribes in particular, through the action of the sun on the swampy forests, rise up in terrible and destructive numbers. They fill the air, and darken the sky; they annihilate the labour of nations; they drive even armies before them. The locust, when its bands issue in close and dark array from the depths of the desert, commits ravages surpassing those of the most ferocious wild beasts, or even the more desolating career of human warfare. In vain do the despairing inhabitants seek, with fire and other means, to arrest their progress; the dense and irresistible mass continues to move onward, and soon baffles every attempt to check its course. Whole provinces, which at their entrance are covered with rich harvests and brilliant verdure, are left without a leaf or a blade. Africa, from the earliest ages, has been the most conspicuous theatre of crime and of wrong; where social life has lost the traces of primitive simplicity, without rising to order, principle, or refinement; where fraud and violence are formed into national systems, and man trembles at the sight of his fellow-men. For centuries this continent has seen thousands of her unfortunate children dragged in chains over its deserts and across the ocean, to spend their lives in foreign and distant bondage."

TABLE OF THE HEIGHT OF THE PRINCIPAL MOUNTAINS ON THE GLOBE.

EUROPE.

	English Feet.
Mont Blanc, Alps, Savoy	15,668
Monte Rosa, Alps, Switz.	15,527
Finster Aarhorn, Alps	14,325
Jungfrau, Alps	13,730
Schreckhorn, Alps	13,310
Oertler Spitze, Alps	13,065
Gross Glockner, Alps	12,900
Simplon, Alps	11,730
Mulhacen, Sierra Nevada	11,678
Maladetta, Pyrenees	11,436
Mont Perdu, Pyrenees	11,275
Penaranda, Asturias, Spain	11,000
Etna, Sicily	10,870
St Gothard, Alps	10,605
Ruska, Carpathians	9,912
Mount Cenis, Alps	9,650
Little St Bernard, Alps	9,010
Monte Corno, Apennines	9,523
Kanigou, Pyrenees	8,800
Skagtios Find, Dofrines	8,400
Lomnits, Carpathians	7,962
Taygetus, Greece	7,950
Olympus, Turkey	6,650
Mont d'Or, Auvergne, Fran.	6,470
Cantal, Auvergne	5,350
Parnassus, Greece	5,850
Ossa, Turkey	5,840
Riesen Koppe, Sudetes	5,330
Pelion, Greece	5,200
Hecla, Iceland	5,010
Puy de Dome, Auvergne	4,800
Feldberg, Black Forest	4,750
Haydelberg, Bohemian For.	4,600
Helicon, Greece	4,550
Ben Nevis, Grampians	4,379
Ben Lawers, Grampians	4,051
Cairngorm, Grampians	4,050
Vesuvius, Italy	3,932
Brocken, Hartz	3,730
Snowdon, Wales	3,568
Schehallien, Grampians	3,564
Cader Idris, Wales	3,550
Macgillicuddy's Reeks, Irel.	3,404
Ben Lomond, Grampians	3,262
Schneekopp, Thuringian Forest	3,220
Skiddaw, England	3,022

ASIA.

	English Feet.
Chumularee, Himalayah, the highest mountain in the world	29,000
Dhawalagiri, Himalayah	26,500
Javaher, Himalayah	25,800
Rudra, Himalayah	23,000
Jamautri, Himalayah	22,500
Highest Peak of Hindoo-Coosh	20,000
Elburts, Caucasus	18,350
Ararat, Great, Armenia	17,700
Kasbek, Caucasus	15,800
Gounong Pasumbra, Sumatra	15,270
Gounong Pasaman, or Ophir, Sumatra	14,160
Ararat, Little, Armenia	13,500
Alas Tag, Altai	11,520
Highest Peak of Lebanon	11,050
Italitskoi, Altai	10,900
Awatcha, Kamtschatka	9,750
Olympus, Asia Minor	9,100
Highest Peak of Nilgherries	8,835
Sinai, Arabia	7,059
Takhtalou, Taurus	7,715
Adam's Peak, Ceylon	6,650
Sabramani, Ghauts	5,750
Ida, Asia Minor	5,435
Chaisgour, Vindhya	2,700
Carmel, Palestine	5,250
Tabor, Palestine	2,053

AFRICA.

	English Feet.
Highest Peak of Cameroons	13,000
Peak of Teneriffe	12,176
Bernard, Bourbon Isles	12,100
Highest Peak of Atlas	11,900
Lamalmon, Abyssinia	11,300
Compass, Sneuwberg, Afri.	10,250
Komberg, S. Africa	8,330
Fogo, Cape de Verd Isles	8,100
Taranta, Abyssinia	7,900
Pico Ruivo, Madeira	6,233
Table Mountain, Africa	3,582
Piter Boot, Mauritius	2,790
Diana's Peak, St Helena	2,710

AMERICA.

	English Feet.
Sorata, Andes	25,400
Illimani, Andes	24,200
Gualatieri, Andes	22,000
Chimborazo, Andes	21,000
Cayambe, Andes	19,638
Antisana, Andes	19,136
Cotopaxi, Andes	18,867
Tolima, Andes	18,436
Mount St Elias, North America	18,000
Popocatepetl, Mexican Cordillera	17,780
Pinchincha, Andes	15,931
Istaccihuatl, Mexican Cordillera	15,705
Mount Fairweather, N. America	14,736
Cofre de Perote, Mexican Cordillera	13,275
James's Peak, Rocky Mountains	11,500
Sierra de Cobre, Cuba	9,000
Grand Serrania, Hayti	9,000
Duida, Parima	8,230
Highest Peak of Blue Mountains, Jamaica	7,278
Mount Washington, Alleghanies	6,650
Mount Sarmiento, Straits of Magellan	6,000
Mount Otter, Alleghanies	4,250
Kaatskill, Alleghanies	3,150
Cape Horn, South America	1,860

SOUTH SEA ISLANDS.

	English Feet.
Mouna Roa, Sandwich Is.	15,900
Mouna Koa, Sandwich Is.	13,800
Oroeno, Otaheita	9,350
Egmont Peak, N. Zealand	8,150
Sea View Hill, Blue Mountains, New South Wales	6,700
Highest Peak of Barren Mountains, Van Diemen's Land	5,000

COMPARATIVE LENGTH OF THE PRINCIPAL RIVERS ON THE GLOBE.

Names.	*Country.*	*Mouth.*	*Length in Miles.*
Forth	Scotland	North Sea	115
Tay	Scotland	North Sea	120
Trent	England	North Sea	125
Shannon	Ireland	Atlantic Ocean	200
Thames	England	North Sea	215
Severn	England and Wales	Bristol Channel	220
Hudson	North America	Atlantic Ocean	270
Ebro	Spain	Mediterranean Sea	380
Po	Italy	Adriatic Sea	410
Seine	France	English Channel	425
Rhone	Switzerland and France	Mediterranean Sea	600
Loire	France	Bay of Biscay	545
Tagus	Spain and Portugal	Atlantic Ocean	550
Oder	Austria and Prussia	Baltic Sea	500
Susquehanna	United States	Atlantic Ocean	620
Vistula	Austria and Prussia	Baltic Sea	640
Elbe	Austria, Germany, and Prussia	North Sea	670
Gambia	Africa	Atlantic Ocean	700
Dniester	Austria and Turkey	Black Sea	710
Dwina	Russia	White Sea	750
Rhine	France, Ger. and Holl.	North Sea	850
Colombia	North America	Pacific Ocean	910
Senegal	Africa	Atlantic Ocean	950
Don	Russia	Sea of Azof	1020
Dnieper	Russia	Black Sea	1140
St Lawrence	North America	Atlantic Ocean	1320
Orinoco	South America	Atlantic Ocean	1480
Ganges	Hindostan	Bengal Bay	1550
Danube	Germany and Turkey	Black Sea	1760
Indus	Hindostan	Indian Ocean	1770
Euphrates	Turkey in Asia	Persian Gulf	1800
Tigris	Turkey in Asia	Euphrates	950
Mackenzie	North America	Arctic Ocean	1920
Volga	Russia	Caspian Sea	2040
La Plata	South America	Atlantic Ocean	2130
Niger	Africa	Gulf of Guinea	2300
Nile	Nubia and Egypt	Mediterranean Sea	2610
Hoang-ho	Thibet and China	Pacific Ocean	2630
Yang-tse-kiang	Thibet and China	Pacific Ocean	2890
Mississippi	North America	Gulf of Mexico	1930
Maranon	South America	Atlantic Ocean	3380
Illinois	North America	Mississippi	500
Missouri	North America	Mississippi	2310
Ohio	North America	Mississippi	1190

AUSTRALASIA,

Which now ranks as one of the great divisions of the earth, consists of a number of large and small islands in the Indian or South Pacific Ocean, between the 1st and 30th degrees of south latitude, in a south-easterly direction from China, which is the nearest part of the Asiatic continent. These islands also lie in a fair south-easterly direction from India, or Hindostan. The chief island in the group is Australia or New Holland, the principal settlement upon which is termed New South Wales, which, with Van Diemen's Land, a smaller island and British settlement, are described in separate articles in the present work. The other islands, which are still inhabited by only savage races, are New Zealand, New Guinea, Solomon's Islands, New Britain, New Ireland, New Hebrides, and New Caledonia. The whole islands are understood to comprise fully three millions of square miles, of which the British government claims the dominion.

POLYNESIA.

Polynesia—a word signifying "many isles"—is the name now given to the numerous groups of small islands scattered over the Pacific Ocean, but principally lying in an easterly and north-easterly direction from the above-mentioned territory of Australia, within about thirty degrees on both sides of the equator. They are perhaps better known under their specific titles of Sandwich Islands, Friendly Islands, Society Islands, Queen Charlotte's Islands, &c. They are many thousands in number, and are inhabited by savage races, who have generally been found much more tractable than the barbarous tribes of the other parts of the world. Most of the islands are fruitful and beautiful; some are exceedingly high and romantic, and their climate is reckoned the most delicious on the globe. Otaheite is one of the principal of the Society Islands. Owhyhee, or Hawai, is the largest of the Sandwich Islands, and measures eighty-four miles in length by seventy in breadth. Here Captain Cook, in 1779, fell a victim to a sudden resentment of the natives, with whom his party unfortunately had a dispute.

AMERICA.

The continent of America lies in the western hemisphere, in a situation altogether aloof from the continents of the Old World—as Europe, Asia, and Africa are termed. America, or the New World, was first discovered by Columbus in the year 1492, but its coasts were not fully known to Europeans for nearly a century after that period. Although Columbus is entitled to be considered the first discoverer of America, it happened that he was robbed of the honour of giving it his name by the superior address of Americus Vespucius, one of his adventurous successors. America consists of two large portions, very nearly separated by the intervening Gulf of Mexico, and only connected by a neck of land called the Isthmus of Darien. The northern portion is named North America, that in the south, South America. From its northern boundaries to the Gulf of Mexico, North America extends about 4376 miles in length, and 3000 miles wide at the broadest part. South America commences at the 9th degree of north latitude, reaching to the 56th degree south latitude, being a length of 4550 miles, by a breadth at widest of nearly 3000 miles. On this vast double continent the works of nature are found on a large scale, calculated to excite our wonder. Mountain ranges, plains, and rivers, are all larger and more magnificent in their proportions and appearance than those in the eastern hemisphere. The soil is also very generally fertile, and covered with the most lofty timber and luxuriant vegetation. At the period of the discovery of America, it was found to be thinly inhabited by a number of tribes of aboriginal people, generally of a copper colour, and more or less savage in character and habits. The subsequent settlement of colonists from Spain, Portugal, Holland, England, France, and other European nations, had the effect of either extirpating these races, or of driving them westward towards the shores of the Pacific Ocean. They are now comparatively few in number. While they have decreased, the colonists have vastly increased in number by emigration, and the natural increase of population. In a general sense, North America has fallen to the share of British colonists, while South America has become the portion of the Spanish and other bigoted and bad-managing Europeans. In the course of time, the colonists in nearly all parts have emancipated themselves from the dominion of the mother countries, and set up as independent nations. In doing so, they have embraced the opportunity of trying to establish democratic institutions, with an absence of aristocratic distinction. The greatest of the republics thus established has been that of the United States of North America. A third race, the descendants of negroes imported as slaves, is rising into a large amount of population over the whole continent, partly emancipated and still partly as slaves; and being most unfortunately or inhumanely kept as a despised caste, their increasing numbers and condition are at present exciting the attention of the civilised world. It has been computed that the whites and their descendants in all parts of America amount in number to nearly fourteen millions; the Indians to eight millions; the negroes to about seven millions; and the mixed races to at least six millions—making a total of thirty-five millions: but there is yet space and fertile soil for more than five hundred millions. Besides the United States, North America comprises the British settlements of Upper and Lower Canada, on the north; a district claimed by Russia, on the north-west; and the state of Mexico, in the south-western quarter. Having in various numbers of the present work given an ample description both of the North and South American states and settlements, we do not here require to enlarge on the subject, but refer the reader to the separate articles, beginning with that which immediately follows this sheet; namely, a description of our possessions in Upper Canada.

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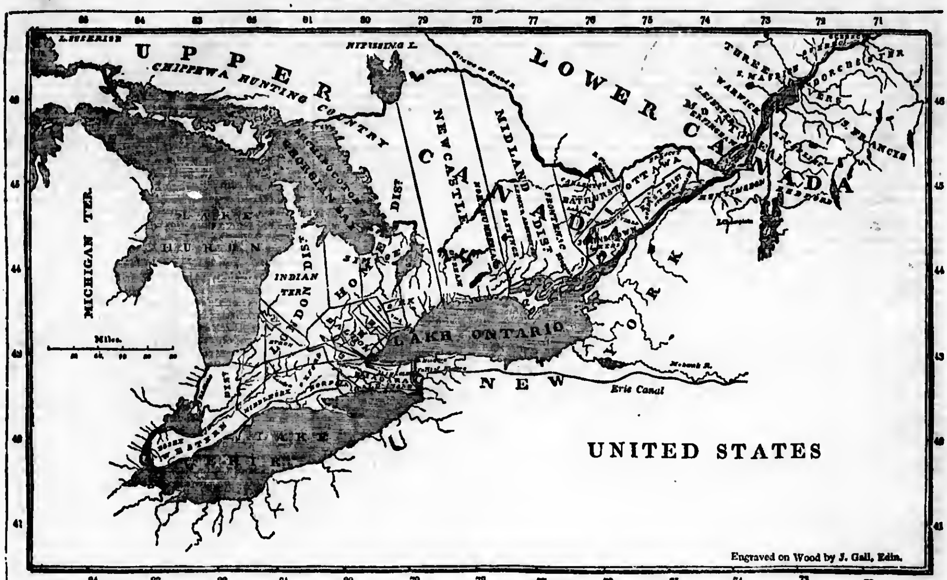
EMIGRATION TO CANADA.



PRELIMINARY.

It naturally occurs, when the condition and prospects of the working classes in one country sink beneath what they are in another, that all who can remove from the worse to the better, wish to do so. Now, Great Britain is at present in the condition of a country where, though the wealthy are *very* wealthy, and the middle orders at once larger in number and better in condition than in any other quarter of the world, yet the poor are very poor—greatly overwrought, in general, where work is to be had—poorly fed and clothed—and totally without hope, if they marry, of withholding their offspring from the same misery. The population of the country is yearly increasing; but it may be said, in the deeply touching language of Scripture, the nation is multiplied, but the joy is not increased. (*Isaiah*, ix. 3.) The only remedy, as pointed out elsewhere by the present writers, is in flight. At this moment, there are several countries at no great distance, to which the depressed workman may transport himself, with a reasonable prospect of bettering his condition; and of these it is the purpose of the present and some other sheets to give an account.

In this task we cannot pretend to much originality; the most of our materials are and will be derived from the books of late travellers in those countries, and we will only give new information, when we think it decidedly better than what is to be found in books. In condensing our materials, we have been, and will continue to be, inspired by a most conscientious sense of responsibility regarding the interests of those who may act upon our information alone. Nothing is flattered or exaggerated: we have no reason to wish that men may emigrate, if they think themselves better in Great Britain; nor have we any reason for describing one country as better for emigrants than another, unless a regard for truth shall induce us to do so. The whole will be, in fact, a plain and unvarnished report of what the most clear-headed and trustworthy men have said about the countries in question—a report which we compile with no other governing wish than that our suffering fellow-countrymen may be cheaply and faithfully instructed in what it concerns them to know for their guidance in, perhaps, the most important step of their lives.

There are three regions of the earth to which the attention of emigrants is chiefly directed, namely, Canada and the other British possessions in North America; the United States, which many prefer, and which hold out similar advantages; and the British colonies in New South Wales and Van Diemen's Land. At present, our attention will be confined entirely to Canada.*

GENERAL DESCRIPTION.

North America, of which Canada is a part, lies at the distance of 3000 miles west from Great Britain, on the opposite side of the Atlantic Ocean. This vast continent is much larger than Europe, measuring 4376 miles in length from north to south, and 3000 miles across from east to west. In a general sense, civilization has penetrated no more than from 1000 to 1200 miles westward, and that only in straggling lines: the remainder of the territory is still inhabited by wild Indians. The more southerly civilized portion of North America consists of the United States, governed as an independent republic; the more northerly part, with some islands, is in the possession of Great Britain, and comprehends the provinces of Upper and Lower Canada, New Brunswick, Nova Scotia, Newfoundland, Cape Breton, St John's or Prince Edward's Island, &c. The population of these extensive colonies amounts to nearly a million and a half of souls, or what Scotland alone contained some years ago. The line of division betwixt the British possessions and the United States, is either the River St Lawrence and the lakes from whence it proceeds, or an ideal and partly contested boundary. Canada extends chiefly from 61 to 81 degrees of west longitude, and from about 42 to 52 degrees of north latitude, and measuring about 1300 miles in length from east to west. The population is estimated at 700,000. Canada is politically divided into the two provinces of Upper and Lower Canada. A legislative council and an assembly are appointed for each, having power to make laws, with consent of the governor. These local governments resemble in miniature that of the mother country, to whose supreme rule the whole are subject. In Lower Canada, or that portion next the sea-coast, the greater part of the population is of French descent (this having originally been a French colony): the laws resemble those of France; and the Roman Catholic religion is established. Upper Canada, or, more properly, *Inner* Canada, lies to the west and south-west of the lower province. Its inhabitants are of British descent, and a very great number of them are from Scotland, both lowlands and highlands.* The

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* That the purchaser of the present sheet may know where to obtain more detailed information on Canada, with reference to emigration, we subjoin a list of the books used in our compilation:—"The British Dominions in North America," by Joseph Bouchette, Esq., 2 vols. quarto, with plates and drawings. Colburn, London. This work possesses a very complete body of information, chiefly of a statistical and political nature; and it is particularly recommended to the perusal of those who wish a good account of the whole British possessions in North America.—"British America," by John Macgregor, 2 vols. octavo. Blackwood, Edinburgh. This work relates principally to the British possessions on the sea coast, including Lower Canada.—"Five Years' Residence in Canada," by E. A. Talbot, 2 vols. octavo, Longman, London.—"Sketches of Upper Canada," by John Howison, Esq. octavo. Oliver and Boyd, Edinburgh. This is one of the most delightful works ever published on the subject of Canadian emigration; its details are highly entertaining and instructive, and the author's views are solid and philanthropic: it should be read, if possible, by intending emigrants.—"Practical Notes made during a Tour in Canada," by Adam Fergusson of Woodhill. Mr Fergusson's Notes were originally published in the Quarterly Journal of Agriculture; they are of a valuable practical nature, but being already widely circulated and well known, they here require no recommendation. We have had recourse also to numerous volumes of travels in North America, and to some smaller works of merit; among others, to "Hints to Emigrants," by the Rev. William Bell, 12mo. Waugh and Innes, Edinburgh; and to a pamphlet entitled "Information published by his Majesty's Commissioners for Emigration, respecting the British Colonies in North America. Knight, London.

* The stream of emigration from Britain and Ireland has for some years been flowing steadily towards the province of Upper Canada, which is greatly preferable to the Lower Province, and whose resources are annually increasing to a very great extent. From 1831 till 1832, the population increased twenty-five per cent.; and every expectation is in favour of an equally rapid increase during the current year. As a proof of the respectability of the emigrants, the fact is stated in the colonial newspapers, that during the summer of 1832, the enormous sum of 300,000 sovereigns was deposited in the Bank of Upper Canada.

English law and church are here established; but there is no tax for the clergy; and there is the most perfect liberty of conscience, and as great a security of life and property as in Scotland or England. Upper Canada is divided into districts, counties, ridings, townships, special tracts, and allotments; together with blocks of land, reserved for the clergy and the crown, and lands appropriated to the Indians. A district contains two or three counties, and each county contains from four to thirty townships. There are 11 districts, 26 counties, and 6 ridings, comprising together 273 townships. The line of division betwixt Upper and Lower Canada is in one part the Ottawa or Grand River; nearly all the other lines of division in the provinces are straight, without regard to physical distinction, such as hills and rivers; and this peculiarity is common over the whole of North America. The average territory of each township may be estimated at 61,000 acres, making an aggregate quantity of 16,816,800 acres. About 7,000,000 of acres have been granted to different classes of settlers; 4,805,400 acres are reserved for the crown and clergy (part of which has already been granted by the crown to the Canada Company); and 5,011,400 acres remain to be granted within the townships. This extent of country, chiefly bordering the north shore of the River St Lawrence to Lake Ontario, the northern side of that lake and of Lake Erie up to Lake St Clair, and of the communication between it and Lake Huron, a distance little short of five hundred and seventy miles, and stretching northward from the water to a depth varying from fifty to eighty miles, is composed of a soil, which, for productive richness, variety, and applicability to the highest purposes of agriculture, may challenge competition with the choicest tracts of land in the New World.

Upper Canada is chiefly a flat country, and is for the greater part covered with timber, but possesses a number of chains or ridges of high lands running in different directions, and separating the sources and channels of innumerable rivers and brooks. The higher and level districts are called Table Lands. The grand feature of the country is its water-courses. By looking at the map, it will be perceived that there is a series of large lakes, communicating with each other; these are unequalled by any inland sheets of water in the world, and are entitled to the appellation of fresh water seas, for they are not only of great extent, but are liable to be affected by storms like the ocean itself. The uppermost, called Lake Superior, is 381 miles long, and 161 broad; Huron, 218 miles long, and from 60 to 180 broad; Erie, 231 miles long, and about 70 in breadth; Ontario, 171 miles in length, and 60 in breadth. The accumulated waters of these lakes form the River St Lawrence, which is one of the largest streams in the world, and which, after a course of 2000 miles, falls into the Atlantic. This majestic river is 90 miles wide at its mouth, and is navigable for ships of the line for 400 miles from the ocean. In its upper parts, its navigation is impeded by *rapids*, or the rushing of the stream down an inclined plane; but some of these impediments are obviated by means of canals, recently cut; wherefore there is now a continued water communication for vessels from the Atlantic into the interior, or innermost lakes. Lake Erie is also connected by a canal with the Hudson, a river of the United States, which also falls into the Atlantic. The Ottawa, or Grand River, is next to the St Lawrence in point of size, and is tributary to it. It falls into the north side of the St Lawrence at Montreal. The Welland, or Chippewa, is also a remarkably fine river, wholly unobstructed by falls. The St Lawrence has a tendency northward in its course, and, therefore, the farther up its banks the more mild does the climate become.

CANADIAN TOWNS.

The chief towns in Canada are Quebec, Montreal, Three Rivers, Prescot, Kingston, and York. The city of Quebec is the capital of Lower Canada, and stands in the extremity of a precipitous cape, on the north bank of the St Lawrence, opposite the island of Orleans. The appearance of the town, on coming into view, is particularly striking. The city is divided into an upper and lower town; the former being of ancient date, and adopted as the seat of commerce, and the latter being the residence of the higher and more respectable classes. There are a number of fine public edifices; among the rest, the castle of St Louis, a prominent object on the summit of the rock; the Roman Catholic and Protestant cathedrals; the barracks; hospitals; the Quebec bank; and a handsome monument to Wolfe and Montcalm. The institutions are, in many instances, of French character, and the language of the inhabitants is French and English. In 1825, the population of the city and suburbs amounted to 22,021; at present it may amount to 30,000.

Montreal is a city of an entirely different appearance. It is agreeably situated on a beautiful island of the same name in the St Lawrence, which measures 32 miles long, by 10½ broad, and lies at the confluence of the Ottawa River and the St Lawrence. The island of Montreal is nearly level, and is scarcely excelled in fertility. The city stands on the south side of the island, and is reckoned the first in the province, in respect of situation, local advantages, and superiority of climate. The houses are well built, and the streets commodious. There are also some handsome public buildings. The literary

and scholastic institutions in Montreal are numerous, and are of great benefit to the province. There are no wharfs, and the ships and steam-boats sail close to the bank of the river, where there is deep water. Mr M'Gregor mentions, in his work on British America, that there is much activity observable among all classes connected with trade. "The position of Montreal (says he), at the head of the ship navigation, and near the confluence of the St Lawrence with the Ottawa, and its subsequent communication with Upper Canada, the Gennessee country, and other parts of the United States, will always constitute it one of the greatest commercial emporiums in America, which must increase in magnitude and importance along with the rapid improvement and increasing population of the upper and surrounding countries. In winter, the trade of Montreal is not suspended like that of Quebec. Thousands of sledges may be seen coming in from all directions with agricultural produce, and frozen carcases of beef and pork, firewood, and other articles. Manufactured goods of all kinds are continually selling off in packages by the merchants or the auctioneers, to the shopkeepers and country dealers, who again retail them to the townsfolk, or country people; and flour, wheat, potatoes, &c., are continually coming in, and filling the stores or warehouses. The markets of Montreal are abundantly supplied at all seasons of the year."

The population of Montreal and suburbs, in 1825, amounted to 22,357. Upwards of three-fourths are French, and the rest English, Scotch, Irish, and Americans. York, the capital of Upper Canada, and the other towns, are much inferior in size, and will be noticed in passing.

PERSONS WHO OUGHT TO EMIGRATE.

The question of most importance as regards emigration, seems to be that referring to the description of persons who ought preferably to take the great step of leaving their native country. This is a point of great moment, and should be well weighed by intending emigrants, for it is obvious that success will in a great measure depend upon previous habits and occupations. "The persons who may be inclined to emigrate to Upper Canada (says Howison), are of three different descriptions, viz. the poor peasant or day-labourer; the man of small income and increasing family; the man possessing some capital, and wishing to employ it to advantage.

Persons of the first class never would repent if they emigrated to Upper Canada, for they could hardly fail to improve their circumstances and condition. The poorest individual, if he acts prudently and is industrious, and has a common share of good fortune, will be able to acquire an independence in the space of four or five years. He will then have plenty to eat and drink, a warm house to reside in, and no taxes to pay; and this state of things surely forms a delightful contrast with those hardships and privations which are at present the lot of the labouring population of Great Britain.

It is evident that some descriptions of emigrants will succeed better in Upper Canada than others. Those who have been accustomed to a country life and to country labour, are of course more fitted to cultivate land, and endure the hardships at first attendant upon a residence in the woods, than artizans or manufacturers, whose constitutions and habits of life are somewhat unfavourable to the successful pursuit of agriculture. But every individual, who to youth and health joins perseverance and industry, will eventually prosper. Mechanics cannot fail to do well in Upper Canada; for, when not employed in clearing lands, they will find it easy to gain a little money by working at their professions; and they likewise have the advantage of being able to improve their dwelling-houses, and repair their farming utensils, at no expense. Weavers, being ignorant of country affairs, and unaccustomed to bodily exertion, make but indifferent settlers at first, and their trade is of no use to them whatever in the woods. Married persons are always more comfortable, and succeed sooner, in Canada, than single men; for a wife and family, so far from being a burden there, always prove sources of wealth. The wife of a new settler has many domestic duties to perform; and children, if at all grown up, are useful in various ways."

Every candid traveller in Canada concurs in these views. "Of this, I think (says Fergusson) there can be no doubt, that either the moderate capitalist, or the frugal, sober, and industrious labourer or artizan, cannot fail of success. *Fortunes* will not be rapidly or even readily acquired; but it must be the settler's own fault if he does not enjoy, in large abundance, every solid comfort and enjoyment of life, and rear around his table even a *forest* of 'olive plants,' without one anxious thought regarding their future destination or provision."

PASSAGE.

It seems doubtful whether the passage to Upper Canada should be effected by way of the St Lawrence, or New York and the Erie Canal. Both ways are recommended, and it is more than likely that most emigrants will have to be governed in their decision by convenience of shipping and other circumstances. Having wound up his affairs in this country, and otherwise prepared himself and family for proceeding to the land of their adoption, it is recommended that the emigrant should take with him a box of tools, whether he be learned to use them or not. The tools should consist of a common axe, handsaw, three augers of different sizes, pick-axe, spade, two gimlets, a hammer, iron wedge, three hoes; a kettle, frying pan, an iron pot, nails, and a small portable handmill for grinding corn; a gun and fishing nets will be of great service, if he has means to purchase them. He should also have good warm frieze coats and jackets, and worsted stockings and mittens for the winter; also strong hide leather shoes, without iron heels, as iron is not required in soft roads, and is apt to attract the frost, and make the feet colder; linen trousers and jacket for the summer, as many cotton shirts as he can afford to take out (linen being dear in Canada, and more apt to rot with perspiration in summer), and a short flannel shirt, to be worn next the skin, both in summer and winter. Without caution as to clothing, the settler has a chance of being attacked with ague, which is the only complaint to be dreaded. He should also provide himself with a small stock of simple medicines, to preserve the bowels in regularity. Every one ought to take a dose of medicine on landing. No bulky articles or furniture of any kind should be taken, but an emigrant should take all his mattresses and bedding, and as many good blankets as possible; also a warm fur cap. Straw hats for summer can be had at a cheap rate in Canada. Every thing should be packed in substantial handy trunks. Plain furniture can be bought at a cheap rate in the colony, or the emigrant can perhaps manage to make some articles for his new household. The bark of the bass tree, woven or laced across his bedstead, will support a mattrass, and that mattrass need consist of nothing more expensive than the boughs of the spruce fir, or dry beech leaves; a buffalo skin will answer for quilt and blankets.

"Passages to Quebec (says the official pamphlet of the Commissioners) may either be engaged inclusive of provisions, or exclusive of provisions, in which case the shipowner finds nothing but water, fuel, and bed-places, without bedding. Children under fourteen years of age are charged one half, and under seven years of age, one third, of the full price; and for children under twelve months of age, no charge is made. Upon these conditions the price of passage from London, or from places on the east coast of Great Britain, has generally been L.6, with provisions, or L.3 without. From Liverpool, Greenock, and the principal ports of Ireland, as the chances of delay are fewer, the charge is somewhat lower [we would here strongly advise emigrants to sail, if possible, from a port on the west coast, as being a great saving of time, trouble, and expense]; this year the charge will probably be from L.2 to L.2, 10s. without provisions, or from L.4 to L.5 including provisions. In ships sailing from Scotland or Ireland, it has mostly been the custom for passengers to find their own provisions; but this practice has not been so general in London, and some shipowners, sensible of the dangerous mistakes which may be made in this matter through ignorance, are very averse to receive passengers who will not agree to be victualled by the ship. Those who do resolve to supply their own provisions, should at least be careful not to lay in an insufficient stock; fifty days is the shortest period for which it is safe to provide, and, from London, the passage is sometimes prolonged to seventy-five days.*

The best months for leaving England are certainly March and April. The names of the vessels to sail are generally advertised in the public newspapers. The conveyance of passengers to the British possessions in North America is regulated by an act of Parliament (9 Geo. IV. cap. 21), of which the following are the principal provisions:—Ships are not allowed to carry passengers to these colonies unless they be of the height of five feet and a half between decks, and they must not carry more than three passengers for every four tons of the registered burthen; there must be on board at least fifty gallons of pure water, and fifty pounds of bread, biscuit, oatmeal, or bread-stuff, for each passenger. Masters of vessels who land passengers, unless with their own consent, at a place different from that originally agreed upon, are subject to a penalty of L.20, recoverable by summary process before two justices of the peace in any of the North American colonies. The enforcement of this law rests chiefly with the officers of his Majesty's customs; and persons having complaints to make of its infraction, should address themselves to the nearest custom-house."†

Taking it for granted that the emigrant and his family find their way across the Atlantic by the means just specified, we have next to direct him how to proceed on his landing. On this important particular we cannot do better than lay before him the following two exceedingly valuable official documents, issued for the express benefit of emigrants, by his Majesty's agent at Quebec, entitled

ADVICE TO EMIGRANTS.

Quebec, 1st May 1832.

There is nothing of more importance to emigrants

* Scotch families usually, and very judiciously, provide themselves with a sufficient quantity of oatmeal, eggs well packed, and some tea and sugar, besides other provisions. A tea-kettle, and one or two pans for cooking victuals, are indispensable. Milk boiled with loaf sugar, in the proportion of one pound of sugar to a quart of milk, and bottled when quite cool, will keep sweet all the voyage.

† We here recommend that emigrants should stipulate for the use of the water-closet, and not to be *forced* ashore for at least 24 hours after their arrival at Quebec; and all bargains ought to be by *written* agreement with the captain.

on arrival at Quebec, than correct information on the leading points connected with their future pursuits. Many have suffered much by a want of caution, and by listening to the opinions of interested designing characters, who frequently offer their advice unsolicited, and who are met generally about wharfs, and landing places frequented by strangers. To guard emigrants from falling into such errors, they should, immediately on arrival at Quebec, proceed to the office of the Chief Agent for Emigrants, in Sault-au-Matelot Street, Lower Town, where every information requisite for their future guidance, in either getting settlement on lands, or obtaining employment in Upper or Lower Canada, will be obtained *(gratis)*.

Previous to disembarkation, arrange your baggage in a small compass, the fewer packages the better, but have them well secured—old dirty clothing, large boxes, and other useless articles, are not worth the carriage. If you have any provisions left, such as oatmeal, potatoes, &c., you can sell them at Quebec at a profit, and avoid the expense of transport, and you can purchase baker's bread, butter, tea, sugar, and other necessaries more suited for your journey. All sorts of provisions may be bought cheaper, and generally of a better quality, in Montreal and Upper Canada, than at Quebec. Dress yourself in light clean clothing. Females frequently bring on sickness by being too warmly clothed. Cut your hair short, and wash daily and thoroughly. Avoid drinking ardent spirits of any kind, and, when heated, do not drink cold water. Eat moderately of light food. Avoid night dews. By attending to the preceding directions, sickness will be prevented, with other serious inconveniences. When every thing is ready for disembarkation, and if the ship is lying at anchor in the river, take care in passing from the ship to the boat; avoid all haste, and see that your baggage is in the same conveyance with yourself, or left under the charge of some friend, with your name on it. If the ship hauls to the wharf to disembark, do not be in a hurry, but await the proper time of tide, when the ship's deck will be on a line with the quay or wharf. Passengers are entitled by law to the privilege of remaining on board ship 48 hours after arrival; and it is unlawful for the captain to deprive his passengers of any of their usual accommodations for cooking or otherwise; you may, therefore avoid the expense of lodgings, and make all your arrangements for prosecuting your journey. Previous to disembarkation, should sickness overtake you, proceed immediately, or be removed to the Emigrant Hospital, in St John's Suburbs, where you will be taken care of, and provided with every thing needful until restored to health. Medicine and medical advice can also be had at the Dispensary attached to the Quebec Charitable Emigrant Society. This society will grant relief to all destitute emigrants. In Montreal there is a similar institution for the relief of emigrants. It is particularly recommended to emigrants not to loiter their valuable time at the port of landing, but to proceed to obtain settlement or employment. Many have regretted, when too late, that they did not pursue this course, and take advantage of the frequent opportunities that presented themselves for settlement in convenient situations in Upper or Lower Canada, instead of squandering their means and valuable time in looking after an imaginary paradise in the aguish swamps of Illinois and Missouri, or other distant regions of the Western States. There is no portion of the American continent more congenial to the constitution or habits of emigrants from the United Kingdom, or that offer a wider field or surer reward for industry and good conduct, than the fertile districts of Upper Canada or Lower Canada. Many emigrants will find employment in the city of Quebec and its vicinity, as also in and about Montreal. Single men in particular are advised to embrace the offer; but emigrants with large families had better proceed without delay to Upper Canada, as hereafter directed, or to situations in Lower Canada, particularly the Eastern Townships; and if they have sons and daughters grown up, they will find a sure demand for their services. Artificers and mechanics of all denominations, and farming labourers, if sober and industrious, may be sure of doing well. Blacksmiths, particularly those acquainted with steam-engine work, also good millwrights and sawyers by machinery, are much wanted in the Canadas.

The following are the current rates of wages paid in Upper and Lower Canada to persons acquainted with the country;—strangers ought not to expect so much:—

	Upper Canada.	*Lower Canada.*
Ship Carpenters and Joiners, per day - - - - -	4s 0d to 7s 6d	3s 6d to 6s 0d
Bricklayers and Masons, do.	6s 6d to 7s 6d	4s 0d to 9s 6d
Blacksmiths, Millwrights, &c. do.	5s 0d to 8s 6d	3s 6d to 7s 6d
Farm and Common Labourers, &c. do. - - -	2s 6d to 4s 0d	2s 0d to 3s 0d
Ditto ditto, per month, and found - - -	30s 0d to 60s 0d	20s 0d to 50s 0d
House Servants (Men) do. do.	30s 0d to 50s 0d	20s 0d to 40s 0d
Ditto do. (Females) do. do.	20s 0d to 35s 0d	10s 0d to 30s 0d

A great number of labourers are employed on board ships, and about timber-yards, at Quebec and Montreal, who get from 3s. to 4s. 6d. a-day, and generally found. The extravagant habits engendered in such occupations are decidedly in favour of the labouring emigrant proceeding immediately to the country. Emigrants with families, and who are possessed of from L.20 to L.25, are advised to push immediately into the woods, in the vicinity of old settlements, where they can obtain provisions for their spare labour. The difficulties, although great at first, soon subside, and much experience is the result. The cost of clearing wild lands, and making them ready for crop, is from 50s. to 70s. per acre in Upper Canada and the Townships of Lower Canada. To these I should say, select a favourable spot for your log-house, near a spring of water, or running stream, and where a *cellar to keep your potatoes in winter can be dug under the house.** If you proceed to build houses and clear lands on a large scale on first arrival, it rarely succeeds so well; for the price of labour is so high, and the difficulty of getting persons to work, added to the great expense of providing food for increased numbers, until produced from your own land, ought in every instance to induce the strange emigrant and family to proceed cautiously in laying out their money; but a crop of potatoes and fodder for a cow is the first object, and this may be accomplished the first year, if you arrive early. The second you will be enabled to feed your family with the necessaries of life, and the third year you may find yourself possessed of a yoke of oxen, a cow or two, and a year old calf, a couple of pigs, poultry, &c., abundance of provisions for your family, and fodder for your cattle. The Irish and Scotch peasantry know well how to value the economy of a milch cow; every new settler ought to strive to obtain one as soon as possible, taking care to provide a sufficiency of fodder for the long winter. Cattle require a little salt in the Canadas. It is not considered necessary to go farther into the details of the first settlement, as on all these points you will be guided by your own observations on the spot, and the advice you will get from the local agents and superintendants. Great caution is necessary in all your transactions. When you stand in need of advice, apply to the government agents, or other respectable sources. You will find many plans and schemes offered to your consideration on your route from Quebec to your destination in Upper Canada; but turn away from them, unless you are well satisfied of the purity of the statements. Should you require to change your English money, go to the banks or some well known respectable person. The currency in the Canadas is at the rate of 5s. to the dollar, and is called *Halifax currency.* The value of English gold or silver is regulated by the rate of exchange in England, which fluctuates. At present the gold sovereign is worth 23s. 6d. to 24s. currency. In New York, 8s. is calculated for the dollar; hence many are deceived when hearing of the rates of labour, &c.—5s. in Canada is equal to 8s. in New York; thus, 8s. New York currency is equivalent to 5s. Halifax. In Upper Canada, and in the Townships of Lower Canada, the tenure of lands is "Free and Common Soccage," as in England. In the Seigneurial or French parts of Lower Canada, the feudal or French tenure is the custom. In the Canadas you live under the British laws and constitution, and are less encumbered with taxes or local imposts than in any other country on the face of the globe. You ought, previous to leaving Quebec, to apply at the post-office, should you expect any letters; and if you are writing to your friends in the United Kingdom by post, you must pay the postage; so also when writing to the United States. Letters from one part of the Canadas to the other do not require to be post-paid. Emigrants may forward letters to the United Kingdom from Quebec, by taking them to the keeper of the Merchants' Exchange, and paying one penny for each.

Having arranged all your business at Quebec, you will proceed without loss of time to Montreal, by steam-boat, on your route to Upper Canada. Two steam-boats ply daily to Montreal, 180 miles up the St Lawrence, which is performed in 24 to 30 hours. The fare for deck passengers is 7s. 6d. for adults; children under 12 years pay half-price; and under 7 one-third. These steam-boats belong to private individuals. Government is in no manner connected with them. At Montreal you will find a government agent, who will advise you should you require it.

Routes to the principal places in Upper Canada, as follows:—

Quebec to Montreal, by steam-boats, -	7s 6d cost.
Montreal to Prescot, by Durham boats, -	6s 3d
Prescot to Kingston, by steam, - -	5s 0d
Ditto to Coburgh, or Port Hope, - -	7s 6d
Prescot to York, Capital of Upper Canada, Hamilton, and Niagara, - -	10s 0d

From Niagara, you proceed by land to Fort Erie, opposite Buffalo on Lake Erie, where steam-boats, or sailing schooners, will convey those destined to Port Talbot, or other parts of the London district, or vicinity of Lake St Clair. Persons going to settle on the lands of the Canada Company will proceed to York or Burlington Bay, head *of Lake Ontario.*

At most of the preceding towns and landing places you will find government agents. If you are bound to Perth, or New Lanark, or the vicinity, disembark at Prescot; or you may go by By-Town on the Ottawa. If for the thriving settlements in the Newcastle district, disembark at Coburgh or Port Hope, on Lake Ontario. Those going to the townships of Seymour may proceed from Kingston, by the beautiful Bay of Quinté, to the mouth of the Trent River, from whence a road, distance 18 miles, brings you to Seymour. If proceeding to the Home or Western Districts, disembark at York, the capital of Upper Canada. Emigrants going any where beyond York, will in general find it their interest to make it their route. If for the London District, proceed by the Niagara frontier, to Lake Erie and the Talbot Settlement. If for By-Town, Grenville, Hull, Horton, or other situations on the Ottawa River, proceed from Montreal and Lachine by the usual conveyances.

Crown lands, of the most fertile quality, are prepared for the reception of emigrants in many parts of Upper Canada, and will be sold, payable by instalments. The following offices have been opened by the Commissioner of Crown Lands in Upper Canada, for the convenience of emigrants:—

In the Bathurst District, Mr M'Naughton will open his office at By-Town.

Major Campbell, of the Township of Seymour, for the Midland District.

Mr Ritchie for the Home District, and will reside in Sunnidale.

Mr Mount, Deputy-Surveyor for the Western District, between Carradoc and the St Clair.

Emigrants may obtain employment, for two or three months, on the roads, in several townships, in the Western and Home Districts of Upper Canada.

Routes to the principal settlements in Lower Canada are as follows:—

District of Quebec, south side of the River St Lawrence.

Township of Frampton, 36 miles from Quebec by Point Levy, a thriving settlement. Inhabitants, mostly Irish.

Townships lying contiguous to the Kennebec road, beyond Frampton, offer good prospect for settlement. The lands are principally private property. The seignlory of St Giles, 30 miles from Quebec, by St Nicholas and the Craig's road, is favourably situated for emigrants, from its contiguity to the capital, and is increasing rapidly; its population is principally Irish.

New Argyle, in the seignlory of St Croix, 8 miles from Richardson's Tavern, on the Craig's road in St Giles, and 38 miles from Quebec; the new road to the township of Inverness passes through this settlement. Inhabitants, principally Highlanders from the Island of Islay, and Irish. The lands in this part are of good quality.

The settlements of Ulster, Yorkshire, Dublin, and New Hamilton, commence four miles beyond New Argyle, and 42 miles from Quebec, and are situated in the flourishing township of Inverness, through which a new road has been nearly finished to the borders of the township of Halifax. The inhabitants of Inverness are from various parts of the united kingdom. Those from England are principally from Yorkshire; those from Ireland, mostly from the northern counties; and those from Scotland are chiefly Highlanders from the Island of Arran. Beyond Inverness lie the townships of Halifax, Chester, and Tingwick, good lands for settlement; but at present there is no convenient road to them. The township of Athabaska joins Inverness, and is a desirable place for settlement.

The township of Leeds, through which Craig's road passes, lies to the left of Inverness, is 50 miles from Quebec, and is increasing rapidly in population. Inhabitants, Scotch, Irish, and English.

The township of New Ireland, through which Craig's road also passes, lies beyond Leeds, 60 miles from Quebec, and is increasing much in population. The inhabitants are principally Irish, and a number of English of the Wesleyan connexion, also about 25 American families from the United States.

Craig's road leads to Shipton and Dudswell, but is impassable for wheel-carriage transport beyond Ireland.

From the Market-slip, in the Lower Town of Quebec, ferry-boats go daily as the tide suits to St Nicholas, 12 miles up the river on the south side, where Craig's road begins.

Eastern Townships of Lower Canada. The present route is by Three Rivers, 90 miles above Quebec, by steam-boat; here cross the St Lawrence to the south side, and proceed to *Sherbrook*, by Nicolet, La Baie, and Drummondville; or you may proceed to Sorrel, 40 miles above Three Rivers, on the south side of the St Lawrence, and there disembark. The rate of passage from Quebec by the steam-boat will be about the same as to stop at Three Rivers, and you will avoid the ferry. A good road leads from Sorrel to Sherbrook, by Yamaska and Drummondville. The distance from Quebec to Sherbrook, in a straight line by the new road to Inverness, when finished, is 99 miles; and by Three Rivers or Sorrel, the route to be taken for transport is 160 miles, of which 70 is land-carriage.

Sherbrook is the capital of the Eastern Townships, and is surrounded by thriving settlements, particularly Stanstead, where industrious farming labourers or mechanics are much wanted, and are sure (by good conduct) to do well; as also the townships of Stanbridge, Brome, Dunham, Potton, and the seignlory of St Armand, the route to which is by St John's.

Chambly is 40 miles from Sorrel, and 18 from Montreal. Labourers may get employment at the canal now making at Chambly. Chateauguay, Godmanchester, and Sherington, from 25 to 40 miles from Montreal, south side of the St Lawrence, are thriving situations.

* Carefully clear the timber and brush to a distance from your dwelling and out-buildings, or, in the event of fire in the woods, great risk is incurred of their being destroyed.

North side of the River St Lawrence, and in the district and vicinity of Quebec, are the settlements of Beauport, Stoneham, Tewkesbury, Valcartier, and Jacques Cartier, Deschambault, and the settlement of Portneuf. Inhabitants, principally Irish.

Three Rivers and its vicinity, 90 miles from Quebec, give employment to many emigrants. In the rear of Berthier, 130 miles above Quebec, are the Townships of Brandon, Kilkenny, Rawdon, and Kildare.

New Glasgow settlement in the seigniory of Terrebonne, is about 30 miles from Montreal. Persons bound for the Townships bordering on the Ottawa River, particularly Lochaber, Templeton, Hull, &c., will take their route and departure from Montreal. There are many desirable situations for settlement belonging to private individuals in Upper and Lower Canada. The names of the proprietors or the agents may be had on application at this office.

It is particularly recommended to emigrants to be exceedingly cautious in ascertaining the titles to such lands as they may settle on.

Recommendation for lands to the respective Township agents and superintendants of settlements in Upper and Lower Canada, with routes, &c., will be furnished to emigrants (*gratis*).

A. C. Buchanan, *Chief Agent.*

Emigrant Department,
Quebec, 1st May 1832.

Quebec, 1st June 1832.

Emigrants arriving at Quebec from the United Kingdom, and who are desirous of settling in Upper Canada or Lower Canada, or of obtaining employment, are informed that all necessary information for their guidance may be obtained (*gratis*) on application at this office, between the hours of 10 and 3 o'clock daily, Sundays excepted.

The principal situations in Upper Canada, where arrangements are made for locating emigrants, are in the Bathurst, Newcastle, Home, and Western Districts.

Indigent emigrants, on condition of actual settlement, may obtain a location on the following terms, viz.

Fifty acres of land will be allotted to each head of a family, upon condition of paying at the rate of 5s. currency per acre. The first payment to be made at the expiration of three years, and the whole to be paid by annual instalments of L.3, 2s. 6d. each, with interest, to commence from the expiration of three years.

The government will incur the expense of building a small log-house, for the temporary accommodation of settlers on their respective locations, and will afford some assistance towards opening roads to the lands proposed to be settled, but will make no advances in provisions or utensils, and the settlers must depend entirely upon their own resources for bringing their lands into cultivation.

Settlers with means will have opportunities of purchasing Crown lands in several parts of the province at the public sales, due notice of which may be obtained on application at the Commissioner of Crown Lands' Office, York, or to the following government agents :—

Ottawa and Bathurst Districts,	Mr M'Naughton, at	*By-Town.*
Newcastle District,	Mr M'Douall,	*Peterboro.*
Home District,	Mr Ritchie,	*Township of Medonte.*
Western District,	Mr Mount,	*Carradoc and St Clair.*

A. C. Buchanan, *Chief Agent.*

SETTLING ON LANDS.

The difficulties which an emigrant has to encounter in settling upon his lands are most severe at the outset. His first object is to erect a wooden hut, formed of trees laid upon each other in a particular manner; and his neighbours, if he be in a located part of the country, will generally assist him. If quite inexperienced in such kind of labour, he must necessarily hire some one to build his cabin for him. In erecting one of these log-huts he must not consult an elegant outside appearance, all that is wanted being protection from the atmosphere and a fire to cook his victuals. Having selected a dry commodious situation, he will fell some trees, and, having cut them into straight logs, of the length required, and drawn them by oxen to the spot where the dwelling is to be placed, he will next lay them across one another at the corners, notching them half through at the ends, so as to admit them to lie close upon each other. A log-hut so formed is usually eighteen feet by sixteen. The roof is covered with thin shingles or split logs. As for the door and windows, they are sawed out after the house is erected; and the fire-place is formed with stones at one end. A log-hut, if paid for, will cost about L.12 when completed. The emigrant is next advised to bring his family, cattle, provisions, and farming utensils, upon his lot, and, when fully settled, to commence his operations on the forest around his habitation. The brushwood and small timber being cleared off, the trees are next cut down, the axe being applied at about three feet from the ground. Some persons cut a circle of bark from the trees, so that its vegetative principle may die, and the sun and air thereby reach the lands; but this plan is not to be recommended. The trees should be at once cut down and burnt, however toilsome the labour may be. The stumps will continue to disfigure the fields after this process, but these may be eradicated at any future convenient opportunity; and if the settler be active, he will in a few years have his whole lot, or *estate*, as we would term it, altogether clear and in a state of productiveness. The lands, after being cleared, require at first little cultivation; the ground is rudely dug or harrowed and sown, and the first crop in mostly every instance is sufficient to repay all that has been expended.

CANADA COMPANY AND ITS LANDS.

This association was incorporated by royal charter on the 19th of August 1826, and empowered to enter into extensive contracts with his Majesty's government for the purchase of reserves, and other large tracts of crown lands in the province of Upper Canada. By these purchases the Company became possessed of upwards of two millions three hundred thousand acres, one million three hundred thousand of which they hold in dispersed tracts of two hundred, two thousand, and ten thousand acres, and also, in a few cases of blocks, containing from twelve thousand to forty thousand acres. The residue, amounting to one million acres, composes one vast section of territory on the shores of Lake Huron, known by the name of the Huron tract, which was granted in lieu of the moiety of the clergy reserves scattered through the various townships of the province. Since the institution of the Company, it has been paying government from L.15,000 to L.20,000 a-year; and at the end of sixteen years, the stipulated period of credit, it will have paid L.295,000. The Canada Company sells its lands in small or large lots to emigrants, at much the same price as government; the lands it possesses are generally good, especially those in the Huron tract. Many prefer to buy their lands at once from this respectable association, which is considered liberal in its dealings. There are agents in London, Edinburgh, and other places, who will give every explanation to, and enter into arrangements with, intending emigrants. They will also furnish, *gratis*, plans of the lots.* The agents of the Company, on the arrival of the emigrants at Quebec or Montreal, will convey, at the Company's expense, purchasers who pay a first instalment in this country of 2s. an acre upon not less than one hundred acres, to the head of Lake Ontario, which is in the vicinity of their choicest lands; and their agents in all parts of the Upper Province will give emigrants every information and assistance in their power. Should emigrants, on their arrival, not settle on the Company's lands, the money paid them will be returned, deducting the actual expense of conveyance to York. The Canada Company sold upwards of eighty thousand acres of land in 1829, 1830, and 1831, in lots of various extent, at from 10s. to 14s. per acre.

The Huron tract, in the western part of the province, belonging to this Company, is nearly triangular in its general outline, and extends about sixty miles along the south-eastern and eastern shores of Lake Huron. "The general surface of this territory (says Bouchette) is remarkably level, and frequently presents rich natural meadows and excellent pastures. The soil chiefly consists of a deep, rich, black loam, with a subsoil of clay intermixed with sand, which, in point of facility of cultivation and fertility, does not probably yield to any in the province. The forests are composed of the most valuable and useful timber, and are not of that almost impenetrable thickness that in general characterizes a Canadian wilderness. The maple tree, which here predominates, is a source of essential profit to the farmer, from the copious supplies of sugar he derives from it, by the most simple process, and with the least possible labour and expense. The soil is well watered by the river Maitland, a large branch of the Thames and its tributaries, the River Aux Sables, and numerous rivulets and brooks. Fresh springs abound throughout the tract, and salt springs are frequent. The rivers are partially navigable, and are well adapted to the erection of mills.

In the township of Godrich, a town has been laid out on the borders of Lake Huron, in a good situation, with a harbour. The town of Guelph, the capital of another extensive tract belonging to the Company, situated in the county of Halton, district of Gore, is also in a thriving condition. The country around Guelph enjoys most of the advantages of the Huron tract, in respect of climate and fertility; but a nearer proximity to the older settlements of the province gives it probably a superiority of relative local situation.

The Company gives the following information regarding the lands it possesses for sale :—"Lots of land are selling at prices varying from 7s. 6d. to 20s. an acre, one-fifth payable down, and the remainder (which industrious settlers would be able to pay out of the crops) by annual instalments in five years, with interest. Settlers with capital, who prefer establishing themselves on land in which partial clearings have been made, and log-houses erected, will generally find lots with such improvements for sale. This arises from persons going originally in very destitute circumstances, or rather dependant on the Company's assistance, who, having succeeded on their lots, are willing to sell their land, with a reasonable profit, to new comers, at from four to six dollars, with the improvements on the same, houses, barns, &c. These individuals generally remove further westward, having acquired sufficient knowledge of the country, and purchase on the Huron tract, which is equal in quality, at from 7s. 6d. to 10s. per acre."

CHARACTER OF DISTRICTS.

The various writers on Canada each recommend particular districts for the settlement of the emigrant; but it is hardly to be expected that persons in this country can make a perfectly judicious choice, an absolute inspection of the lands, or at least information near the spot, being in almost every case requisite. The most elaborate details are given by Bouchette regarding the different parts of the province; and as what he mentions may be of use in furnishing emigrants with an idea of the nature of the lands, we take the liberty of offering a few of his observations.

"*The Eastern Section*, including Ottawa, Johnstown, Midland and Bathurst districts.—Situated between two broad and navigable rivers, the Ottawa and the St Lawrence, and centrally traversed in a diagonal course by an extensive and splendid sloop canal, connecting the navigation with the waters of Ontario, this section of country evidently enjoys important geographical and local advantages. Its surface presents, almost unexceptionably, a table level of moderate elevation, with a very gentle and scarcely perceptible depression, as it approaches the margin of the magnificent streams by which it is bounded to the northward and south-east. The soil, though sometimes too moist and marshy, is extremely rich and fertile, and chiefly consists of a brown clay and yellow loam. This section is intersected by numerous rivers, remarkable for the multitude of their branches and minor ramifications. There are also a number of good public roads, both along the St Lawrence and Ottawa, and into the interior. Great industry and attention to improvement are displayed upon most of the lands throughout this tract. The town of Kingston, the largest and most populous of the Upper Province, is very advantageously seated on the north side of the St Lawrence, or rather at the eastern extremity of Lake Ontario. The streets are regular and well planned, and the number of houses may be estimated at about 620. The town has now considerable mercantile importance; the harbour is well sheltered and convenient.

The thriving village of Perth is situated in the township of Drummond, on a branch of the Rideau, and occupies a central position between the Grand River and the St Lawrence, communicating by tolerably good roads with Kingston to the south, and By-Town to the northward, at the opposite extremities of the Rideau Canal. The first establishment fostered by government was made in 1815, by British emigrants, chiefly from Scotland, many of whom are now at the head of excellent farms, possess comfortable habitations, and reap the fruits of their perseverance and industry.

Ascending along the shores of Lake Chaudiere, the objects of note first presenting themselves are the rising colonies in front of the townships of March and Tarbolton; they are chiefly composed of families of high respectability, possessed, in general, of adequate means to avail themselves of the advantages that are incident to a newly-opened country. High up, on the bold and abrupt shore of the *Chats*, the Highland chief Macnab has selected a romantic edifice, Kinell Lodge, which he has succeeded, through the most unshaken perseverance, in rendering exceedingly comfortable. His unexampled exertions in forming and fostering the settlements of the township, of which he may be considered the founder and leader, have not been attended with all the success that was desirable, or which he anticipated.

The Central Section of the province (continues the accurate Bouchette) embraces the districts of Home and Newcastle, which occupy a grant of about one hundred and twenty miles upon Lake Ontario, extending from the head of the Bay of Quinté westward, to the line between Toronto and Trafalgar. Although less populous than the tract of country composing the first part of the division which we have adopted, this portion of the province does not yield to it in fertility, and is equally well watered by numerous lakes, broad and beautiful rivers, and innumerable rivers and brooks. The rivers in general abound with excellent fish, and especially salmon, great quantities of which are annually speared in the River Credit for the supply of the western country. In front of Newcastle district, on the borders of Lake Ontario, the soil consists of a rich black earth; but in the district of Home, the shores of the lake are of an inferior quality. The lands upon Yonge-street [roads are frequently called streets in Canada], which connects York with Lake Simcoe, are exceedingly fertile, but so destitute of stores as to create some inconvenience to the settlers. A sandy plain, of some extent, exists some distance north of Ontario, towards Rice Lake:

* The chief office of the Canada Company is at 13, St Helen's Place, Bishopsgate Street, London. The agents are—

For England.—*Bristol*, W. D. W. and W. E. Acraman; *Hull*, Richard Tottie; *Liverpool*, Hugh Mathie; *Oundle*, Thomas Bell; *Plymouth*, Hawker and Sons; *Swansea*, J. C. Morgan.

For Scotland.—*Edinburgh*, James Adam, W. S.; *Leith*, Jas. Duncan and Company; *Aberdeen*, J. Catto, Son, and Company; *Glasgow*, Alexander G. Gilkison; *Greenock*, R. Ewing and Company; *Haddington*, John Haldane.

For Ireland.—*Dublin*, John Astle; *Belfast*, William Gray; *Cork*, Sexton Bayley; *Limerick*, John Carroll; *Londonderry*, George Buchanan; *Ross* and *Waterford*, Watson and Graves.

In *Quebec*, John Davidson; *Montreal*, Hart Logan; and *New York*, J. C. Buchanan.

but, saving this, and probably one or two more comparatively insignificant exceptions, the soil of this tract of country is extremely fertile, highly conducive to agriculture, and yields luxuriant crops of wheat, rye, maize or Indian corn, peas, barley, oats, buckwheat, &c. The fronts of all the townships from Kingston to York are, with few exceptions, well settled; roads lead through them, from which, in many places, others branch off to the interior. At intervals, rather distant indeed from each other, there are a few small villages. On the lands that are occupied great progress has been made in agriculture; the horses, generally speaking, are strong and well built; and the inhabitants appear to be possessed of all the necessaries, as well as most of the comforts, that a life of industry usually bestows." In this division is settled the town of York. Our authority next proceeds to notice

The Western Section, including Gore, Niagara, London, and Western districts; but as part of this division is noticed under the head Canada Company, we need not here enter into long details. "With the aid of a little fancy (says Bouchette), the tract of country we are now describing may be shaped into a vast equilateral triangular peninsula, whose base, extending from Fort Erie to Cape Hurd on Lake Huron, measures 210 miles, and whose perpendicular, striking the Detroit River at Amherstburgh, is about 195 miles. It is bounded to the north and west by Lake Huron, River and Lake St Clair, and Detroit River; south by Lake Erie; and east by Niagara River, Lake Ontario, and the western limits of the district of Home. The surface it exhibits is uniformly level, or slightly undulating, if we except a very few solitary eminences, and those parts of the districts of Gore and Niagara traversed by the ridge of elevated land. The variety of soils, and the diversity of their combinations observable in these four districts, are by no means so great as might be expected in so extended a region. The whole tract is alluvial in its formation, and chiefly consists of a stratum of black, and sometimes yellow loam, above which is deposited, when in a state of nature, a rich and deep vegetable mould, the sub-stratum beneath the bed of loam being generally a tenacious gray or blue clay, which in some parts appears at the surface, and, intermixed with sand, constitutes the super-soil. There are numerous and extensive quarries of limestone to be found in these districts, that supply the farmers with excellent materials for building. Freestone is also found, but in small quantities, and generally along the shores of the lakes. The Thames River, in this section, rises far in the interior, and, after pursuing a serpentine course of about one hundred and fifty miles, in a direction nearly south-west, discharges itself into Lake St Clair." This portion of the province seems to us to be that most worthy of the attention of the emigrant; the climate is pleasant, the land excellent, the rivers numerous and useful; roads are opening up in all directions for the benefit of the inhabitants; and although at a great distance inland, the communication with the ocean is conveniently kept up by means of the lakes and canals. Were we about to emigrate, we would have little hesitation in directing our steps towards this portion of Upper Canada, so tempting from the prodigious vastness of its waters, the exuberant fertility of its extensive plains, its luxuriant orchards, and its busy scenes of rural and thriving industry.

Nearly equal to this tract, and superior as regards exemption from ague, is the Simcoe District, lying betwixt the lake of that name and the eastern part of Lake Huron. This land is about 100 feet above the level of Ontario, and of the richest quality. A steamboat on Lake Simcoe conveys the produce to Holland-landing at the south end of the lake, and a rail-road has been projected from thence to York. A great part of this tract being settled by naval and military half-pay officers, who draw their pay quarterly, there will, consequently, be more ready money circulating here, and more employment for all kinds of tradesmen, than in most other places. The land here is rising rapidly in value.

We may state that all kinds of tradesmen will find abundance of employment at York; but, in consequence of its low situation on Lake Ontario, it is liable to agues, and will be avoided by those who may be so affected.

It may here be remarked, that the general salubrity of the climate improves as you recede from the banks of the lakes and great rivers, although these possess, as a counterpoise, a greater facility of disposing of surplus produce, being nearer to markets.

The general complaints on the shores of the lakes and large rivers are fevers and the ague, which, although a most annoying complaint, is by no means fatal. By great care being given to regularity of the bowels, moderate use of spirituous liquors, keeping the feet dry, and unnecessary exposure to night air, it may generally be avoided. We cannot sufficiently impress on the minds of emigrants the necessity they will be under of adhering to temperate habits. In the Canadas, whisky is much cheaper than in Britain; hence this advice becomes of double importance.

Mr Fergusson, in his "Practical Notes," made during a tour in Canada in 1831, furnishes his readers with a number of valuable illustrations of the state and appearance of the Upper Province, along the routes he pursued: indeed, all who can afford it should purchase his very instructive and entertaining volume. Speaking of that part of the territory adjacent to Lower Canada, he says—"Returning to the St Lawrence, we enter the Upper Province, the Ottawa here forming the boundary line. As we ascend the river, we find numerous settlers, and thousands of acres well adapted for the farmer. One of the first settlements we meet with is the Glengarry district, an extensive tract of good land, enjoying the advantages of water carriage. The language, the customs, the native courage of their Celtic sires, still distinguish the clan, though at the same time, we are afraid, accompanied by some of those less profitable traits which stamp the Highlander as more at home in wielding the claymore, or extracting mountain dew, than in guiding the ploughshare to slow but certain results. The farms are but indifferently improved, considering the advantages they have enjoyed; and much valuable time is expended in the depths of the forest, in a demi-savage life, cutting and preparing timber for the lumber merchant, which, if steadily devoted to the cultivation of the land, would certainly be attended with infinitely greater benefit, both in a physical and moral point of view.

To go minutely into the statistics of even the banks of the river, would far exceed the limits to which I must necessarily restrict myself. Suffice it to say, that a constant succession of eligible situations present themselves for estates and farms. I was much pleased with the Matilda district, and consider it capable of great improvement. The soil is a fine mellow sandy loam, sometimes perhaps rather light, but admirably adapted for turnip husbandry and fine-woolled sheep, with numerous beautiful situations for a residence, the noble St Lawrence ever forming a prominent feature, its surface varied by lovely wooded islands, similar to those we so justly admire on many of our British lakes. In approaching Kingston, or the east end of Lake Ontario, the River Gananogue falls into the St Lawrence, and, at its mouth, is the establishment of Messrs M'Donell, two brothers who came about eight years ago to the colony, and who, by steady enterprise, without original capital, have realized considerable wealth, while, along with it, they have secured the respect and esteem of all who know them. They have here what is called in America a valuable water privilege, or fall, and have erected flour and saw-mills to a large extent. Last season they sent down to Montreal 24,000 barrels of flour; and a friend of mine, who was their agent, informed me that one of the brothers having resolved upon becoming their own agent in Montreal, it would be a loss of some hundreds a-year to his house in commission. They have a very clever cooperage worked by water, similar to the steam cooperage at Glasgow, and the articles turned out are uncommonly reasonable, substantial, and neat. I regretted much not having it in my power to form an acquaintance with these spirited colonists, more especially as they farm likewise to a large extent. The farm at Gananogue extends to 1200 acres, and the mansion-house and barns are commodious and handsome.

Having received very encouraging accounts at Kingston, of the country along the Bay of Quinté, a deep inlet of Lake Ontario, formed by a peninsula called Prince Edward's Island, I made an excursion into that district. The scenery was pleasing, in many places very fine; and settlements are forming on every hand. The soil is partly clay, partly loam and sand, sufficiently rich to yield fifteen crops of good wheat, with impunity, in a period of twenty years. Granite, limestone, and schistus, or clay-slate, are successively met with. Wherever a stream or creek of any importance falls into the lake, there we find a mill-seat and a village growing up, the embryo, in many cases, of considerable towns.

To the patriot or philanthropist, it is highly gratifying to remark, how the wants of the farmer and the interests of the trader or mechanic co-operate in the rapid progress of general improvement and civilization. Holywell, Sophiaburgh, and Belville, are all thriving villages of this description; and many individuals are to be met with in each, who, from the humble situation of merchant's clerks, &c., are rapidly acquiring independence.

York (he says in another place) is a very desirable station for a settler to choose as head-quarters, in looking about for a purchase. He is sure, at this place, to meet with numerous offers of farms, regarding which he will do well to act with caution; and he will be able to inspect the plans of public lands in the government land-office, under the superintendence of Mr P. Robinson, a gentleman able and willing to afford him every facility. The *rich* and *heavy* land of Upper Canada is not to be found, in general, upon the immediate banks of the lakes and rivers. It lies for the most part from twelve to twenty miles back, and thus compensates the enterprising settler for plunging into the forest."

CLIMATE AND PRODUCTIONS.

It will prove both important and interesting to persons who have any intention of emigrating to Upper Canada, to have some knowledge regarding the climate of the country. On this subject, Howison gives the following account:—

"The nature of the climate is a consideration of the greatest consequence to all those who propose to remove to a foreign country, and deservedly so; for a malignant atmosphere exerts an influence over the mind and body, which it is impossible to evade. But he who takes up his residence in Upper Canada runs no risk of suffering in this way. The climate, in the westerly parts of the province particularly, is alike healthful and agreeable. In winter, the thermometer occasionally stands several degrees below *zero*; but this intense cold seldom continues more than three or four days at a time, and is by no means unpleasant. The temperature, during January and February, may, in the generality of seasons, average 15° Fahrenheit. The snow usually lies six or seven weeks; but the time, of course, varies according to the quantity that falls. While it remains upon the ground, the carriage called a *sleigh* or *cariole* (which is too generally known to require description), is exclusively used, and forms a delightful mode of conveyance, one pair of horses being able to draw several persons sixty or seventy miles in the course of a day, without much fatigue. Often, for some weeks in winter, the sky continues bright and cloudless; and though the air is intensely keen, yet its bracing and exhilarating effects enable one to bear the cold without any inconvenience. At these times the public roads are crowded with sleighs; and the farmer conveying his produce to market, the wood-cutter hauling wood, the quack doctor, the merchant driving for pleasure, and the jogging traveller, all meet the eye in varying succession.

When the winter is moderate and steady, with plenty of snow, it is the most agreeable season in the year; however, it is sometimes subject to vicissitudes which render it the most unpleasant. I have seen storms of thunder and lightning in the month of February, the thermometer having stood at *zero* only a few days before; and have also known hail, rain, and snow occur successively in the course of half an hour. The changes of temperature are sometimes inconceivably sudden and extraordinary; but they affect the Canadians very slightly; for they are always prepared for them, and their constitutions are not so *barometrical* as those of English people. The winter season is extremely healthy, sickness of any description being almost unknown either among the natives or foreigners.

Spring commences in March; but the early part of this season is seldom agreeable, being damp, tempestuous, and rainy, and occasionally very cold. The roads likewise become so bad, that it is hardly possible to go out of doors. Towards the end of April the ground becomes dry, vegetation commences, and the fields afford a little pasture to the cattle. In May the earth is covered with verdure; and if the weather is genial and warm, the buds of the trees expand with astonishing rapidity, while the forests exhibit an innumerable variety of hues, all resplendently bright and exquisitely pure.

In June the orchards are in full blow, and a transparent atmosphere and cloudless sky prevail from the rising to the setting of the sun. During July and August, however, the heat becomes so intense, that it is unpleasant to leave the house, or take the least exercise; and musquitoes abound wherever there are woods, which prove a torment to those who are exposed to their attacks. The heat in the course of the summer has several times been found to exceed 100° Fahrenheit in the shade; but it usually averages from 82° to 90°.

The autumns of Upper Canada very much resemble those of Britain. October is usually a delightful dry month, with mild days and clear frosty nights. The early part of November is generally characterized by a peculiar state of the weather, which the Canadians term *Indian summer*. The atmosphere has a haziness and smokiness which makes distant objects appear indistinct and undefined, and a halo often encircles the sun. At the same time, a genial warmth prevails, and there is seldom any wind. The Indian summer is so delightful, that one would almost suppose the country where it takes place to be transported for a season to some celestial clime, where the elements ever existed in harmony and acted in unison. It is extremely difficult to explain the cause of the regular recurrence of this kind of weather; for scarcely a year passes, in the autumn of which there are not some days of Indian summer. It derives its name from the vulgar and prevailing notion, that the haziness of the weather is produced by the smoke which arises from the burning of the long grass that covers the immense prairies bordering on the Missouri and Mississippi. It is true that these prairies are annually set on fire by the Indians; but that the conflagration affects the climate and atmosphere of Canada, is an idea too absurd to require refutation.

The climate of Upper Canada has not yet attained that salubrity and purity which will eventually characterize it. Thick forests cover nine-tenths of the inhabited parts of the province, and these, by preventing the evaporation of water from the surface of the earth, produce marshes, swamps, and collections of water, which in their turn generate mists, chilly winds, and agues. When the woods are cleared away, the air, although perhaps colder, will be even more dry than it is at present. The lakes will then attract the clouds towards their surface, and Upper Canada will seldom be exposed to heavy falls of rain, or violent storms of snow.

I have already mentioned (he continues) that the soil and climate of the province are very favourable to the growth of fruit. The cultivation of orchards, however, has hitherto been almost entirely neglected. The kinds of fruit most common in the country are not well chosen, and they appear to degenerate from want of care and attention. Wild grapes grow abundantly in the forests, and would, I believe, by proper culture, become equal in size and flavour to the garden grape, and also fit for making wine. Hickory nuts, walnuts, butter-nuts, plums, wild strawberries, cranberries, &c. are found in profusion almost every where, and might all, of course, be improved in value and quality by suitable cultivation.

The soil of Upper Canada is in general excellent, and likewise of easy cultivation. Wheat is the grain that is raised in greatest quantity. A bushel and a half of seed is generally allowed for an acre, and the return averages from twenty-five to thirty-five bushels. Buck-wheat is also cultivated to a considerable extent, and an acre yields about fifteen bushels. Rye succeeds well, the crop being generally twenty bushels an acre. Oats are very indifferent, and much inferior to those raised in Europe, being small and light in the grain, and, comparatively, not nutritious. An acre yields on an average from thirty to forty bushels. Barley is but little known in Upper Canada; however, it would appear that the seasons are rather too warm and dry to be favourable to its growth. Indian corn is much cultivated in the western parts of the province, and yields largely, if it is not injured or destroyed by late frosts. Potatoes succeed well in most soils, but are much inferior in quality to those produced in Britain. Turnips also form a profitable crop, and are used to feed live stock during winter; but the vegetable best adapted for this purpose is the squash or gourd, which affords an abundant crop, is much liked by the cattle, and never communicates any unpleasant flavour to the milk of the cows, as turnips invariably do.

But while examining this general estimate of the returns made by different crops, it must be recollected that in Upper Canada the land is scarcely ever made to produce nearly so much as it would do, were it under judicious cultivation. The Canadian farmers have no system in their agricultural operations, or in the management of their lands, and they prepare the soil for the reception of the seed very imperfectly. These circumstances are generally the result of ignorance, but often arise from a want of capital, and a difficulty of procuring labourers to assist them in the business of the farm. Were an enlightened English farmer to subject a portion of the best lands in Upper Canada to the British system of agriculture, making of course those deviations which the climate, soil, and other circumstances might render necessary, he would raise crops infinitely superior, alike in quantity and quality, to those that are generally yielded at present throughout the province."

MAPLE SUGAR.

In Upper Canada, the inhabitants of the woody districts have it in their power not only to supply themselves with sugar for the use of their families, but to make such quantities as may be advantageous in a commercial point of view. This sugar is produced from the sap of the maple tree, one of the most valuable vegetable products of the American forests. An active farmer and his wife may make, it is said, about 700 lbs. of sugar annually, not inferior in quality to that of the West Indies, and worth about 4d. per pound. The manufacture of this native sugar greatly tends to lower the price of West India sugars, which would be otherwise as high as 1s. 6d. a pound. Talbot, in his "Five Years' Residence in the Canadas," writes with enthusiasm of the value and use of this manufacture, which it seems is far from being properly attended to by the settlers. "Maple sugar might be manufactured (says he) by the rudest mountaineer in your country, as well, in the first season after his arrival here, as by the most eminent sugar refiner in Jamaica. The manufacture is generally commenced early in the month of April, when the sap of the tree is first put into motion at the return of spring, and when no other agricultural operation can be carried on to good purpose by the farmer, on account of the unpleasant weather which occurs at that period. A part of the estate is selected which contains the largest quantity of flourishing maple trees nearly contiguous to each other; and a temporary hut is erected for the accommodation of the operators, not more than two or three being required for the management of a hundred trees, from every one of which the sap is oozing out at the same time. In rainy weather, the trees yield their valuable juice rather tardily; and, during the whole month which is sometimes devoted to this employment, it often happens that only eight or nine days are propitious to this part of the settler's labours. The best weather for the purpose is that in which the night is frosty, and the day cheered by the rays of a warm sun. If the process of boiling were not continued both day and night, the sap would accumulate too rapidly in the reservoir, and soon evince symptoms of vinous fermentation, which would change its quality, and render it useless for the manufacture of sugar.

The first thing necessary for commencing the manufacture of this article is a metal boiler, which costs in Upper Canada about L.2, 10s. sterling. This holds nearly thirty gallons, and, with a small cooking-pot, is sufficient, in a prosperous season, to boil down 800 lbs. One hundred and fifty troughs, eight reservoirs, and four hand-buckets, will be necessary for the regular supply of this boiler. The troughs cost about 12s. 3d. per hundred; the reservoirs, which are barrels without heads, about 4s. each; and the buckets, 2s. 6d. each. These are the only utensils which an emigrant will need: The troughs may be made by himself, if he has acquired any skill in the use of his axe during the preceding winter. An expert hand can make 30 or 35 troughs in a day, which, though formed only with the axe, will last for many years, if carefully placed under cover during summer. The trees are tapped either by means of an incision made by an axe, or the perforation of an auger. But the latter mode is considered the less injurious to the growth of the tree, and is therefore the more approved plan. A small spout about nine inches long is made the conductor of the sap from each incision to its respective trough, from which, when nearly full, it is conveyed in buckets to the reservoirs, and there allowed to subside. When the grosser particles of the sediment have been left to sink to the bottom, the sap is drawn off into the boilers, and reduced to molasses by the simple process of evaporation. The liquid in this purer state is then drawn from the boilers, and placed in the reservoirs, or coolers, until it becomes nearly cold, when it is strained through a woollen cloth into a smaller boiler, and, after being clarified with eggs, milk, or bullock's blood, is boiled down to the consistence of sugar, and poured into moulds of the particular shape which it is intended to assume as a sort of candy; but, if to be used as soft sugar, the syrup in its last stage of purification is left in a sugar-cask, which is perforated, to allow the moist particles, in the form of molasses, to ooze through the bottom. Many people neither clear nor strain the molasses, and consequently make very coarse and dirty sugar; but by a strict adherence to the simple directions which I have given, the most ignorant novice in the art might manufacture sugar equal to any that is imported into England. Some of it, indeed, has what is called 'a smack,' or peculiar taste, derived often from the kind of wood of which the troughs are made, and sometimes from being neglected while in the act of boiling, and suffered to burn. Every tree, on an average, will from a single wound yield about twenty gallons of sap, and a proportionate quantity from any number of incisions not exceeding four. Five gallons of sap contain at least one pound of sugar."

POTASHES.

Settlers in the woods have also an excellent opportunity of manufacturing potashes, an article of great use and considerable value. A vast quantity of this substance is annually made in Canada, and exported to Great Britain. Potashes are made from the ashes of burnt trees. In burning timber to clear the land, the ashes are carefully preserved, and put in barrels, or other vessels, with holes in the bottom; and water being poured over them, a liquid or alkali is run off; this ley being boiled in large boilers, the watery particles evaporate, and leave what is called black salts, a sort of residuum, which, when heated to a high degree, becomes fused, and, finally, when cool, assumes the character of potash. By these potashes the Canadians make their own soap: the ley of a barrel of ashes, boiled along with ten pounds of tallow, till it is of a proper consistence, produces about forty pounds of very good soft soap. It is related, that when the land has been covered with heavy timber of a hard nature, there is such a quantity of ashes produced that their value will pay for clearing the land.

ORIGINAL LETTER FROM AN EMIGRANT.

We have much pleasure in now introducing an original letter from Upper Canada, which brings up information regarding the colony to the month of November 1832. The emigrant by whom this letter was written was, till lately, a shopkeeper in Edinburgh, and a person of respectability and substance. Finding that his means as a tradesman were subject to constant diminution, and that, by the most persevering efforts in his business, he could not anticipate a competence, at however distant a date, he resolved on emigrating to Canada; and the result of this important step, it appears, has been such as he had reason to expect. We give his very interesting letter to a friend in Edinburgh, precisely as it was put into our hands, and only suppress the name of the writer; but we vouch for its authenticity and the integrity of its details, and thus leave it to make its own impression on the minds of intending emigrants.

Whitby, Upper Canada, 14th Nov. 1832.

MY DEAR SIR,—I confidently expect that long before you receive this letter you will have heard of our safe arrival in Canada, in good health, and otherwise in comfortable circumstances. We stopped at Quebec for eight or ten days, during which time I never allowed my family to quit the ship, in dread of the cholera, which raged in the town at the time with very great violence. We immediately proceeded on our journey to York with all due speed; this is performed partly by land, and partly by water, the accommodation in both cases perhaps as good as the country can afford; the charges, however, are very high. I paid for my luggage alone, from Montreal to York, nearly L.12, and for my family a great deal more; from Quebec to Montreal my luggage cost nothing, this circumstance arising entirely from great opposition in the latter case, and more in the former. Our journey, however, upon the whole, was comparatively agreeable, and, under the superintending care of Divine Providence, we arrived at York in safety and good health. I had expected, upon our arrival at York, to have stopped there for a month at least, and left my family, while I myself surveyed the country for the purpose of obtaining information, and procuring a permanent place of residence, but I found this to be quite impracticable, owing to the state of the town—as regarded the cholera—and secondly, as regarded the enormous rent of houses. I therefore determined to quit York next day, and proceed to Whitby. I accordingly procured a coach for that purpose, and came to John Williamson's; we stopped there for eight or ten days till once our luggage arrived; I then procured a small house. We lived in this house for four or five weeks, when a hundred acres of land coming to hand, which I considered well worth the money asked for it, I purchased it, and am now lodged in my own house, and at my own fire-side, with my family around me, all in excellent health and spirits. I have thus shortly conducted you from Quebec to York, and from York to my *lairdship* in Whitby, where I shall leave you for a while, and proceed to matters of perhaps greater interest. The scenery upon the banks of the river and lake between Quebec and York is very dull, and altogether uninteresting—at least it appears to be so in my eyes, and, I believe, in the eyes of Scotsmen in general, so much accustomed to hill and dale. Excepting towns such as Montreal, Kingston, a few villages, and farm-houses, nothing is to be seen but an interminable range of wood, stumps of trees, and wooden fences, which are at once calculated to damp the spirits of the emigrant, and to make him wish he had never left his native land. I can assure you, Sir, I then felt that Canada, as it is, was not the Canada I had formed an idea of in my own mind; I was severely disappointed on this score, and I believe thousands have experienced the same kind of disappointment, and have returned home with an evil report of the country, without giving it any thing like a fair trial. I mention this circumstance, in order to warn any person who may be similarly placed not to despair; only let him allow reason to resume its legitimate sway, and those airy castles which had been formed in the imagination will be demolished in a minute—Canada will then be seen as it really is. And what is Canada? Why, I'll try to answer that question. Well, then, Canada is a country where persevering labour and industrious habits will accomplish what the same persevering and industrious habits will not accomplish at home. I frankly confess, however, that this circumstance, coupled with the entirely different manners and customs of the people, so wrought upon me as to damp my spirits very much—so very much, indeed, that I deeply regretted I had ever left Scotland. I then found it no easy matter to bid adieu to my native land—the land where repose the ashes of my father, my mother, and sister, the wife of my youth, and some of my dear children; it was then that the early scenes and associations of my boyhood and youthful years rushed into my mind in all their native force and impetuosity, and, in language of silent eloquence, unuttered and unutterable, consecrated these scenes as sacred, and the places where they happened.

Whitby is universally allowed to be one of the finest townships in the whole of the Upper Province; its local situation, as regards markets and the other conveniences, is very good; there is always a ready market here for all kinds of farm produce; the soil is excellent, and, taking all things to account, generally speaking, well cultivated; the price of land here is rising very fast—land that was selling last season at from 15 to 20 shillings per acre, has advanced to 25 and 30 shillings, and cleared land, which was selling at L.4, 10s. per acre, has advanced this season to L.5 and L.6, and, in all probability, will advance still higher; so that it appears to me quite plain, that those who intend to emigrate, especially those who intend to purchase land, should do so as soon as possible. Whitby, in my opinion, is a very eligible situation for emigrants of almost every description; there is not a baker in the whole township; there is not a flesher; a wright and cabinetmaker would succeed well, provided he kept close to his business; a tavern-keeper to keep lodgings for travellers, and be discreet, would also do well; store-keepers have all made fortunes, and more fortunes may still be made by emigrants judiciously following out the same line of business. But why do I enumerate? Suffice it to say here, that Canada is a rising country, and every class of emigrants must succeed, provided they act with prudence and caution. There are a good number of Scotsmen settled in this part of the country. Upon the one hand, and within ten minutes' walk of my house, is a Mr Armstrong, a justice of the peace for the district; I had the honour and happiness to dine with him the other day, when I found him to be a very agreeable and intelligent gentleman. His case is a singular one, inasmuch as it clearly shows, in a strong point of light, what perseverance and industry will accomplish, under trials and difficulties seemingly altogether insurmountable. This gentleman came to the township in Whitby about twelve years ago, without any original capital; he bought 200 acres of land, and began clearing it with great spirit; he built himself a log-house, and all things seemed to go on and prosper; but in an evil hour his fair prospects were completely blasted, and his fondest hopes dashed from his lips to the ground. His log-house was reduced to a heap of ruins by fire, and his little all perished along with it. He, however, by extraordinary perseverance and industry, soon overcame the whole, and he is now proprietor of as fine land as Canada can boast of. His whole property cannot be valued at less than between L.2000 and L.3000. The next that I shall mention is a Mr Tweedie, from Symington, in the Upper Ward of Lanarkshire. This gentleman came to this country about three years ago, and brought L.500 with him; he has now property worth L.1200. Much about the same distance from me as the two other gentlemen, is a Mr Balmer, from Roxburghshire, who came to this township, and without any original capital has succeeded in getting his land cleared of wood, and mostly cleared of debt. This gentleman is certainly a very remarkable instance of what perseverance and industry will accomplish. Nearer me still are the Messrs Williamson, from Stockbridge. These gentlemen have bought 100 acres of land, at a remarkably low price, and promise to do well. The next is a Mr Hepburn. He has bought 100 acres of land, very fine, and has begun the clearing of it with great spirit. Adjoining to him is a Mr Black, from the neighbourhood of Carnwath, who came out this season. He has bought 300 acres of excellent land, and has begun to improve it with great spirit also.

You will thus see, from what I have enumerated, that I am in no great want of Scottish society, and it only requires a few more to enable them to go on in public matters with greater spirit and complete success. As regards the state of religion in this township, I would say, that the majority of inhabitants are composed of Methodists and Baptists, and the remaining part are Presbyterians and Quakers. These different classes have all of them places of worship, except the Presbyterians, who are not yet supplied.

Schools for the education of youth are very numerous in this township, but a great deal requires to be done in the way of obtaining better teachers; as society advances, however, this will be rectified. The season here has been rather backward, in consequence of which a considerable failure of certain kinds of crop has taken place. Wheat, upon the whole, may be considered an average crop, and so may oats; but hay, Indian corn, buck wheat, and potatoes, have failed to a considerable extent. On that account, markets are looked upon to be very high during the season, and holders of grain are beginning to speculate on the subject. Wheat has been selling during the summer as high as six and seven shillings per bushel, and other kinds of grain in proportion. Potatoes are at this time selling at 10s. per two imperial bolls, and are expected soon to be a great deal higher. Butter brings here 10d. to 1s. per lb.; cheese, 10d. to 15d. per do.; eggs, 7d. to 7½d. a dozen; pork, L.3 to L.3, 5s. a barrel of 200lbs. Cows from L.4 to L.6; a good yoke of oxen from L.17, 10s. to L.20; and horses from L.20 to L.25 each. Farm-servants get from L.25 to L.30 per annum, with victuals. It is impossible for me to say what may be the wages of mechanics, as I have not been able to obtain correct information upon the subject. Harvest wages are a dollar per day, but still you can cut your own crops a great deal cheaper than in Scotland. Cradling wheat and oats is a very common way of cutting these kind of crops, and I can assure you a very excellent way it is. A Canadian can easily cut two acres of wheat per day. There are plenty of labourers who will take it to cut it at 5s. per acre, and upwards, according to the heaviness of the crop. Farming utensils seem well adapted to the present uncultivated state of the country, and work well, where Scotch carts, ploughs, harrows, &c. would be of no use whatever, and the same observations apply to carriages on the roads. Upon land free of stumps, however, the case is different; upon such land Scotch implements of husbandry are decidedly preferable. Oxen are much used in husbandry, and, in so far as my opinion and observation go, they are used wisely. It is truly astonishing to see these cattle drawing the logs of wood together in heaps for burning, and to see them ploughing and harrowing among the stumps. I have often stood upon the road in passing, and admired the docility and tractableness of the animals, and, while viewing such scenes, have thought that Canada could not have been cultivated without them, the fast and fiery disposition of the horse, in general, utterly unfitting them for performing any such work. The same observations also apply to roads in wet weather, as oxen will go through with the same load where horses would turn restive and refuse to work altogether; *both* are best, however; and it so happens that Canada is richly stored with both.

As regards my own situation and prospects, I am truly happy to say that they are cheering. It is allowed on all hands that the purchase I have made is a good one. It is a hundred acres of very fine land, fifty of which are cleared, with an excellent new barn upon it, built this season, which cost L.70, with a frame-house and other offices. The soil is a deep rich loam, and adapted to every kind of crop. Its local situation is also excellent, being within one mile of the main road between York and Kingston, where coaches pass daily; and about three miles from Windsor Bay, where there is plenty of shipping to all parts. A fine stream of water runs through a part of it, upon which is erected a saw-mill, and presents one of the finest situations for a grist-mill, which is very much wanted in this part of the country. The price I paid for my land was 256 sovereigns; but, after deducting the improvements on it, it costs only 22s. 6d. per acre—a small price, when it is considered that land in its immediate neighbourhood is selling at from L.2 to L.2, 10s. per acre.

My prospects of a crop next season are not of the most flattering description, owing entirely to the extreme indolence of the person I purchased from. I shall, however, have five acres of wheat in pretty good condition, and other crops in proportion. I intend to keep 10 milch cows next summer, which will pay me well, as dairy produce sells very high. By next fall of the year, if spared so long, I shall have 50 acres ready for wheat, which, calculating the produce per acre so low as from 25 to 30 bushels, will bring me from 350 to 400 bolls of wheat, which, at 5s. per bushel, will be as many pounds; this, along with the produce of the cows, and other crops, will bring me a sum nearly equal to pay all expenses, and bring me back the whole of the money I paid for the land. I do not mean to say that I shall have 50 acres of wheat annually; but I do mean to say, that, by prudent management and persevering industry, I shall be fully enabled to realise between L.300 and L.400 a-year, for the payment of expenses and the maintenance of myself and family. This circumstance, coupled with the fact that I have no rent to pay, and almost no taxes, certainly presents, in a worldly point of view, a cheering and animating prospect indeed. This, I believe, is no exaggerated statement; but as I have had no opportunity of realising it in my own experience, I only offer it as my opinion. Being upon the spot, however, and judging from the state of the markets, and other circumstances, I not only offer it simply as my own opinion, but as my *decided* opinion. If the above statement be at all correct—and I believe I am rather below the mark as otherwise—then it must appear perfectly plain to every unprejudiced mind, that, in so far at least as worldly circumstances are concerned, the ends of emigration are completely answered. It is perfectly true, that, if a person is judicious in laying out his money upon land, and be at all industrious, he must be independent; and let it be understood, that the same observation applies to every branch of trade.

It is no uncommon occurrence, however, to find persons possessing from 100 to 300 acres of land, of the finest quality, not at all able to support their own family, proceeding entirely from their own indolence; but this circumstance, melancholy as it is, is one of the reasons, among many others, why an industrious man makes himself the sooner independent, inasmuch, at least, that in so far as the individuals alluded to are concerned, the market for grain and other farm produce remains almost entirely unoccupied, and naturally throws a greater number of local purchasers into the market. The prospects of the farming interests in this young country are certainly of a very pleasing description, and calculated at once to rouse and animate the mind to redoubled activity and vigilance, in endeavouring, by honest industry, to better the circumstances of yourself and family. All kinds of farm produce have been gradually on the increase for these two or three years past, and still continue so. I believe I am correct when I say, that, speaking generally, both cattle and grain have risen one-third, and in some cases more than one-half, within the time alluded to. A farmer here is at little or no expense whatever as regards his young cattle after they are one year old; they are turned into the woods, and thrive there remarkably well; they will regularly return to the farm, once or twice in the fortnight, for the purpose of getting a little salt—a thing which all cattle must have in this fresh-water country; they then go back to the woods again, and I have not heard of any of them being lost. As regards swine, the case is somewhat similar. Many a farmer keeps from fifty to sixty of these animals, which do not cost one sixpence for keep, except when any are penned up to feed off; they then get a little Indian corn, peas, &c. &c., and, as I am informed, pay well. Under these circumstances, it must appear quite evident that the land that would thus be required for the maintenance of the above species of stock, the farmer has it in his power either to put a crop upon it, or milch cows; and this presents another source whereon he may calculate with safety the sooner to raise himself, and, of course, to independence.

Such being the facts of the case, and when all things are considered, I have not the slightest hesitation in declaring, that it appears to me as plain as the sun at noonday, that a farmer in Scotland, occupying a farm that does not pay him, distressed as he must be, perplexed and degraded, toiling from morning till night, with a degree of mental anguish pressing upon him, calculated at once to unnerve all his energies, and to bring him to a premature grave, and yet, after all, unable to support his family or better their circumstances in any shape—I say, a farmer, in such circumstances, ought to rouse himself from his lethargy, and, by one grand and mighty effort, shake himself free of the fetters by which he is enclosed, and, along with his family, cross the mighty Atlantic, and set himself down in Canada, where his talents and industry as a farmer will be far better paid, and both his character and standing in society, in a moral and political point of view, more duly appreciated.

These observations apply with equal force to every other class of persons placed in similar circumstances, and to all such the call to bestir themselves is equally loud. If I were asked the question, whether (all things considered) I would purchase land, or betake myself to some other trade, I would instantly answer, *Buy land.* I do not mean to say, however, that purchasing land is the quickest way of realising a fortune. I believe the reverse to be the fact. I am persuaded, however, it is the safest plan. As regards people in the mercantile way, I am credibly informed there are several in this line, and even in this township, who have realised fortunes, within these ten or twelve years past, of upwards of L.1500. This fact speaks volumes to persons in that line, and requires no comment from me.

I shall now state a few things that may be of use to such of my readers for whom this letter is intended, and who may have emigration in view. I here wish it distinctly to be understood, that I mean to offer no advice, but simply to state my own opinion, leaving those who read to judge and determine for themselves. What I have just now stated applies to every other part of this letter.

The price of land varies in this township according to circumstances; for instance, land upon the front of the township, say cleared land, and free of stumps, is selling at from L.5 to L.6 per acre, upon a farm of 100 acres in extent, and 75 acres cleared. Again, a farm of the same extent of land and clearance, but the stumps upon it, and similarly situated, sells at from L.4 to L.4, 10s. In proportion, however, as you go back into the township, the price falls. A farm of 200 acres, seven or eight miles back, with 70 acres cleared, but the stumps upon it, sells at from L.2 to L.2, 10s. per acre—houses upon the farms in both cases, to less or more extent; uncleared land in the former situation, at L.2 to L.2, 10s., and in the latter case, at L.1, 5s. to L.1, 10s. per acre. Lodgings are very ill to be got here, and present very serious difficulties to emigrants with large families. I myself was exceedingly put about in this respect; but these difficulties were soon overcome. A room with firewood included, costs 5s. per month. Persons with small capital, say from L.50 to L.100, must lay their account with hard work. In my opinion, they ought to buy land, if they intend to do so, whenever they arrive, and pay the first instalment; then work at some trade or other for a year or two, and in the interim pay the instalments as they fall due: they may depend on it they will find this plan very much to their advantage, as it will assuredly better their circumstances very much, and enable them to go on their land with every prospect of complete success. For want of such caution, I am credibly informed that many a one, in the course of a year or two, get so entangled as to be obliged to quit their farms, and so render their situations incomparably worse than at first.

Upon the whole, from what I know personally, and from others, I am decidedly of opinion, that, in almost all cases of the above description, the plan I have just now recommended ought invariably to be adopted. There are very few lots of land in this township which are not already occupied, but there are plenty of farms to purchase from private individuals; there are still, however, a few lots, and I shall give you a description of one of them. This lot is situated on the front of the third Concession, about one mile distant from me, on the main road from York to Kingston, and about three miles from the lake. It consists of 600 acres of excellent land, with a large stream of water running through it, and includes by far the best waterfall and situation for a grist-mill that is to be found in the whole township. The price put on it is 30s. per acre, and is certainly well worth the attention of persons of capital and enterprise. Keeping in view the case of the M'Donalds, I do not think it at all presumptuous to look forward to similar results.

In my opinion, all articles of household furniture, husbandry utensils, &c., ought to be brought out, at least so far as the circumstances of the individual will permit. I hazard this opinion from my own experience, because, had I known what I now know, I certainly would have brought out more than I did. The price of conveyance from Quebec to York is 4s. 7d. per cwt. All articles ought to be put up in as small packages as possible. China, crystal, earthenware, &c., ought to be carefully packed. I unfortunately had the most part of what I brought with me of that kind broken to atoms.

With regard to how emigrants should bring out any capital they may have, I dare scarcely venture an opinion. I myself brought out the most part of the capital I had in *gold*: I got 24s. for every sovereign, which certainly paid well. In other circumstances, however, prudence may dictate otherwise.

Upon the voyage out, your provision store should consist mostly of oatmeal, plenty of potatoes, eggs, hams; plenty of porter and ale, which you will find to be very useful. Tea will not be much used; coffee will. Bring along with you some rice, with every other article to make a rice pudding; and particularly bring plenty of red herrings; you will find these very useful indeed; a few dried fruits; &c. Be sure to bring provisions for three months at least; and if you do not use them all on the voyage, you will find them of great use to you afterwards.

I would strongly recommend all emigrants to come out by the way of New York; the expenses are much the same in both cases, and the passage shorter, and by far the safest. You will then get intelligence which way to proceed, to go to York, or any other part in Upper Canada.

I had written thus far, when I have now to state that I have purchased 50 more acres of land immediately adjoining the 100 acres I formerly purchased. I paid rather a high price for it as otherwise, viz. L.3, 10s. per acre. It, however, makes my farm a complete one, and is not surpassed for quality of soil and local situation by any farm in the township of Whitby. There are about 20 acres of cleared land upon the 50—so that upon the farm there are in whole 70 acres cleared, 50 acres with stumps upon it, and 20 acres free of stumps. I have let about 30 acres of woodland, to be chopt, logged, burnt, and fenced, and ready for receiving the seed by the first of September next, at L.3 per acre. If the land is sown down with grass-seed immediately after the first crop of wheat, and remains so, it will require 10 or 12 years in that state to rot out the stumps; but if continued under the operation of the plough, the stumps will come out in six or eight years, and in some situations a good deal sooner.

The above purchase will materially increase my yearly income, without adding much to the item of expenses. In the meantime, however, my expenses are high, but not near so high as the same extent of land would require in Scotland for stocking it only, *and a heavy rent to boot*, and the returns not much less. The weather here at this time, 10th November, is uncommonly fine, with a slight frost in the mornings, and clear sunshine through the day. I will have the most part of my land ploughed before the winter sets in, which is calculated to take place about six weeks hence. I have hired a man of the name of John Cairns, a Scotsman, from Symington, in the Upper Ward of Lanarkshire, who came out this season. He seems a very quiet and steady lad, and ploughs uncommonly well; with his help I intend to chop ten acres of wood during winter. The wood upon the land here, in general, is not very heavy; the trees are very tall, but not of great girth—of course they are more easily managed to cut into proper lengths for drawing into proper heaps to burn. I have thus endeavoured to give you all the information at present in my power. The facts I have stated may with safety be depended upon, and, as regards my own opinion, you can either adopt or reject it as you choose. I must say, however, that I have given it candidly and honestly; and whatever difference of opinion there may be on the subject, I can say, from the bottom of my heart, these hands are clean. Emigration, however, is a serious matter, and I would advise every person to be fully persuaded in his own mind before he resolves upon the step. You can easily perceive, by the tenor of this letter, what my mind is upon the subject, but, as I said before, so say I now again, let every who reads, judge and determine for himself. I shall now conclude, by observing that Canada may, with propriety, be emphatically styled the poor man's country—to such persons the prospects in this country are certainly cheering. Language cannot describe the thrill of pleasing and delightful sensation which must take possession of the breast of every one, who, from a state bordering on absolute destitution, is thus suddenly raised to a state of comparative plenty and independence. In such distressing circumstances, how often must such a man, while looking with trembling emotion upon the wife of his bosom, and the dear innocent and prattling pledges of their mutual affection and love to each other—how often, I say, must such a one, with tears in his eyes, have perceived such coming misery with horror and dismay, the contemplation of which is calculated at once to palsy every nerve within him, and freeze the blood within his veins! Things, however, are changed for the better. The mind that was once the constant prey of fearful forebodings of coming wretchedness, is now peaceful and serene. The cloud that was dark and lowering, and threatened a coming storm, has now passed away, and the sun, which was thus for a time obscured, suddenly breaks forth in all his noonday brightness and brilliancy. Well may such persons (at least in so far as worldly circumstances are concerned) lay their heads down upon their dying pillow, and with their weeping family around their beds, commit their souls to God, and close their eyes in death, without a corroding thought of what is to become of their surviving relations, after they have gone the way from whence they shall never return.—I am, my dear Sir, yours sincerely,

J. F. S———

Since the preceding was written, the price of rural produce has risen considerably in Upper Canada, a circumstance advantageous to those already in possession of cleared productive lands, and which will act as an incentive to the emigration of agriculturists.

EMIGRANTS ON HALF-PAY.

Upper Canada seems to be a country excellently adapted for the comfortable settlement of officers on half-pay, and others who happen to be possessed of a small annuity. The sums of money they from time to time receive enable them to purchase many of the conveniences and luxuries of life; the style of living suits their previous habits, and they have it always in their power to provide for their children, which is not often the case with those upon small fixed incomes in this country. It will also be remembered that government gives a certain quantity of land gratis to those who have been in the army. Captain Hall, in his "Travels in North America," presents his readers with a letter which he had received from a half-pay officer, who had emigrated to Upper Canada, an extract from which we here take the liberty of offering, as illustrative of the condition of emigrants of that class:—

"Having made my mind up, in the winter of 1818 I began to make preparations, by disposing of my household furniture, reserving for myself beds, bedding, carpets, and such other things as were portable, and likely to be useful. I also made arrangements for borrowing the sum of L.200. Arrived at Bristol, I procured a variety of tools, implements of husbandry, clothing, &c., to the amount of L.100, and laid in a good stock of provisions, and every thing likely to make the voyage comfortable across the Atlantic.

We sailed on the 3d of May 1819, and after a tedious voyage to Quebec, and some detention afterwards in getting up the country, we arrived at the village of Cobourg, in the district of Newcastle, on the 19th of July. The whole of my expenses for voyage, provisions, and all other travelling charges, amounted to L.100, 8s., so that, on my arrival, I had a very small sum left. However, my quarter's pay came round; I was in a cheap country; and, moreover, found a most warm and hospitable reception in the house of an old and esteemed friend. As a new township on the Rice Lake was about being surveyed, and I had not means to purchase a cleared farm near my friend, I determined to wait till the survey was finished, and try the Bush—as the woods here are called. This was in the month of December of the same year. I then obtained the grant of land my rank in the naval service entitled me to. In February 1820, I contracted with two men to put me up a log-house, 28 feet by 20; and thirteen logs, or as many feet, high; to roof it with shingles, and to board up the gable ends; and to clear off one acre about the house, to prevent the trees from falling on it, for all which I paid them 100 dollars. This shell of a building had merely a doorway cut out of the middle; and when my friend and the clergyman of Hamilton drove out in a single sleigh with me, to see it, and we took our dinner at one end and our horse at the other, on a miserably cold day in the month of March, it looked wretched enough; but as it was the first but one, so it was the last in the township. Whilst the snow and ice were good, I moved all my effects, got boards sufficient to finish my house, and a six months' stock of provisions out, and on the 8th of May took my family into their pile of logs in a Canadian forest.

I will own, for a time our situation appalled me, and to my then unformed judgment in Bush matters, it seemed a hopeless struggle; but I was out with my family, and as I did not want for energy, I set to work in earnest. To two Americans I let a job to chop four acres and a half, at six dollars an acre; and at the same time, a man whom I had occasionally employed at home, followed me out, and came to hire. During the course of the summer, he felled and chopped up three acres more; my cleared acre I planted with potatoes, a little corn, and turnips; my stock consisted of a cow and yoke of steers three years old, with the management of which I was totally unacquainted when I bought them; but if a man will give his mind to any common thing of the kind, and not think it a hardship, it is surprising what he may do, as in this case after a few days I found no difficulty.

I was now anxious to get my house made habitable as soon as possible, and a carpenter being employed not far off, I endeavoured to engage him to put in the windows and door; but finding that he wished to take advantage of my situation, I determined to do it myself, and thus was forced to learn the business of a carpenter. This I considered no hardship, as I had always been fond of the use of tools, and had, previous to my leaving England, taken several lessons in turning. During the summer, I got my house chinked, or filled the interstices between the logs with pieces of wood to make the inside flush or smooth, and to prevent the mud used as plaster on the outside from coming through. I then put in the windows and door, laid the floors, and partitioned off the lower part of the house into two good rooms, on wet days employing my men to dig a cellar under the house; in short, before the winter, I had made the log-house comfortable within, and, with the addition of some white-wash, smart without.

In August, we cut some coarse grass in a beaver-meadow close by, sprinkling salt through the little stack as we made it; after this we logged up and cleared three acres of the land I had chopped, and by the latter end of September had it sown with wheat; the logging, though heavy, I did with my hired man and steers, and before the winter had it fenced with rails. Here, it may be remarked, I did not get much land cleared, but by doing little, and that partly with my own hands, I gained experience; and I would strongly advise gentlemen settling in Canada with small means, to commence clearing slowly, and with as little expense as possible.

In the fall, or autumn, I put up a log-kitchen, and a shed for my cattle; during the winter, I employed my man in chopping three acres more, in which I now and then assisted him, and soon became very expert in the use of the axe, felling the trees to the most advantage to assist their burning, and to save trouble in logging. With my beaver-meadow hay, and the fir tops of the fallen trees, my cattle were kept fat all the winter. In the spring, three acres more were cleared, fenced, and cropped with corn, potatoes, and turnips; and where log heaps had been burnt, the ashes were hoed off, and planted with melons and cucumbers; a small patch was fenced off for a nursery, and apple seeds sown, trees which are now ten and twelve feet high. I also put out several of the wild plum-trees of the country, which now bear abundance of fine fruit. From this time, about five acres yearly have been added to my farm, taking great care, in clearing off my land, never to destroy a log that would make rails, by which means the fence always came off the field cleared; and although they are small—from four to six acres—the fences are all six feet, or nine rails high. Here I will remark, it is a great fault to split rails small, an error that most new settlers persist in. In the spring of 1822, my attention was turned to making a flower and kitchen garden. Round the latter I made a straight fence with cedar posts, and thirteen rails high, which is at this day stocked with every kind of fruit tree to be had in the neighbourhood, which flourish beyond my expectation. My stock of animals has been gradually increasing, and to my other stock I have added horses and sheep, with poultry of all kinds.

In the year 1825, I had repaid the money I borrowed, by leaving back a small part of my half-pay every quarter, and had received a deed for 600 acres of my land, on which I had performed the settlement duty, which cost me L.30. My farm is now increased to 36 acres. I have the deed for the remaining 200 acres of my land; also deeds for town and park lots in the rapidly settling town of Peterborough; and, as my family have increased to six, and are growing up, I am just now about building a frame-house, 36 feet by 20 in the clear, two stories high, with a commodious kitchen behind, the timber and shingles for which I have bought by disposing of a mare, after using her for five years, and breeding a pair of horses from her. With my own exertions—being able to do most of the carpenter's work inside—and about L.100, I expect to get it finished.

Some of my first chopped land is now nearly clear of stumps. I am planting out an orchard of apple-trees, raised from the seed sown by myself; have a good barn and stable, with various other offices;—in short, feel that I have surmounted every difficulty. A town is growing up near me, roads are improving, bridges are built; one of the best mills in the province is just finished at Peterborough, another within three miles of me. Boards, and all descriptions of lumber, are cheap—about five dollars 1000 feet, four saw-mills being in operation. Stores, a tannery, distillery, and many other useful businesses, are established, or on the eve of being so, at Peterborough; on the road to which, through Otanabee, the Land Company, the clergy, and some private individuals, have some of the best land in the province for sale, at from 7s. 6d. to 10s. per acre. The price of land generally, except on the roads, is about 5s. per acre. I was the first settler in the township, and almost before a tree was cut down; now there are nearly two thousand acres cleared, and 125 families, consisting of 600 souls."

CONCLUSION.

Very little remains now to be told regarding Canada. In our opinion, the question of emigration is one of a very simple nature, and may easily be solved by every thinking human being. We have proved beyond the possibility of doubt, that Upper Canada is a country placed in infinitely better circumstances at the present moment, than any part of Great Britain and Ireland. We have shown that, in most places, the climate is delightful, and the lands fertile. It is not denied that in many portions of the colony agues and other local diseases prevail, but it admits of demonstration, that Canada, on the whole, is as healthy as these islands. If the inhabitants of the low uncleared lands in North America be liable to ague and fevers, those of this country are, on the other hand, continually liable to colds and consumptions to a degree fully as dangerous; indeed, the *colds* of the island of Great Britain seem to rank as the most destructive of the diseases which affect mankind. Besides, every year, the continent of America, as it becomes cleared, is becoming more salubrious, and it certainly possesses extensive tracts of land already fully as healthful and pleasant as any part of England. If it be established that Upper Canada is that fertile and promising territory which it is represented to be, the whole of the question of emigration resolves itself into this: are men who are in difficulties in this country willing to undergo the trouble of removing thither, and of exerting themselves for a few years after they arrive? As for the notion which obtains as to the pain of parting with early friends, and the place of our birth, that we take to be entirely fallacious. It is the duty of every man to go where his mental and physical properties can be most advantageously exercised. It is a fundamental law of human nature, that mankind must disperse themselves over the whole earth to seek out the best means of subsistence, and the most agreeable spot for their residence. Had intending emigrants to proceed to a land of barbarians, where neither human nor divine laws were understood or acted upon, and where they had to settle on sterile deserts, or burning wildernesses, we might excuse their hesitation to depart from their native country; but the case is quite different. To emigrate to Canada, or any other British colony, is simply to remove, as it were, to another part of Great Britain. Distance is nothing; for the removal of a family from the north of Scotland to the south of England would be attended with nearly the same trouble and expense; and, in each case, the family would find itself surrounded with neighbours equally strange. But to emigrate to Upper Canada with the means of purchasing a tract of land, holds out a much better prospect than to remove from one part of Great Britain to another. In this country, it now requires a very great mental and physical effort to obtain a comfortable subsistence. Nearly the whole of the lands and manufactures in the United Kingdom are passing into the hands of capitalists. The rich are becoming very rich, and the poor are sinking deeper and deeper into poverty and wretchedness. The small farmers and tradesmen of England, Scotland, and Ireland, are now placed in that peculiar condition, when emigration to a country less occupied and overdone than their own is almost imperative; for, looking around on all sides, they see little chance of rising into better circumstances, or of rearing their families in that comfortable and reputable manner which their feelings dictate. To such, therefore, Upper Canada offers a fair field for removal and settlement. In that country lands can be had in full possession, at an expense of from fifteen to twenty times less than what is paid here by way of annual rent; and it is seen that in a space of from three to five years, the whole cost may be realized by the amount of the produce. In Upper Canada, moreover, there are no taxes; at least they are so very trifling—a penny an acre, we believe, for cultivated land—that they are not worthy of being classed as taxes. There are also no poor-rates, and no tithes, both of which imposts are severely felt in England. The emigrant thither will likewise have nothing to annoy him in a political sense. In the United States, to which he can always proceed from Canada, if it suit his pleasure, he becomes a free citizen after a certain period; but it is alleged that he will most likely have his feelings hurt occasionally, if he has any sentiment of attachment to Great Britain and its form of government. In the Canadas, he continues to be a British subject, and can claim all the prerogatives of such a distinction. In short, if we consider how quickly local and other attachments can be formed, and how invariably the objects pressing most immediately around us become in our eyes the most important and interesting—if we further consider the almost instant improvement of circumstances which must take place after the first difficulties are got over, and the great value of what is in this country only a source of anxiety and vexation, a family of children, we see such advantages in emigration, that we are convinced nothing but a want of knowledge of those advantages, sufficient to create confidence in their reality, prevents many thousands from annually leaving this exhausted and monopolised country, and betaking themselves to a place where there is literally "a world for the winning."

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HISTORY OF THE ISLAND OF GREAT BRITAIN,

From its Conquest by the Romans, till the Civil War.

INTRODUCTION.

THE United Kingdom of Great Britain and Ireland forms, at the present time, one of the most important parts of the face of the whole earth; and there is hardly any human being who enjoys such advantages in respect of society, personal liberty, and education, as the subject of that kingdom. But, as may be easily supposed, this has not always been the case. The time has been when the people of these countries had somewhat inferior advantages; the time has been when they were no better off than the inhabitants of neighbouring countries; nay, there has been a time when they were far less enlightened and comfortable in their circumstances than some other people—in short, savages, like the Indians of America.

Now, the purpose of this history is to show how the people who lived before ourselves in Great Britain and Ireland contrived to be always improving their circumstances from the worse to the better state, till in the end the generation which now lives has become what we all know it to be. Knowledge of this kind is called history, and its use is to teach the living by the experience of the dead what is for their advantage. If the men who now live did not know any thing of those who lived before, they would be in a condition little better in that respect than the animals which have no knowledge whatsoever; but by knowing the events of past times, and what sort of people their ancestors were, they assert their superiority, in one material point, to animals, and have the advantage of not only all their own experience in the world, but that of many generations now in the dust.

History is only to be rendered intelligible by dates and periods. By dates is meant the years in which events happened; by periods is meant the dates of the most remarkable events. Some people say they cannot remember and do not care for dates; but this is only because they cannot remember and do not care for events. If a person has a general idea of history, dates become ideas—it may be said, leading ideas—serving to arrange the whole in his mind. In fact, dates form the perspective of history, and, without them, the whole would be a confused mass, like a picture in which sheep at a distance are made as big as churches in the front.

The present year, every body knows, is 1833; that is, the eighteen hundred and thirty-third year since the birth of Jesus Christ, the founder of the Christian religion. Go back three years, and we have 1830, when the present king acceded to the throne. Go back thirteen years, and we have 1820, when George the Fourth became king. Go back thirty-three years, and we have 1800, when the kingdoms of Great Britain and Ireland were united under one legislature. If we go back to 1714, which is a hundred and nineteen years ago, we have the date of the accession of the present royal family to the throne, in the person of King George the First, who was his present Majesty's grandfather's grandfather. All these are *periods*, particularly the last, because the sway of the Stuarts (another family) then came to an end. The next great period is the Revolution of 1688, when the people expelled one king (James the Second), because he was a tyrant and a Catholic, and set another (William the Third) on the throne, because he was a Protestant, and willing to rule with a more moderate exercise of power. We may next mention the period 1603 (two hundred and thirty years since), when the two kingdoms of England and Scotland were united under one monarch, by the accession of James the Sixth of Scotland to the throne of England. Previous to that period, the political history of these two countries was quite distinct, to the great discomfort and injury of both. Go back sixty-six years farther—namely, to the year 1537—and we have the date of the Reformation of religion in England, perhaps the most important event in its history. Fifty-two years earlier we have 1485, when the line of the Plantagenet race of sovereigns ceased in the person of Richard the Third, and a period was at the same time put to a contest and civil war, which had raged on account of two rival branches of that family for many years. All before this period is rude and warlike, as if men were different in nature from what they are now; all after, though occasionally rude enough, is something like the mildness and intelligence and neighbourly peacefulness of the present day. History, therefore, before the year 1485, is of much less use than what follows; the experience which it teaches does not bear so strongly on the circumstances of the present age. As we go back farther and farther, we find always a more and more imperfect government and system of laws, till, about the beginning of the Christian era, we reach the ages of absolute barbarism.

CONQUEST OF BRITAIN BY THE ROMANS.

At the time when the British islands were inhabited by barbarians, the Romans had extended their sway over nearly the whole of the known world, being a people almost as enlightened, or at least the ruling classes among them were so, as the people now living in Great Britain. Our islands being situated at the extremity of the earth, as then known, came late under the attention of the Romans. It was not till the year 55 before Christ, that their great captain, Julius Cæsar, having subdued Gaul (now France), thought of extending his conquests to the opposite island, of which he was so ignorant, that he had to gather some Gaulish merchants to tell him about it. He disembarked near Deal, and soon overawed the savage natives, though they were naturally warlike, and averse from a foreign yoke. He did not, however gain a proper footing in the country till the succeeding year (54 before Christ), when he employed no fewer than eight hundred vessels to convey his troops from Gaul. Except on the coasts, where some tillage prevailed, the British tribes lived exactly as the Indians now do, upon animals caught in hunting, and fruits which grew spontaneously. They stained and tattooed their bodies, and had no religion but a bloody idolatry called Druidism.

Little was done on this occasion to establish the Roman power in Britain; but about a century afterwards, namely, in the year of Christ 43, when the Emperor Claudius was reigning at Rome, another large army invaded the island, and reduced a considerable part of it. A British prince, called Caradoc or Caractacus, who had made a noble defence against their arms, was finally taken and sent prisoner to Rome, where he was regarded with the same wonder as we would bestow upon a North American chief who had greatly obstructed the progress of our settlements in that quarter of the world. In the year 61, an officer named Suetonius did much to reduce the Britons, by destroying the numerous Druidical temples in the Isle of Anglesey; religion having, in this case, as in many others since, been a great support to the patriotic cause. Soon after, he overthrew the celebrated British Princess Boadicea, who had raised an almost general insurrection against the Roman power. In the year 79, Agricola, a still greater general, extended the influence of Rome to the Firths of Forth and Clyde (that is to say, over the southern part of the country now called Scotland), which he formed into a frontier, by connecting them with a chain of forts. He was the first to sail round the island. In the year 84, having gone a little beyond the Forth, he gained a decisive victory over the rude inhabitants of the north, who were assembled under a chief named Galgacus.

It is generally allowed that the Romans experienced an unusual degree of difficulty in subduing the Britons; and it is certain that they were entirely baffled in all their attempts upon the northern part of Scotland, which was then called Caledonia. The most they could do with the inhabitants of that country, was to build walls across the island to keep them by themselves. The first wall was built in the year 120, by Hadrian, between Newcastle and the Solway Firth. The second was built by Antoninus, on the line of forts between the Firths of Forth and Clyde. When the conquest was thus so far completed, the country was divided into six provinces, of the following names and boundaries:—*Britannia Prima*, or First Britain, to the south of the Thames and Severn; *Britannia Secunda*, or Second Britain, containing Wales and the adjoining districts along the Severn; *Flavia Cæsariensis*, from the two former provinces to the German Ocean, the Humber, and the Don; *Maxima Cæsariensis*, to the north of the Humber, from its mouth, to the mouths of the Tyne and Eden; *Valentia*, from the Tyne and Eden to the Forth and Clyde; *Vespasiana*, the level country beyond the Forth, over which they had only a temporary dominion. The country was governed in the usual manner of a Roman province; and towns began to rise in the course of time, being generally those whose names are now found to end in *chester*, a word derived from *castra*, the Latin word for a camp. The Christian religion was also introduced.

CONQUEST BY THE SAXONS

A time came, by and bye, when the Romans could no longer defend their own proper country against the nations in the north of Europe. The soldiers were then withdrawn from Britain (about the year 440), and the people left to govern themselves. The Caledonians, who did not like to be so much straitened up in the north, took advantage of their unprotected state to pour in upon them from the other side of the wall, and despoil them of their lives and goods. The British had no resource but to call in another set of protectors, the Saxons, a people who lived in the north of Germany, and were very warlike and enterprising. The remedy was found hardly any better than the disease. Having once acquired a footing in the island, this hardy nation proceeded to make it a subject of conquest, as the Romans had done before—with this material difference, that they drove the British to the western parts of the island, particularly into Wales, and settled themselves, and new hordes of their countrymen, over the better part of the land. So completely was the population changed in this manner, that, excepting in the names of some of the hills and rivers, the British language was extinguished, and even the name of the country itself was changed from what it originally was, to Angle-land, or England, a term taken from the Angles, who were a detachment of the Saxon conquerors. The conquest required about a hundred years, and, like that of the Romans, it extended no farther than the Firths of Forth and Clyde. The great warrior Arthur, of whom every body has heard, was a patriotic prince of the Britons, who in vain tried to defend his country from the Saxons.

England, exclusive of the western regions, was now divided into seven kingdoms, called Kent, Northumberland, East Anglia, Mercia, Essex, Sussex, and Wessex, each of which was governed by a race descended from the leader who had first subdued it; and the whole have since been called by historians the *Saxon Heptarchy*, the latter word being composed of two Greek words signifying *seven kings*. The kingdom of Northumberland included the present Scottish counties of Berwick, Roxburgh, and the Lothians; while Lanarkshire and Dumfriesshire, with part of the present northern counties of England, formed a British kingdom called Strathclyde. To the north of the Firth of Forth, dwelt a nation called the Picts, who had also a king; and in the Highlands there was another nation, known by the name of the Scots, who had come thither from Ireland in the year 503, and established a monarchy, destined in the long-run to absorb all the rest. There were at one period no fewer than fifteen kings, all reigning at once in the island of Britain, and Ireland was in much the same situation. The prosperity of the whole has been found to increase as these small principalities were gradually amassed together: it has only happened, very unfortunately, in Ireland, that a distinction in religion, and some other causes, have prevented that union of national feeling which has elsewhere followed the political union of the different nations.

The Saxon Heptarchy prevailed from about the year 585 to 800, when Egbert, King of Wessex, acquired a paramount power over all the other states, though their kings still continued to reign. Alfred, of whom all must have heard, was the grandson of Egbert, and began to reign in the year 871. At this time, the Danes, who are now a quiet inoffensive people, were a nation of pirates, and, at the same time, heathens. They used to come in large fleets, and work dreadful ravage on the shores of Britain. For some time, they completely overturned the sovereignty of Alfred, and compelled him to live in obscurity in the centre of a marsh. But he at length fell upon them, when they thought themselves in no danger, and regained his kingdom. Alfred spent the rest of his life in literary study, of which he was very fond, and in forming laws and regulations for the good of his people. He was, perhaps, the most able, most virtuous, and most popular prince that ever reigned in Britain; and all this is the more surprising, when we find that his predecessors and successors, for many ages, were extremely cruel and ignorant. About his time, the country of England became divided into counties. He died in the year 901, in the fifty-third year of his age.

The Saxon line of princes continued to reign, with the exception of three Danish reigns, till the year 1066, when the crown was in the possession of a usurper named Harold. The country was then invaded by William Duke of Normandy, a man of illegitimate birth, attended by a large and powerful army. Harold opposed him at Hastings (October 14), and, after a well-contested battle, his army was defeated, and himself slain. William then caused himself to be crowned king at Westminster; and in the course of a few years he succeeded, by means of his warlike Norman followers, in completely subduing the Saxons. His chiefs were settled upon the lands of those who opposed him, and became the ancestors of the present nobility of England.

Previously to this period, the church of Rome, which was the only surviving part of the power of that empire, had established its supremacy over England. The land was also subjected to what is called the feudal system, by which all proprietors of land were supposed to hold it from the king for military service, while their tenants were understood to owe them military service, in turn, for their use of the land. All orders of men were thus kept in a chain of servile obedience, while some of the lower orders were actually slaves to their superiors.

In the year 853, Kenneth, King of the Scots, had added the British kingdom to his own, and his descendant Malcolm the Second, in 1020, extended his dominions over not only the south of Scotland, but a part of the north of England. Thus the whole island, putting aside Wales, was divided into two kingdoms, of unequal magnitude and strength—the kingdom of England and the kingdom of Scotland, under which distinctions they were destined to continue for several hundred years, neither being able to make much impression upon the other.

THE NORMANS.

William the First, surnamed the Conqueror, reigned from 1066 till 1087, being chiefly engaged all that time in completing the subjugation of the Saxons. He was a monarch of much sagacity and power to command, but of a violent and brutal character. His eldest son Robert, happening to be at a greater distance from London than William, who was the second son, that individual seized upon the crown, of which he could not afterwards be dispossessed, till he was shot accidentally by an arrow in the New Forest, in the year 1100. In the latter part of this king's reign, the whole of Christian Europe was agitated by the first crusade—an expedition for the recovery of the Holy Land from the Saracens. Robert of Normandy had a high command in this enterprise, and gained much glory as a warrior; but while he was in Italy, on his return, his youngest brother Henry usurped the throne left vacant by William, so that he was again disappointed of his birthright. Henry the First, surnamed Beauclerk, from his being a fine scholar, was a prince of some ability; but he disgraced himself by putting out the eyes of his eldest brother, and keeping him nearly thirty years in confinement. Such barbarous conduct shows that, in this age, might was the only right, and that men hesitated at no actions which might promise to advance their own interests.

Contemporary with William the Conqueror in England, was Malcolm the Third in Scotland, surnamed *Canmore*, from his having a large head. This prince, after overthrowing the celebrated usurper Macbeth, married Margaret, a fugitive Saxon princess, through whom his posterity became the heirs of that race of English sovereigns. He was a good prince, and, by settling Saxon refugees upon his lowland territory, did much to improve the character of the Scottish nation, who are described as having been, before this time, a nation in which there was no admixture of civilization. At Malcolm's death, in 1093, the crown was contested for a while by an usurper called Donald Bane, and the elder sons of the late monarch, but finally fell to the peaceable possession of his youngest son David the First, who was a prince of much superior character, apparently, to the Norman sovereigns who lived in the same age. It was David who founded so many of the abbeys and monasteries which still overspread the land.

Henry Beauclerk of England, in order to strengthen his claim by a Saxon alliance, married Maud, the daughter of Malcolm Canmore and of the Princess Margaret. By her he had an only daughter of the same name, whom he married first to the Emperor of Germany, and then to Geoffrey Plantagenet, eldest son of the Earl of Anjou, in France. This lady and her children by Plantagenet were properly the heirs of the English crown; but on the death of Henry, in 1135, it was seized by an usurper, named Stephen, a distant branch of the Conqueror's family, who reigned for nineteen years, during which the country was rendered almost desolate by civil wars, in which David of Scotland occasionally joined. At this time, the birthright of princes used to cause immense bloodshed and misery among the people in other quarters of Europe, besides England. A Duchess of Brittany being declared unfaithful by her husband on his death-bed, caused the devastation of that province before the succession was settled.

On the death of Stephen, in 1154, the crown fell peacefully to Henry the Second, who was the eldest son of Maud, and the first of the Plantagenet race of sovereigns. Henry was an acute and politic prince, though not in any respect more amiable than his predecessors. His reign was principally characterised by a series of measures for reducing the power of the Romish clergy, in the course of which, some of his courtiers, in 1171, thought they could not do him a better service than to murder Thomas à Becket, archbishop of Canterbury, who had been the chief obstacle to his views, and was one of the ablest and most ambitious men ever produced in England. For his concern in this affair, Henry had to perform a humiliating penance, which is not wonderful, however, when we consider, that, about this time, the Pope caused two kings to lead his horse.

Henry was the most powerful king that had yet reigned in Britain. Besides the great hereditary domains which he possessed in France, and for which he did homage to the king of that country, he caused William of Scotland, the grandson of David, to acknowledge himself as his vassal for the whole of that kingdom. [William reigned from 1166 to 1214.] Henry also added Ireland to his dominions. This island had previously been divided into five different kingdoms—Munster, Leinster, Meath, Ulster, and Connaught. The people, being quite uncivilized, were perpetually quarrelling among themselves; and this, with their heathen religion, furnished a flimsy pretext for invading them from England. Dermot Macmorrough, King of Leinster, having been dethroned by his subjects, introduced an English warrior, Richard Earl of Strigul, generally called *Strongbow*, for the purpose of regaining his possessions. The discipline of fifty knights, ninety esquires, and four hundred and sixty archers, in all six hundred men, enabled them to overthrow the whole warlike force that could be brought against them; and the conquest was easily completed by Henry in person, who went thither in 1172. The military leaders were left to rule over the country, and they managed their trust so ill, that the Irish never became peaceable subjects of the Norman king, as the English had gradually done.

MAGNA CHARTA.

Henry the Second was much troubled in his latter years by the disobedience of his children. On his dying, at length, in 1189, he was succeeded by his son Richard, styled *Cœur de Lion*, from his headstrong courage, and who was much liked by his subjects on that account, though it does not appear that he possessed any of the other good qualities which usually command affection. At the coronation of Richard, the people were permitted to massacre many thousands of unoffending Jews throughout the kingdom. He was in reality a military savage, only redeemed a little by the profession of religion, and of what is called chivalry. Almost immediately after his accession, he joined the King of France in a second crusade; landed in Palestine, and fought with prodigious valour, but no good result; and then, returning with a small remnant of his gallant army, wandered in disguise into the dominions of his mortal enemy, the Duke of Austria, who, with the Emperor of Germany, detained him till he was redeemed by a ransom, which impoverished nearly the whole of his subjects. This prince spent the rest of his life in unavailing wars with Philip of France, and was killed at the siege of a castle in Limousin, in 1199, after a reign of ten years, of which he had spent only about three months in England.

John, the younger brother of Richard, succeeded, although Arthur Duke of Bretagne, the son of an intermediate brother, was the proper heir. John who was at once vain, cruel, and weak, alienated the affections of his subjects almost at the very first, by the assassination of his nephew, which he is said to have performed with his own hands. It happens, however, that the weakness of kings is often the means of giving increased liberties and privileges to the people. The paltry tyranny and wickedness of John caused his barons to rise against him, and the result was, that, on the 19th June 1215, he was compelled by them to grant what is called the *Magna Charta*, or great charter, for securing the various orders of his subjects in their rights. The clergy and barons, who acted in this noble enterprise, gained for themselves many privileges and exemptions, which suited their own interests; but they fortunately deemed it necessary, in order to procure the support of the people, to stipulate something for them also. The principal point secured to the barons and commoners was, that no tax or supply should be levied from them without their own consent in a Great Council—the first idea of a Parliament. Some excellent provisions were also made regarding courts of law and justice, so as to secure all but the guilty. The Pope was dreadfully wroth at this invasion of the royal privileges; he excommunicated the barons, declaring them to be worse than infidels. The opinion of a modern historian is very different; he says, "To have produced it (namely, the Great Charter), to have preserved it, to have matured it, constitute the immortal claim of England on the esteem of mankind."* And such is now the universal sentiment regarding this first bulwark of English liberty.

FIRST PARLIAMENT.

On the death of John, in 1216, he was succeeded by his son Henry the Third, then a boy in the tenth year of his age, who eventually proved as weak, but not just so wicked, as his father. In his reign was held the first assemblage approaching to the character of a Parliament. It was first called in 1225, in order to give supplies for carrying on a war against France. The money was only granted on condition that the Great Charter should be confirmed; and thus the example was set at the very first, for rendering supplies a check upon the prerogative of the king, and gradually reducing that power to its present comparatively moderate level. Under the earlier Norman kings, and even, it is believed, under the Saxons, an assembly called the Great Council had shared with the sovereign the power of framing laws; but it was only now that the body had any power to balance that of the king, and it was not till 1265 that representatives from the inhabitants of towns were introduced.

EDWARD THE FIRST.

The reign of Henry the Third, extending to fifty-six years, was characterised by frequent civil broils, and was disgraced by the pusillanimity of the king; but it derives a lustre, with which the king has no connection, from its having given birth to the present constitution, or system of legislature and government. Edward, the son of Henry, succeeded (1272), a prince as warlike and sagacious as his father was the reverse. He distinguished himself by his odious attempts to add Wales to his kingdom, an object which he accomplished in 1282, by the overthrow and murder of Llewellen, the last prince of that country. In the meantime, from the death of William the Lion in 1214, Scotland had been ruled by two princes, named Alexander the Second and Alexander the Third, under whom it advanced considerably in wealth, civilization, and comfort. On the death of Alexander the Third, in 1285, the crown fell to his grand-daughter Margaret, a young girl, whose father was Eric, King of Norway. Edward formed a treaty with the Estates of Scotland for a marriage between this princess and his son, whom he styled Prince of Wales. Unfortunately, the young lady died on her voyage to Scotland; and the crown was left to be disputed by a multitude of distant relations, of whom John Baliol and Robert Bruce seemed to have the best right. Edward, being resolved to make Scotland his own at all hazards, interfered in this dispute, and being appointed arbitrator among the competitors, persuaded them to own, in the first place, an ill-defined claim put forward by himself of the right of paramountcy or superior sovereignty over Scotland. When this was done, he appointed Baliol to be his vassal king, an honour which the unfortunate man was not long permitted to enjoy. Having driven Baliol to resistance, he invaded the country, overthrew his army, and, stripping him of his sovereignty, assumed to himself the dominion of Scotland, as a right forfeited to him by the rebellion of his vassal. After he had retired, a brave Scottish gentleman, named William Wallace, raised an insurrection against his officers, and, defeating his army at Stirling in 1297, cleared the whole country of its southern invaders. But in the succeeding year, this noble patriot was defeated by Edward in person at Falkirk, and the English yoke was again imposed. It is to be remarked, that this could have hardly taken place if the common people, who rose with Wallace, and who were exclusively of Celtic and Saxon race, had been led and encouraged by the nobility. The grandees of Scotland, and even the competitors for the crown, being recent Norman settlers, paid more reverence to Edward than to the national

* Mackintosh's History of England, Cabinet Cyclopædia.

spirit of Scotland, and thus were disposed to betray the independency of that kingdom into the hands of the usurper. At length, as Edward became engrossed with his French wars, ROBERT BRUCE, Earl of Carrick, grandson of him who had competed with Baliol, conceived the idea of putting himself at the head of the Scots, and endeavouring, by their means, at once to gain the crown, and to recover the independence of the kingdom. After a series of adventures, among which was the unpremeditated murder of a rival named Comyn, Bruce caused himself, in 1306, to be crowned at Scone. For some time after, he had to skulk as a fugitive, being completely unable to maintain his ground against the English officers; but at length he became so formidable, that Edward found it necessary (1307) to lead a large army against him. The English monarch, worn out with fatigue and age, died on the coast of the Solway Firth, when just within sight of Scotland, leaving his sceptre to his son EDWARD THE SECOND. That weak and foolish prince immediately returned to London, leaving Bruce to contest with his inferior officers. After several years of perpetual skirmishing, Bruce was at last met on the open field by King Edward, who had a hundred thousand men to oppose to thirty thousand Scots. The result of the battle of Bannockburn, fought on the 24th of June 1314, was the complete rout of the English army, and the flight of the king, who never again molested Bruce in his hard-won sovereignty. Thus, at the time when Ireland was sinking under English rule, through its unfortunate internal dissensions, the national spirit of the Scots, united under one beloved leader, saved their comparatively poor country from that disaster, and enabled it, at the proper time, to accede to a union, instead of submitting to a conquest.

The weakness of Edward the Second chiefly took the direction of a fondness for favourites, into whose hands he committed the whole interests of his people. In private life, extravagant friendships, or a custom of depending much upon the company and countenance of others, is always a strong general mark of an inferior character; but in sovereigns, the infirmity becomes a crime. Edward's first favourite, a low Frenchman, named Piers Gaveston, fell a victim to the indignation of the barons. His second, Hugh Spencer, misgoverned the country for several years, till at length the Queen and Prince of Wales raised an insurrection against the King, and caused him to be deposed, as quite unfit to reign. The prince was then crowned as EDWARD THE THIRD (1327), being as yet only about fourteen years of age; and, in the course of a few months, the degraded monarch was cruelly murdered in Berkeley Castle.

During the minority of the young king, the reins of government were held by his mother and the Earl of March. Under their administration, a peace was concluded with King Robert of Scotland, of which one of the conditions was a full acknowledgment of the independency of the Scottish monarchy. The English historians have since laboured to prove, that, in earlier times, the King of Scots really did hold his kingdom from the sovereign of England. Even if this had been the case, it would have been the greater honour to Scotland to have retrieved its independence. The holding of one king from another, in an early age, was a comparatively slight matter, according to the feudal ideas; but it was a noble matter for a small nation to have thoroughly shaken off a greater, at a time when others were sinking in *actual bondage* under England.

EDWARD THE THIRD.

Edward the Third, who soon after assumed full power, was destined to make good the remark prevalent at this time, that the kings of England were alternately able and imbecile. He was a warlike and sagacious monarch, and inspired by all his grandfather's desire of conquest. In 1329, Robert Bruce died, and was succeeded by his infant son David the Second, to whom a young sister of the English king was married, in terms of the late treaty. Notwithstanding this connection, Edward aided a son of John Baliol in an attempt to gain the Scottish crown. Edward Baliol overthrew the Regent of Scotland, at Dupplin, September 1332, and for two months reigned as King of Scots, while David and his wife took refuge in France. The usurper afterwards returned, and for many years the country was harassed by unceasing wars, in which the English took a leading part. But for his attention being diverted to France, Edward the Third would have made a more formidable effort to subdue Scotland, and might have succeeded. He was led into a long course of warfare in that more wealthy country, in consequence of an absurd pretension which he made to the throne of France. In the victories which he gained at Cressy (August 26, 1346) and Poitiers (September 17, 1356), the national valour, and his own, and that of his celebrated son, the Black Prince, were shown conspicuously; but this lavish expenditure of the resources of his kingdom, in which he was supported by his Parliament, was of no permanent benefit, even to himself, for whom alone it was made. In those days, almost all men fought well, but very few had ever the art to improve their victories. John, King of France, who had been taken at Poitiers, and David, King of Scotland, who had been taken in 1346, while conducting an invasion of England, were at one time the prisoners of Edward the Third; but no permanent advantage

was ever gained over either of the states thus deprived of their sovereigns. In 1361, after about twenty years of active fighting, the English king left France with little more territory than he had previously enjoyed. Edward had invaded Scotland with a powerful army in 1356, but without making any impression. The Scots, under David's nephew, Robert Stewart, effectually protected themselves, not only from his arms, but from a proposal which David himself basely undertook to make, that Lionel, the third son of the English king, should be acknowledged as his successor. Edward died in 1377, a year after the decease of his son the Black Prince; and, notwithstanding all their brilliant exploits, the English territories in France were less than at the beginning of the reign. The truth is, kings at this time acted only like bold and thoughtless children, and their inferiors were held of no use but to be their playthings.

RICHARD THE SECOND.

RICHARD THE SECOND, son of the Black Prince, succeeded—a gay, profligate, and wicked youth. Stung by the severity of a tax imposed upon all grown-up persons, the peasantry of the eastern parts of England rose, in 1381, under a person of their own order, named Wat Tyler, and advanced sixty thousand strong to London, where they put to death the Chancellor and Primate, as evil counsellors of their sovereign. They demanded the abolition of bondage, the liberty of buying and selling in fairs and markets, a general pardon, and the reduction of the rent of land to an equal rate. The king came to confer with them at Smithfield, where, on some slight pretence, Walworth, mayor of London, stabbed Wat Tyler with a dagger—a weapon which has since figured in the armorial bearings of the metropolis. The peasants were dismayed, and submitted, and no less than fifteen hundred of them were hanged. Wat Tyler's insurrection certainly proceeded upon a glimmering sense of those equal rights of mankind which have since been generally acknowledged; and it is remarkable, that at the same time the doctrines of the reformer Wickliffe, who has been called the Morning Star of the Reformation, were first heard of.

HENRY THE FOURTH.

Richard the Second misgoverned his country till 1399, when he was deposed by his subjects under the leading of his cousin, Henry Duke of Lancaster. This person, though some nearer the throne were alive, was crowned as HENRY THE FOURTH, and his predecessor, Richard, was soon after murdered. In the meantime, David of Scotland died in 1371, and was succeeded by Robert Stewart, who was the first monarch of that family. Robert the First dying in 1389, was succeeded by his son Robert the Second, who was a good and gentle prince. He had two sons, David and James: the former was starved to death by his uncle, the Duke of Albany; and the second, when on his way to France for his education, was seized by Henry the Fourth of England, and kept captive in that country for eighteen years. Robert the Second then died of a broken heart (1406), and the kingdom fell into the hands of the Duke of Albany, at whose death, in 1419, it was governed by his son Duke Murdoch, a very imbecile personage.

THE HOUSE OF LANCASTER.

Henry of Lancaster proved a prudent prince, and, comparatively, a good ruler. The settlement of the crown upon him by Parliament was a good precedent, though, perhaps, only dictated under the influence of his successful arms. He was much troubled by insurrections, particularly a formidable one by Percy Earl of Northumberland—and one still more difficult to put down, in Wales, where Owen Glendower, a descendant of the British princes, kept his ground for several years. On the death of Henry in 1413, his son succeeded as HENRY THE FIFTH—a prince, youthful, brave, and victorious, and, therefore, revered by the people of England, although he seems to have been destitute of humanity, like most of the other individuals whom mankind have hitherto agreed to call great. The Lollards, a body of religious reformers of this age, were by him condemned in multitudes to the flames; and the splendid victory which he gained at Agincourt (October 25, 1415), in the course of his French wars, was stained by the deliberate massacre of several thousand prisoners, whom he feared to leave in life. He succeeded, in a great measure, in asserting the claims of his family to the throne of France, and actually, for some time, conducted the government at Paris. But he died in the prime of life, 1422, leaving the crown to an infant nine months old, who was proclaimed as Henry the Sixth, King of France and England.

Under HENRY THE SIXTH, whose power was for some time in the hands of his uncle the Duke of Bedford, the English maintained their footing in France for several years, and, at the battle of Verneuil, in 1424, rivalled the glory of Cressy and Poitiers. At that conflict, a body of Scotch, seven thousand strong, who had proved of material service to the French, were nearly cut off. In 1428, when the nation seemed completely sunk beneath the English rule, the interests of the native prince were suddenly revived by a simple maiden, named Joan of Arc, who pretended to have been commissioned by Heaven to save her country, and, entering into the French army, was the cause of several signal reverses to the English. By her enthusiastic exertions, and the trust every where reposed in her supernatural character, Charles the Seventh was crowned at Rheims, in 1430. Being soon after taken prisoner, the heroic maiden was, by the English, condemned for witchcraft, and burnt. Nevertheless, about the year 1453, the French monarch had retrieved the whole of his dominions from the English, except Calais, and no other attempt was ever made to reduce that country.

Henry the Sixth was remarkable for the extreme weakness of his character. His cousin Richard Duke of York, descended from an elder son of Edward the Third, and, therefore, possessed of a superior title to the throne, conceived that this imbecility of the monarch afforded an excellent opportunity for asserting what he thought his birthright. Thus commenced the famous *Wars of the Roses*, as they were called, from the badges of the families of York and Lancaster, the former of which was a red, while the latter was a white rose. In 1454, the duke gained a decisive victory over the forces of Henry, which were led by his spirited consort, Margaret of Anjou. In some succeeding engagements, the friends of Henry were victorious; and at length, in the battle of Wakefield (December 24, 1460), the forces of the Duke of York were signally defeated, and himself slain. The pretensions of this claimant were then taken up by his eldest son Edward, who, with the assistance of the Earl of Warwick, gained such advantages next year, that he assumed the crown. Before this was accomplished, many thousands had fallen on both sides. Henry, who cared little for the pomp of sovereignty, was confined in the Tower.

Scotland, in the meantime, had (1424) redeemed her king from his captivity in England; and that prince, styled JAMES THE FIRST, had proved a great legislator and reformer, not to speak of his personal accomplishments in music and literature, which surpassed those of every contemporary monarch. James did much to reduce the Highlands to an obedience under the Scottish government, and also to break up the enormous power of the nobles. By these proceedings, however, he excited a deep hatred in the bosoms of some of his subjects; and, in 1437, he fell a victim to assassination at Perth. He was succeeded by his infant son JAMES THE SECOND, the greater part of whose reign was spent in a harassing contention with the powerful house of Douglas, and who was finally killed in the flower of his age, by the bursting of a cannon before Roxburgh Castle. His successor, JAMES THE THIRD, was also a minor, and, on reaching man's estate, proved to be a weak, though not ill-meaning prince. He fell a victim, in 1488, to a conspiracy formed by his subjects, and which was led by his eldest son. The morality of princes in this age seems to have been much upon a par with that ascribed to the Turkish sovereigns of a later age. They never scrupled to destroy life, either within the circle of their own family, or out of it, when it suited their interests to do so.

HOUSE OF YORK.

EDWARD THE FOURTH reigned ten years, perpetually disturbed by renewed attempts of the Lancastrian party, of which he mercilessly sacrificed many thousands who fell into his hands. At length, having offended the Earl of Warwick, who had been chiefly instrumental in placing him upon the throne, that powerful nobleman raised an insurrection against him, and in eleven days was master of the kingdom, while Edward had to take refuge on the Continent. Henry the Sixth was then restored, and Warwick acquired the title of King-maker. Nine months after (1471), Edward landed with a small body of followers, and, having called his partisans around him, overthrew and killed Warwick at St Alban's. Margaret of Anjou, who had fought battles for her husband in almost every province of England, gathered a new army, and opposed Edward at Tewkesbury Park, where she was completely defeated. Her son and husband, being taken, were murdered in cold blood, and she herself spent the remainder of her singular life in France. Edward reigned, a profligate and a tyrant, till 1483, when he died in the forty-second year of his age. He had previously caused his brother, the equally profligate Duke of Clarence, to be drowned in a butt of malmsey wine.

Edward the Fourth was supposed to be succeeded by his son EDWARD THE FIFTH, a mere boy; but his brother, the Duke of Gloucester, a wicked and deformed wretch, in whom all the bad qualities of the family seemed concentrated, caused the young prince, with his still younger brother, to be murdered in the Tower, and soon after mounted the throne under the title of RICHARD THE THIRD. For two years, this disgrace to humanity retained possession of the English throne, though universally abhorred by his people. At length, in 1485, Henry Tudor, Earl of Richmond, a connection rather than a descendant of the Lancaster family, resolved to attempt the dethronement of this monster. Having landed with about two thousand followers at Milford Haven, he advanced into the country, and speedily gained such accessions of force as enabled him to meet and overthrow Richard at Bosworth Field, where the tyrant was slain, and the victorious Richmond was immediately proclaimed king, under the title of HENRY THE SEVENTH. The new monarch soon after sought to strengthen his title by marrying Elizabeth, the daughter and heir of Edward the Fourth, by which it was supposed the families of York and Lancaster were united.

THE TUDORS—HENRY THE SEVENTH.

Under Henry the country revived from a long course of civil wars, in the course of which far more than a hundred thousand men had been slain, the most powerful of the nobility broken down, and the industry and commerce of the land interrupted and laid waste. Even during that dreadful contest, it was remarked that the evils of war fell chiefly on those who made it; that the government, however disturbed by various claimants of the throne, was mild and equitable—at least as compared with that of other countries, and that the people throve under a system in which their own consent, by the voice of the House of Commons, was necessary to the formation of every new law, and the imposition of every tax. It was remarked at this time by Sir John Fortescue, an exiled English judge, that the comparatively despotic monarchy of France produced oppressions and grievances from which the English subject was exempt. According to this lawyer, the sovereign of England held his power from and in behalf of the people, and not from any abstract right, as was pretended by other kings. This idea could never have arisen, but for the repeated breaks in the succession which have already been described. The English kings had in fact undersold each other to the people, and thus, in the course of time, bated down their rights, as they called them, to something very trifling compared with what they were at first. Thus it may be seen that the usurpations which had occasioned so much civil war and bloodshed had also transferred a great deal of power from the hands of the few to the many, and gradually paved the way for the freedom which now prevails.

The reign of Henry the Seventh was much disturbed by insurrections, in consequence of his imperfect title. Some friends of the house of York, rather than want a real claimant on that side, set up a baker's boy, named Lambert Symnel, to personate the son of the late Duke of Clarence; and an army of about eight thousand men was led into the field to assert his pretensions to the crown. This force was defeated at Stoke, in Northamptonshire (June 1487), and Symnel being taken, was contemptuously appointed by the king to be one of his menial servants. A similar pretender, named Perkin Warbeck, but affecting to be Richard Duke of York, the younger brother of Edward the Fifth, set up his claims (1493), and received great encouragement in Ireland, Flanders, and Portugal, by means of which he landed with a considerable force at Deal, but was defeated and obliged to re-embark. This youth, who is said to have been the son of a Jew, next found refuge in Scotland, where James the Fourth, a young and gallant sovereign, was now reigning. James gave to Perkin in marriage a young lady connected with the royal family, and undertook an expedition into the north of England, in favour of his pretensions. This enterprise failed entirely in its object, and the Scottish king soon after deserted the cause of the impostor. Perkin subsequently raised a formidable insurrection in the southern counties of England, but, when about to encounter the royal forces, deserted his army, and took refuge in a monastery, where, according to the ideas of that age, his person was quite secure from all earthly force whatsoever. Here he was literally besieged by the royal army, who, though they could not touch him within the building, were yet able to starve him into a surrender, exactly after the manner of a garrison in an impregnable fortress. Perkin capitulated, and was brought to London, where a pretence was soon found for hanging him (November 23, 1499) at Tyburn. Almost at the same time, Henry procured the judicial assassination of the Earl of Warwick, the real son of the late Duke of Clarence, a poor idiot boy, whom he had kept fifteen years in confinement, and whose title to the crown, being superior to his own, rendered him uneasy. Henry also, in the same manner, killed his own stepfather Sir William Stanley, the individual who had chiefly aided him in obtaining the throne of England. It will be seen with surprise, by the reader, that it was not till a somewhat later period, that the sovereigns of this great country began to have scruples about putting their relations to death.

Henry, though a bloody tyrant, like the rest of his race, was a sagacious and peaceful sovereign. With laudable forethought, he was anxious to seal a peace with Scotland, by marrying his eldest daughter Margaret to James the Fourth; a marriage which, he calculated, might lead to the union of two countries hitherto only productive of war and misery to each other. The marriage took place in August 1503, and Henry's calculation was fulfilled exactly a hundred years after, by the accession of the great-grandson of the royal pair (James the Sixth) to the throne of England.

HENRY THE EIGHTH.

At the death of Henry the Seventh, in 1509, his son HENRY THE EIGHTH succeeded, a prince then in his eighteenth year, and whose character seemed at first that of a gay and jovial young man. Some years before, he had been affianced to Catherine, a Spanish princess, who had previously been the wife of his deceased brother Arthur; he was now married to this lady, the Pope having previously granted a dispensation for that purpose. For many years the reign of Henry was unmarked by any unusual incidents. The chief administration of affairs was committed to a low-born but proud churchman, the celebrated Cardinal Wolsey. The king became much engaged in continental politics; and, during a war which he carried on against France, his brother-in-law James the Fourth, who sided with that state, made an unfortunate irruption into the north of England, and was overthrown and slain, with the greater part of his nobility (September 9, 1513), at Flodden.

Several changes of great importance to European society took place about this time. Ever since the destruction of the Roman empire, the nations which arose out of it had remained in subjection to the papal see, which might be said to have inherited the universal dominion of that government, but altered from an authority over the bodies of men to an empire over their minds. It is said that this authority of the Roman Catholic religion had, in the course of time, become much abused, while the religion itself was corrupted by many superstitious observances. So long as men had continued to be the thoughtless warriors and unlettered peasants which they had been in the middle ages, it is not probable that they would ever have called in question either the authority of the Pope, or the purity of the Catholic faith. With knowledge, however, and the rise of a commercial and manufacturing class, came a disposition to inquire into the authority of this great religious empire. The art of printing, discovered about the middle of the preceding century, and which was now rendering literature accessible to most classes of the community, tended greatly to bring about this revolution in European intellect. The minds of men, indeed, seem at this time as if rising from a long sleep; and it might well have been a question with persons who had reflection, but no experience, whether the change was to turn to evil or to good. When men's minds are in a state of preparation for any great change, a very small matter is required to set them in motion. There was an Augustine monk at Wirtemberg, in Germany, of the name of Martin Luther, who became incensed at the Roman see, in consequence of some injury which he conceived to have been done to his order, by the Pope having granted the privilege of selling indulgences to the Dominican order of friars. Being a man of a bold and inquiring mind, he did not rest satisfied till he had convinced himself, and many others around him, that the indulgences were sinful, and that the Pope had no right to grant them. This happened about the year 1517. Controversy and persecution gradually extended the views of Luther, till he at length openly disavowed the authority of the Pope, and condemned some of the important peculiarities of the Catholic system of worship. In these proceedings Luther was countenanced by some of the states in Germany, and his doctrines were speedily established in the northern countries of Europe.

THE REFORMATION.

Henry the Eighth of England had been originally educated for the church, and still retained a taste for theological learning. He now distinguished himself by writing a book against the Lutheran doctrines; and the Pope was so much pleased with it, as to grant him the title of Defender of the Faith. Henry was not destined, however, to continue long an adherent of the Roman Pontiff. In the year 1527, he became enamoured of a young gentlewoman named Anne Boleyn, who was one of his wife's attendants. He immediately conceived the design of annulling his marriage with Catherine, and marrying this younger and more agreeable person. Finding a pretext for such an act in the previous marriage of Catherine to his brother, he attempted to obtain from the Pope a decree, declaring the marriage unlawful, and that the dispensation upon which it had proceeded was beyond the powers of the former Pope to grant. The Pontiff (Clement the Seventh) was much perplexed by this request of King Henry, because he could not grant it without offending Charles the Fifth, Emperor of Germany, one of his best supporters, and the brother of Queen Catherine, and at the same time humbling the professed powers of the Papacy, which were now trembling under the attacks of Luther. Henry desired to employ the influence of his minister, Cardinal Wolsey, who had now reached a degree of opulence and pride never before attained by a subject of England. But Wolsey, with all his greatness, could not venture to urge a matter disagreeable to the Pope, who was more his master than King Henry. The process went on for several years, and still his passion for Anne Boleyn continued unabated. Wolsey at length fell under the king's displeasure for refusing to serve him in this object, was stript of all his places of power and wealth, and, in November 1530, expired at Leicester Abbey, declaring, that if he had served his God as diligently as his king, he would not thus have given him over in his grey hairs. The uncontrollable desire of the king to possess Anne Boleyn—an object the most contemptible and the most base—was destined to be the immediate cause of one of the most important changes that ever took place in England—no less than a total reformation of the national religion. In order to annul his marriage with Catherine, and enable him to marry Anne Boleyn, he had to shake off the authority of the Pope, and procure himself to be acknowledged in Parliament as the supreme head of the English church. His marriage with Anne took place in 1533, and in the same year was born his celebrated daughter Elizabeth.

In 1536, Henry became as anxious to get quit of Queen Anne as he had ever been to rid himself of Queen Catherine. He had contracted a passion for Jane Seymour, the daughter of Sir John Seymour, a young lady then of the queen's bed-chamber, as Anne herself had been in that of Catharine's. In order to gratify this new passion, he accused Anne of what appears to have been an imaginary frailty, and within a month from the time when she had been an honoured queen, she was beheaded (May 19) in the Tower. On the very next day he married Jane Seymour, who soon after died in giving birth to a son (afterwards Edward the Sixth). His daughters Mary and Elizabeth were declared illegitimate by act of Parliament, and therefore excluded from the succession.

Hitherto, though professing independence of Rome, Henry still maintained, and even enforced, by severe and bloody laws, the most of its doctrines. He now took measures for altering this system of worship to something nearer the Lutheran model, and also for suppressing the numerous monasteries throughout the country. Being possessed of more despotic power, and, what is stranger still, of more popularity than any former sovereign of England, he was able to encounter the dreadful risk of offending, by these means, a vastly powerful corporation, which seems, moreover, to have been regarded with much sincere affection and respect in many parts of England. No fewer than six hundred and forty-five monasteries, two thousand three hundred and seventy-four chaunteries and chapels, ninety colleges, and a hundred and ten hospitals, enjoying altogether a revenue of one hundred and sixty-one thousand pounds, were broken up by this powerful and unscrupulous monarch, who partly seized the revenues for his own use, and partly gave them away to the persons who most actively assisted him, and who seemed most able to protect his government from the effects of such a sweeping reform. By this act, which took place in 1537, the Reformation was completed in England. Yet for many years Henry vacillated so much in his opinions, and enforced these with such severe enactments, that many persons were burnt as heretics on both sides of the question. It was in the southern and eastern parts of England, where the commercial classes at this time resided, that the doctrines of the Reformation chiefly prevailed. In the western and northern parts of the country, Catholicism was still predominant, and in Ireland, which was remotest of all from the Continent, the Protestant faith made little or no impression. After the death of Jane Seymour, Henry married Anne of Cleves, a German princess, with whose person, however, he was not pleased; and he therefore, in the coolest manner possible, divorced her by an act of Parliament. He next married Catherine Howard, niece to the Duke of Norfolk, but had not been long united to her when he discovered that she had committed a serious indiscretion before marriage. This was considered a sufficient reason for beheading the unfortunate queen, and attainting all her relations. Though Henry had thus murdered two wives, and divorced other two, and become, moreover, a monster in form as well as in his passions and mind, he succeeded in obtaining for his sixth wife (1543) Catherine Parr, widow of Lord Latimer, who, it is certain, only contrived to escape destruction by her extraordinary prudence. Almost all who ever served Henry the Eighth as ministers, either to his authority or to his pleasures, were destroyed by him. Wolsey was either driven to suicide, or died of a broken heart. Thomas Cromwell, who succeeded that minister, and chiefly aided the king in bringing about the Reformation—Sir Thomas More, lord chancellor, the most virtuous, most able, and most consistent man of his time—the Earl of Surrey, who was one of the most accomplished knights of the age, and the first poet who wrote the English language with perfect taste—all suffered the same fate with Anne Boleyn and Catherine Howard. It was truly said of Henry, that he never spared man in his rage, or women in his lust.

When James the Fourth died at Flodden, in 1513, the Scottish crown fell to his infant son James the Fifth, who struggled through a turbulent minority, and was now a gay, and, upon the whole, an amiable prince. His uncle Henry the Eighth endeavoured to bring him into his views respecting religion, but James, who was much in the power of the Catholic clergy, appears to have rather wished to become the head of the Popish party in England, in the hope of succeeding, by their means, to the throne of that country. A war latterly broke out between the two monarchs, and the Scottish army having refused to fight, from a dislike to the expedition, James died, December 1542, of a broken heart, leaving an only child, Mary, who was not above a week old. Henry the Eighth immediately conceived the idea of marrying his son Edward to this infant queen, by which he calculated that two hostile nations should be united under one sovereignty, and the Protestant Church in England be supported by a similar establishment in Scotland. This project, however, was resisted by the Scotch, of whom very few as yet were inclined to the Protestant doctrine. Henry, enraged at their hesitation, sent a fleet and army, in 1544, to inflict vengeance upon them. The Scotch endured with great patience the burning of their capital city, but still refused the match. The government of Scotland was now chiefly in the hands of Cardinal Beaton, a man of bold and decisive intellect, who zealously applied himself to suppress the heretical preachers, and regarded the English match as likely to bring about the destruction of his religion.

EDWARD THE SIXTH.

Henry the Eighth died January 28, 1547, leaving the throne to Edward the Sixth, a boy between nine and ten years old. The Duke of Somerset, maternal uncle to the young king, became supreme ruler under the title of Protector, and continued to maintain the Protestant doctrines. Under this reign, the church of England assumed its present form, and the Book of Common Prayer was composed nearly as it now exists. Somerset being resolved to attain, if possible, the match between Edward the Seventh and Mary of Scotland, invaded that country in autumn 1547, and was met at Musselburgh by a large army under the governor, the Earl of Arran. Though the Scotch were animated by bitter animosity against the English, against their religion, and against the object of their expedition, they did not fight with their usual resolution, but were defeated, and pursued with great slaughter. Finding them still obstinate in refusing to give up their queen, Somerset laid waste a great part of the country, and then retired. Previous to this period, Cardinal Beaton had been assassinated by private enemies; but the Scotch were encouraged to persevere by the court of France, to which they now sent the young queen for protection.

In the reign of Edward the Sixth, the government was conducted mildly, until the Protector Somerset was degraded from his authority by the rising influence of Dudley Duke of Northumberland, who caused him soon after to be tried and executed. Northumberland, who was a secret Roman Catholic, was not so mild or popular a ruler. Yet throughout the whole reign of Edward the Sixth, which was terminated by his death, on the 6th of July 1553, at the early age of sixteen, no religious party was persecuted, except those who denied the fundamental doctrines of the Christian religion. It would have been well for the honour of a church which has produced many great men, and to which the modern world is indebted for the very existence of Christianity, if it had not been tempted after this period to commence a very different course of action. The crown now belonged by birthright to Mary, the eldest daughter of Henry the Eighth, who was a zealous Catholic. Northumberland, however, assuming the illegitimacy of that princess, and her sister Elizabeth, set up as queen the Lady Jane Grey, who was descended from a younger sister of King Henry, and who had been married to a son of the Duke of Northumberland. Lady Jane was the most beautiful, most pure, and most amiable of all the females who appear in the history of England. Though only seventeen, she was deeply learned, and yet preserved all the unaffected graces of character proper to her interesting age. Unfortunately, her father-in-law Northumberland was so much disliked, that the Catholics were enabled to displace her from the throne in eight days, and to set up in her stead the Princess Mary. Northumberland, Lady Jane, and her husband, Guildford Lord Dudley, were all beheaded by that savage princess, who soon after took steps for restoring the Catholic religion, and married Philip the Second, King of Spain, in order to strengthen herself against the Protestant interest. Mary experienced some resistance from her Protestant subjects, and being under great suspicion of her sister Elizabeth, who professed the reformed faith, but took no part against her, was almost on the point of ordering her to execution also. As soon as she had replaced the Catholic system, and found herself in possession of sufficient power, she began that career of persecution which has rendered her name so infamous. Five out of fourteen Protestant bishops, including the revered names of Cranmer, Latimer, and Ridley, were committed to the flames as heretics; and during the ensuing part of her reign, which was closed by her death, November 17, 1558, nearly three hundred persons suffered in the same manner. These scenes did not take place without exciting a proper horror in the minds of Englishmen in general, including even many Catholics; but the royal authority was at all times too great under this line of princes to allow of effectual resistance. Such a persecution, however, naturally fixed in the minds of the British Protestants a hereditary horror for the name of Catholic, which has in its turn been productive of many retaliatory persecutions, almost equally to be lamented. In the latter part of her reign, she was drawn by her husband into a war with France, of which the only effect was the loss of Calais, the last of the French possessions of the Kings of England. The natural sourness of Mary's temper was increased by this disgraceful event, as well as by her want of children, and she died in a state of great unhappiness.

ELIZABETH.

A more auspicious scene opened for England in the accession of Elizabeth, a princess of great native vigour of mind, and who had been much improved by adversity, having been kept in prison during the whole reign of her sister. From the peculiar circumstances of Elizabeth's birth, her right of succession was denied by all the Catholics at home and abroad. This party considered Mary Queen of Scots, who was descended from the eldest sister of Henry the Eighth, and had been brought up in the Catholic faith at the court of France, as their legitimate sovereign. Elizabeth had no support in any quarter, except among her Protestant subjects. The Pope issued a bull, which, directly or indirectly, pronounced her an usurper, and gave permission to her subjects to seek her dethronement. The court of France professed to consider the Queen of Scots, who had recently been married to the Dauphin, as the Queen of England; and all the English Catholics befriended the claims of this princess. Under these circumstances, Elizabeth found no chance of safety, except in restoring and maintaining the Protestant religion in her own country, and in seeking to support it in all others where the people were favourable to it. She gained one great point, in the Reformation which now took place in Scotland, by the agency of John Knox, and a part of the nobility, who, with the assistance of a small English army, sent by Elizabeth, overthrew at once the ancient religion and the government of Mary of Guise, who acted as regent for her daughter, the queen. Elizabeth thus established a friendly, though irregular, government in Scotland, and raised an attachment towards herself among the Scotch in general, which eventually proved destructive to their Catholic sovereign.

Mary, the most renowned beauty of her time, and in early life apparently the most fortunate of women, became, in 1559, the Queen-consort of France, by the accession of her husband Francis the Second to the throne of that country. By the death of her husband, however, at the end of the year 1560, when she was only eighteen years of age, she lost in a great measure all interest in France. In August 1561, she returned to her own country, and assumed a nominal sovereignty, where in reality all authority was vested in the Protestant nobles who had lately effected the Reformation.

REFORMATION IN SCOTLAND.

The change of religion in Scotland was of a more decisive kind than it had been in England. The English Reformation was effected by sovereigns, who, while they wished to throw off the supremacy of the Pope, and some of the more odious of the Catholic rites, desired to give as little way as possible to popular principles, and, therefore, not only seized the supremacy of the church to themselves, but, by bishops and other dignitaries, preserved the church as completely in the light of a dominant power over the people, as it had ever been. In Scotland, however, where the reformation was effected by the nobles and the people, and at a time when still bolder principles had sprung up, none of this machinery of power was retained: the clergy were all equal, and all useful; only a small part of the ancient revenues was allowed to them; their general affairs, instead of being entrusted to the hands of bishops, were confided to courts formed by themselves: these courts being partly formed by lay elders, kept up a sympathy and attachment among the community, which has always been greatly wanting in the English church; and, to crown all, while a large part of the ancient revenues was absorbed by the nobles, a very considerable portion was devoted to the maintenance of parish schools, under the express control of the clergy, which at once formed regular nurseries of Protestant Christians, and disseminated instruction more extensively over this small and remote country, than it has ever been over any other part of the world; an advantage which has placed Scotchmen ever since in the most confidential and important offices in all other countries, and given to Scotland itself a lustre superior to that derived from any other source. The English have much to boast of; but in the important matter of public instruction, they are nearly three centuries behind their northern neighbours.

The affairs of England and Scotland are, for some time after this, inextricably mingled. Queen Mary had no power as a Catholic in her own country, and was obliged to govern by means of her natural brother James Stewart, Earl of Moray, who was the leader of the Protestant interest in Scotland. Personally, however, she was intimately connected with the great Catholic powers of the Continent, and became a party, in 1564, to a coalition formed by them for the suppression of Protestantism all over Europe. She had never yet resigned her pretensions to the English throne, but lived in the hope, that, when the Catholics succeeded in every where subduing the Protestants, she would attain that object. Elizabeth, who had only the support of the Protestant part of her own subjects, with a friendly feeling among the Scotch and other unimportant Protestant nations, had the greatest reason to dread the confederacy formed against her, which rendered her situation very similar to that of Great Britain during the war of the French revolution. It was proved, however, at this trying crisis of our history, that the commerce, the insular situation, and, perhaps, the superior intelligence of the British people, fitted them for resisting nearly all the rest of Europe. Elizabeth stood firm upon the Protestant faith, and the principles of a comparatively liberal and popular government—the only safe position, as it has proved oftener than once in our history, for the sovereign of these islands.

A series of unfortunate events threw Mary into the hands of Elizabeth. The former queen, in 1565, married her cousin Lord Darnley, and by that means alienated the affections of her brother and chief minister, the Earl of Moray, as well as of other Protestant lords, who raised a rebellion against her, and were obliged to fly into England. Soon after, the jealousy of Darnley, respecting an Italian musician named Rizzio, who acted as French secretary to the queen, united him in a conspiracy with the banished Protestant noblemen for the murder of that humble foreigner, which was effected under very barbarous circumstances, March 9, 1566. Mary, who was delivered in the succeeding June, of her son James, withdrew her affections entirely from her husband, and began to confide chiefly in the Earl of Bothwell, who some months afterwards caused Darnley to be blown up by gunpowder, while he lay in a state of sickness; in which transaction it has always been suspected, but never proved, that the queen had a considerable share. Bothwell soon after forced her, in appearance, into a marriage, which excited so much indignation among her subjects, that the same Protestant lords who had effected the Reformation, and were the friends of Elizabeth, easily obtained the possession of her person, and, having deposed her, crowned her infant son as king, under the title of James the Sixth, while the regency was vested in the Earl of Moray. In May 1568, Mary escaped from her prison in Lochleven, and put herself at the head of a body of her partisans, who were overthrown, however, by the regent at the battle of Langside, and Mary was then compelled to seek refuge in England. By placing her rival under strict confinement, and extending an effectual protection to the regents Moray, Lennox, Mar, and Morton, who successively governed Scotland, Elizabeth fortified herself in a great degree against the Catholic confederacy.

GOVERNMENT OF ELIZABETH.

It has already been seen that the liberties of the people were much favoured by the frequent interruptions in the succession to the crown. Whenever one branch of the Plantagenet family displaced another, the new king felt himself weak, and endeavoured to strengthen his title, by procuring a Parliamentary enactment in support of it. It thus became established as a regular principle in the English government, that the people, who were represented by Parliament, had a say in the appointment of their king. A considerable change, however, had taken place since the accession of Henry the Seventh. The great power acquired by that king through his worldly wisdom, and the destruction of the nobility during the civil wars, had been handed down through four successive princes, who inherited the crown by birthright, and did not require to cringe to the people for a confirmation of their title. The Parliaments, therefore, were now a great deal more under the control of the sovereign than they had ever been before. Henry the Eighth never permitted his Parliament to oppose his will in the least; it was also seen that to the various changes of religion under successive sovereigns, the Parliaments presented no obstacle. An idea was now beginning to arise, very much through the supremacy the sovereigns had acquired over the church, that the right of the crown was one derived from God, and that the people had nothing to do with it, except to obey what it dictated to them. Of this notion, no one took so much advantage, or was at so much pains to impress it, as Elizabeth. The vigorous talent and fortitude of this woman have always been a subject of admiration and pride among Englishmen, but they have failed to see that the very greatness of her character at once prompted and enabled her to be a tyrant. No doubt the arbitrary measures of Elizabeth were generally of a popular nature; yet this does not excuse them in principle; and their ultimate mischief is seen in the attempts of future sovereigns to pursue worse ends upon the same means. Elizabeth's government consisted entirely of herself and her ministers, who were, from the beginning to the end of her reign, the very choice of the enlightened men of England. Her prime minister was the celebrated Lord Burleigh, by far the most sagacious man who ever acted as a minister in Britain. All her emissaries to foreign courts were of one complexion—circumspect and penetrating men, devoted to their country, their mistress, and to the Protestant religion; indeed, the wisdom of Elizabeth's government might almost be said to have reached an unamiable extreme, as we often find, in individuals, that their perfect propriety and worldly knowledge keep the feelings too much in the background. Elizabeth appeared so much as the champion of the reformed faith against Catholic Europe, that the people do not seem to have ever wished to control her actions. It will hardly be believed that she was at one time permitted to assume a power of making and dispensing with laws by her own proclamation. It is perfectly natural, however, that the people should allow of a more arbitrary line of conduct in sovereigns and ministers, who are in a manner on their own side, than in others who attempt to rule over them more expressly in the light of rulers.

WAR IN THE NETHERLANDS.

The great business of this century was religion. In the Netherlands, which formed part of the dominions of Philip the Second of Spain, the reformed faith had made considerable advances. Philip, like other Catholic princes, entertained the idea that this new religion, besides being condemnable as a heresy and an offence against the Deity, tended to make men independent of their rulers. Finding the people obstinate in their professions, he commenced a war with the Netherlanders, for the purpose of enforcing his authority over their consciences. This war lasted about twenty years. The Netherlanders fought like desperate men, and endured the most awful slaughters and hardships rather than submit to the tyrant, whom some claim of what is called birthright had given a title to oppress them. Elizabeth could not help wishing well to the Netherlanders, though, for a long time, her dread of Spain, then one of the greatest powers in Europe, prevented her from openly assisting them.

The chief leader in this war of liberty was William Prince of Orange, ancestor of the present King of the Netherlands, and one of the purest and most courageous patriots that ever breathed. At the same time, about two millions of the people of France were Protestants, or, as they were then called, Hugonots, who acted also for the general Protestant cause with as much energy as the great strength of the French government would permit. It was the general sentiment of the Catholics of that age, that heresy was an evil the extirpation of which could not be too dearly purchased. They therefore persecuted it at the expense of almost all the best human feelings, trusting to the importance of the end for a justification of every species of means. We do not say this for the purpose of exciting the hostility of Protestants against Catholics. The latter class of persons have, for many years, been far less inclined to persecution than the Protestants, so that the mutual account of injury is now pretty nearly balanced. But, in the sixteenth century, Protestantism seemed a new and dangerous experiment, which all good Catholics felt bound, so far as lay in their power, to prevent from going any farther. Under this feeling, Charles the Ninth of France caused the massacre of from ten to twenty thousand Protestants at Paris, on St Bartholomew's day (August 24), 1572, a barbarity which is said to have given satisfaction to all professors of the Romish faith throughout Europe, and to have been celebrated with public thanksgivings at Rome. Many other cruelties of the same nature were perpetrated by Catholics upon Protestants. Elizabeth at length, in 1578, extended an open protection to the Netherlanders, excusing herself to Philip by stating her fear that they would otherwise throw themselves into the arms of France. The northern provinces were thus enabled to assert their independence, and to form the country which has since been called Holland. It is curious to reflect, that, in modern times, this country has stood conspicuously in opposition to the liberal interest throughout Europe, under the government of a king descended from the patriotic Prince of Orange; while Lord Burleigh, the great English statesman who counselled that England should protect it in its resistance, is the ancestor of two noblemen* distinguished in their own country for their zeal against innovatory principles.

DEATH OF MARY OF SCOTLAND.

It may be easily imagined that the severities and threats of the Catholics provoked some retaliation on the part of the Protestants. It was at this time that the English government began to enact those penal laws against the adherents of the ancient faith, which have only of late been altogether abolished. Elizabeth hanged many men for no other crime than that they were Romish priests; being solely provoked to do so, however, by the plots which were perpetually forming by men of this class for assassinating her. Her principal victim was the unfortunate Queen of Scots, who had been kept in captivity for nineteen years. The liberation of this princess was generally a part of the schemes of all the enthusiasts who plotted the murder of Elizabeth. A law was at length passed, intended for the destruction of Mary, by which it was declared, that any person, by or *for* whom any plot should be made against the life of the Queen of England, should be guilty of treason. In 1586, a gentleman of the name of Babington, with some others, contrived a plan for assassinating Elizabeth, and placing Queen Mary on the throne. The plot was discovered by spies—a class of persons of whom great numbers were employed in this reign. The conspirators were seized and executed; and out of the confessions extracted from them by torture, was woven a tissue of pretended evidence, for proving that the Queen of Scots was concerned in the conspiracy. In reality, Mary might have some vague knowledge that such a plot was in agitation; but, as a prisoner, detained in defiance of all law, she was neither called upon to divulge any secret involving the life of Elizabeth, nor was it in her power to prevent any man from entering upon an enterprise in her favour.

Thirty-six commissioners, appointed by Elizabeth, arrived at Fotheringay Castle, in Northamptonshire, where Queen Mary was confined, in order to subject one independent princess to a trial for high treason against another; a proceeding quite unparalleled in history, and which, indeed, was only giving to murder the form of law. Mary protested, both against the law upon which she was arraigned, and against the competency of the court, but was at length induced to appear upon trial, lest it should have been supposed that she refused, from a consciousness of guilt. "It is impossible," says an English historian, "to read, without admiration, in the minute records of the trial, the self-possessed, prompt, clear, and sagacious replies and remarks by which this forlorn [illegible] defended herself against the most expert lawyers and politicians of the age, who, instead of examining her as judges, pressed her with the unscrupulous ingenuity of enemies." Upon a mere shadow of evidence, which any lawyer would now pronounce to be not only imperfect, but illegal, she was condemned to death, October 25, 1586. Elizabeth had not only public reasons for taking the life of this queen, but was also animated by a deadly hatred against her on account of the personal superiority of Mary; yet with detestable hypocrisy she pretended to all around her that she could never be induced to grant the warrant for execution, unless it was seen to be imperatively necessary for the welfare of her country. Accordingly, the kingdom was now filled with rumours of plots, treasons, and insurrections; and the queen seemed to be continually kept in alarm with fictitious dangers. She appeared to be in great terror and perplexity; sat much alone, and muttered to herself half sentences, importing the difficulty and distress to which she was reduced. In this situation, she one day called her secretary, Davidson, whom she ordered to draw out secretly the warrant for Mary's execution, informing him that she intended to keep it by her, in case any attempt should be made for the delivery of that princess. She signed the warrant, and then commanded it to be carried to the chancellor, to have the seal affixed to it. Next morning, however, she sent two gentlemen successively to desire that Davidson would not go to the chancellor until she should see him; and, upon being informed that the warrant had been already sealed, she seemed displeased at his precipitation. But Davidson, who was not ignorant that his mistress wished to have the sentence executed, laid the affair before the council, who unanimously resolved that the warrant should be immediately carried into effect, and promised to justify him to the queen. Accordingly, the fatal instrument was delivered to Beale, the clerk of the council, who summoned the noblemen to whom it was directed, viz., the Earls of Shrewsbury, Kent, Derby, and Cumberland; all of whom set out immediately to Fotheringay Castle, accompanied by two executioners, to dispatch their bloody commission.

On the 6th of February 1587, Mary was informed of the arrival of these functionaries, who ordered her to prepare for death by eight o'clock the following day. Early on the fatal morning, she dressed herself in a rich habit of silk and velvet, the only one which she had reserved for this solemn occasion. Thomas Andrew, the under-sheriff of the county, then entering the room, informed her that the hour was come, and that he must attend her to the place of execution. She replied that she was ready; and, bidding her servants farewell, she advanced, supported by two of her guards, and followed the sheriff with a serene aspect, having a long veil of linen on her head, and in her hand a crucifix of ivory. She then passed into another hall, the noblemen and the sheriff going before, and Melvil, her master of the household, bearing up her train. In this hall into which they had entered, a scaffold was erected, covered with black. As soon as Mary was seated, Beale began to read the warrant for her execution; and Fletcher, dean of Peterborough, standing without the rails, repeated a long exhortation, which she desired him to forbear, as she was firmly resolved to die in the Catholic religion. The room was crowded with spectators, who beheld her with pity and distress; while her beauty, though dimmed by age and affliction, gleamed through her sufferings, and was still remarkable in this fatal moment. The two executioners kneeling and asking her pardon, she said she forgave them, and all the authors of her death, as freely as she hoped for forgiveness from her Maker, after which she once more made a solemn protestation of her innocence. Her eyes were then covered with a linen handkerchief, and she laid herself down upon the block without any fear or trepidation. After reciting a psalm, and repeating a pious ejaculation, her head was severed from her body, at two strokes, by the executioner.

Thus died Mary, in the forty-fifth year of her age and nineteenth of her captivity, the last victim of that spirit in the royal family of England, which prompted them to embrue their hands in each other's blood. Her son was in the meantime grown to manhood, and, under the title of JAMES THE SIXTH, had assumed the supreme direction of affairs in Scotland, in which, however, he was much controlled by the clergy, who, though they had less apparent power than their brethren in England, were in reality possessed of an influence over the people which set the sovereign at defiance. James made many attempts to assert a control over the church like that enjoyed by the English monarch, and also to introduce an Episcopal hierarchy, but never could attain more than a mere shadow of his object. He had been educated by the regents in the Protestant faith, and was now regarded as heir-presumptive to the English crown.

SPANISH ARMADA.

The year 1588 was remarkable in England for the famous enterprise called the Spanish Armada. It was resolved by the King of Spain to hurl one decisive blow at the Protestant interest, by invading England with an immense fleet, the preparation of which had employed all the resources of his kingdom. The ports of Spain, Portugal, and other maritime dominions belonging to him, had long resounded with the noise of his preparations, and the most eminent Catholic soldiers from all parts of Europe flocked to take a share in the expedition.

The Marquis of Santa-Croce,* a sea-officer of great reputation and experience, was destined to command the fleet, which consisted of a hundred and thirty vessels, of greater size than any that had been hitherto seen in Europe. The Duke of Parma was to conduct the land forces, twenty thousand of whom were on board the ships of war, and thirty-four thousand more were assembled in the Netherlands, ready to be transported into England; so that, as no doubt was entertained of success, the fleet was ostentatiously styled the Invincible Armada.

Nothing could exceed the terror and consternation which seized all ranks of people in England, upon the news of this terrible armada being under sail to invade them. A squadron of not more than thirty ships of the line, and those very small in comparison, was all that Elizabeth had to oppose it by sea; and it was considered impossible to make any effectual resistance by land, as the Spanish army was composed of men well disciplined and long inured to danger. But although the English fleet was much inferior in number and size of shipping to that of the enemy, it was much more manageable, while the dexterity and courage of the mariners were greatly superior. Lord Howard of Effingham, a man of great valour and capacity, took upon him, as lord high admiral, the command of the navy. Drake, Hawkins, and Frobisher, the most renowned seamen in Europe, served under him; while another squadron, consisting of forty vessels, English and Flemish, commanded by Lord Seymour, lay off Dunkirk, in order to intercept the Duke of Parma. Such was the preparation made by the English; while all the Protestant powers of Europe regarded this enterprise as the critical event which was to decide for ever the fate of their religion.

In the mean time, while the Spanish armada was preparing to sail, the admiral, Santa-Croce, died, as likewise the vice-admiral, Paliano; and the command of the expedition was given to the Duke de Medina Sidonia, a person utterly inexperienced in sea affairs; so that these unexpected circumstances served, in some measure, to frustrate the design. Some other accidents also contributed to its failure. Upon leaving the port of Lisbon, the armada next day met with a violent tempest, which sunk some of the smallest of the ships, and obliged the rest to put back into the harbour. After some time spent in refitting, the Spaniards again put to sea, where they took a fisherman, who gave them intelligence that the English fleet, hearing of the dispersion of the armada in a storm, had returned to Plymouth, and that most of the mariners were discharged. From this false intelligence, the Spanish admiral, instead of going to the coast of Flanders, to take in the troops stationed there, resolved to sail directly to Plymouth, and destroy the shipping laid up in the harbour. But Effingham was very well prepared to receive him, and was just got out of port, when he saw the Spanish armada coming full sail towards him, disposed in the form of a half-moon, and stretching seven miles from the one extremity to the other. The English admiral, seconded by Drake, Hawkins, and Frobisher, attacked the Spaniards at a distance, pouring in their broadsides with admirable dexterity. They did not choose to engage the enemy more closely, because they were greatly inferior in number of ships and guns, as well as in weight of metal; nor could they pretend to board such lofty vessels without manifest disadvantage. In this action, however, two Spanish galleons were disabled and taken.

As the armada advanced up the Channel, the English still followed and infested its rear; and as their ships continually increased from different ports, they soon found themselves in a capacity to attack the Spanish fleet more nearly, and, accordingly, fell upon them while they were taking shelter in the port of Calais. To increase their confusion, Howard selected eight of his smaller vessels, which, after filling them with combustible materials, he sent one after another, as if they had been fire-ships, into the midst of the enemy. The Spaniards, taking them for what they seemed to be, immediately bore off in great disorder; while the English, profiting by their panic, captured or destroyed about twelve ships. The Duke of Medina Sidonia being thus driven to the coast of Zealand, held a council of war, in which it was resolved, that, as their ammunition began to fail, as their fleet had received great damage, and as the Duke of Parma had refused to venture his army under their protection, they should return to Spain by sailing round the Orkneys, as the winds were contrary to their passage directly back. Accordingly, they proceeded northward, and were followed by the English fleet as far as Flamborough-head, where they were terribly shattered by a storm. Seventeen of the ships, having five thousand men on board, were afterwards cast away on the Western Isles and the coast of Ireland. Of the whole armada, three-and-fifty ships only returned to Spain in a wretched condition; and the seamen, as well as the soldiers who remained, were so overcome with hardships and fatigue, and so dispirited by their discomfiture, that they filled all Spain with accounts of the desperate valour of the English, and of the tempestuous violence of that ocean by which they are surrounded.

The reign of Elizabeth saw the commencement of the naval glory of England. Up to the reign of Henry the Seventh, there was no such thing as a navy belonging to the public, and the military genius of the people was devoted exclusively to enterprises by land. The rise, however, of a commercial spirit in Europe, which in 1492 had caused the discovery of America, and was again acted upon by the scope for adventure which that discovery opened up, had latterly

* The Marquises of Exeter and Salisbury.

* We here pursue the account of the Spanish armada given by Goldsmith in his Abridgement of the History of England.

caused great attention to be paid to naval affairs in England. Englishmen of all ranks supported and entered into enterprises for discovering unknown territories, and under Drake, Cavendish, Hawkins, and Frobisher, various expeditions of less or more magnitude were sent out. Drake was the first English seaman who sailed round the world. When hostilities with Spain became more open, these commanders made many successful attacks upon the colonies of that country in the West Indies, and also upon the fleets of merchant vessels which were employed to carry home the gold, and other almost equally valuable products of the New World, to the Spanish harbours. These attacks were now made in a more systematic manner, and with a more overpowering effect, as a revenge for the affair of the Armada. It may almost be said, that the dominion of Britain over the seas was perfected in one reign; a power which has been of such advantage to the country, both in protecting its commerce, and keeping it secure from foreign invasion, that it would have conferred everlasting lustre on this period of our history, even although it had not been characterised by any other glorious event.

It is remarkable, that while Elizabeth increased in power and resources, she became more noted for female weaknesses. In her early years she had shown a stoicism, and superiority to natural affections, not usually observed in womankind. But when she became old and infirm—not to mention another word, which politeness will not permit us to use respecting any individual of the sex—she also became volatile and susceptible to an extraordinary degree; so that the hand which she had withheld, in her younger days, from the noblest princes of Europe, seemed likely to be bestowed, in her old age, upon some mere court butterfly. Her favourite, in middle life, was Robert Earl of Leicester, a profligate and a trifler. In her latter days she listened to the addresses of the Earl of Essex, a young man of greater courage and better principle, but also headstrong and weak. Essex, who had acquired popularity by several brilliant military enterprises, began at length to assume an insolent superiority over the queen, who was, on one occasion, so much provoked by his rudeness as to give him a hearty box on the ear. Notwithstanding all his caprices and insults, the queen still doatingly forgave him, until he at length attempted to raise an insurrection against her in the streets of London, when he was seized, condemned, and, after much hesitation, executed (February 25, 1601).

It is always alleged that the life of Essex would have been saved, if the queen had received from him a ring which she had given him in his happier years as a pledge of her affection, and which she told him would at any time recal her tenderness towards him, however deeply he might have offended her. It is said that Essex gave this ring to the Countess of Nottingham, to be carried to Elizabeth, but that the Countess was prevailed upon by her husband, who was an enemy of Essex, to suppress it. Elizabeth, in at last ordering the execution of Essex, had acted upon her usual principle of sacrificing her feelings to what was necessary for the public cause, but in this effort, made in the sixty-eighth year of her age, she had miscalculated the real strength of her nature. She was seen from that time to decline gradually in health and spirits, till a settled melancholy overtook her. Her distress was increased to a great degree by a death-bed confession of the Countess of Nottingham, respecting the ring. The dying woman asked the queen's forgiveness for her treachery, but Elizabeth turned from her in a transport of grief and indignation, saying, that God might forgive her, but that she never could. After this, she declined still more rapidly, and at length became so much absorbed by her sorrow as to refuse sustenance, and to sit for days and nights on the floor, supported by a few cushions brought to her by her attendants. On the 24th of March 1603, she expired, after a reign of nearly forty-five years, during which England advanced from the condition of a second-rate to that of a first-rate power, and the Protestant religion was established on a basis from which it could not be shaken, though it has since made hardly any progress.

THE STUARTS—JAMES THE FIRST.

The successor of Elizabeth, by birthright, was James of Scotland, who was now in the thirty-sixth year of his age, and had been married for some years to the Princess Anne of Denmark, by whom he had two sons, Henry and Charles, and one daughter named Elizabeth. Robert Carey, cousin of the late queen, rode from London to Edinburgh in three days and two nights (which nearly equals the speed of the fastest of the present conveyances), in order to inform the King of Scots that Elizabeth was no more. James immediately removed to London, and assumed the government of England, while his native kingdom, though thus united under the same sovereignty, still retained its own superior institutions. James had all Elizabeth's ideas respecting the power, or, as it is called, the *prerogative* of the crown, and was equally anxious to manage all affairs after his own free will. But though he was not deficient in talent, he entirely wanted the vigorous personal character, and the imperious, and, at the same time, popular manner, which had enabled Elizabeth so effectually to subdue her Parliaments. It must also be owned, that he had not the same straight-forward anxiety for the public welfare and greatness, which always formed such a specious excuse for the despotic proceedings of his predecessor.

PROGRESS OF RELIGIOUS LIBERTY.

It may be easily conceived that James was not so successful a ruler as Elizabeth. The truth is, the popular spirit had been gaining such force in the latter years of that princess, that it would have required a stronger instead of a weaker sovereign, to keep it in check. During the whole reign of Elizabeth, there had been rising in England a party called the Puritans, who wished still greater reforms to be effected in the church, and carried on their devotions in the same manner as our modern dissenters. Elizabeth looked upon the Puritans as her greatest enemies, and enacted many severe laws against them; by one of which it was declared, that any person found guilty for the third time of merely not attending the regular church of the parish, should be punished with death. Perhaps no one ever suffered to the full extent under this bloody law, but it may give an idea of the general severity with which the Puritans were treated in this reign. A dissent from the church, indeed, was looked upon at this time by the higher powers as a kind of rebellion, and there can be no doubt that the Puritans, in struggling with these powers for a mere toleration of their simple system of worship, contracted ideas of natural rights and civil freedom, in the highest degree threatening to the arbitrary sovereigns of this age. It may even be said, that if men had not had the desire of a freedom in religious matters, and been thereby animated by a zeal which despised all worldly dangers, there would not have been so early or so powerful a spirit of civil freedom; for men could never have contested for that object with the same eagerness or constancy, seeing that it rested upon less intelligible principles, and had not such a sacred end in view. Elizabeth had been able to keep the Puritans in some measure in check; yet, as they were constantly increasing in numbers and confidence, the succeeding monarch found it far more difficult to evade their demands. James, in fact, while he inherited all the apparent powers and prerogatives of the Tudor princes, inherited, it may be said, a people always becoming less disposed to obey arbitrary rule, so that this well-meaning monarch has been more blamed for the simplest exertions of what he thought his rightful authority, than Queen Elizabeth has been for the most violent; among which may be reckoned her open contempt for the House of Commons, and her occasional imprisoning its members when they attempted to express their independent opinions.

THE GUNPOWDER PLOT.

One circumstance which greatly tended to favour the opening views of the people respecting their liberties, was, that the Protestant faith was not now threatened by those Catholic powers, in opposing which Elizabeth had been enabled to carry matters with so high a hand. The Protestant faith being itself secure, the people were now bent upon putting it on an improved footing; and hence the spirit of the people was now chiefly turned against the high power of the church and the king. His Majesty, at the same time, was much troubled by the Catholics, of whom a respectable minority still remained among his subjects, and who were grievously oppressed by the penal laws enacted against them. Under the intolerable pressure of a persecution, which transported men beyond the bounds of reason, a few Catholic gentlemen contrived a plot for sweeping off the King and his Parliament, by an explosion of gunpowder from under the House of Lords, and which was to take place on the 5th of November 1605. The gunpowder had all been properly stored in a cellar, and a man named Guy Fawkes was ready to light the train, when one of the conspirators, named Henry Percy, caused the discovery of the plot, by an attempt which he made, through the means of an anonymous letter, to withhold his friend, Lord Mounteagle, from attending the fatal house. Fawkes was seized, and confessed his intentions; and the rest of the conspirators fled to the country, where most of them were cut to pieces in endeavouring to defend themselves. This plot is generally alluded to as a stigma upon the Catholics, and it is still barbarously kept in remembrance by an annual celebration of the day on which it was to have taken effect. In reality, it is a disgrace to the Protestants, or, at least, to the Protestant government of that time, since nothing but the severest persecution could have induced men to contrive any thing so repugnant to all the dictates of humanity. James himself never could be induced to take advantage of it, as most of his subjects desired, for the purpose of increasing the persecution of the Catholics. If men had then been as enlightened as they are now, and not smarting so much under the recent dread of the Catholic confederacies against Protestantism, they would have treated the gunpowder plot as only an awful lesson of toleration.

THE SPANISH MATCH.

The reign of James the First is not marked by any of what are called great events. In 1612, he lost his eldest son Henry, a youth of nineteen, who was considered as one of the most promising and accomplished men of the age. The second son Charles then became the heir-apparent, and James was busied for several years in seeking him out a proper match.

The princess selected by his Majesty was the second daughter of Philip the Third of Spain—a match not very popular, on account of the young lady being a Catholic, but which James thought advantageous, as tending to conciliate the people of that religion, and also because the princess belonged to one of the most powerful houses in Europe. Some delay occurring in the negotiations, the prince set out in 1622, with his young friend the Duke of Buckingham, to visit the court of Spain in disguise, and, if possible, make personal application to the lady herself. The prince and duke travelled under the name of John and Thomas Smith, probably for the very good reason that these were then, as well as now, the most common and undistinguishing names in England. In passing through Paris, the prince saw Henrietta Maria, a sister of the French king, whom he was in reality destined to marry. At Madrid, he was received with great distinction under his proper character; but he was kept at such a distance from his proposed bride, that the Duke of Buckingham proposed to send home for a telescope, in order that he might obtain a peep at her as she walked in her garden. Some disgust finally broke off this match.

CHARLES THE FIRST.

James died in March 1625, in the 59th year of his age, and his son succeeded, under the title of CHARLES THE FIRST. Elizabeth, the only remaining child of the late king, had been married to Frederick Prince Palatine of the Rhine, who was so unfortunate as to lose his dominions, in consequence of his having placed himself at the head of the Bohemians, in what was considered as a rebellion against his superior the Emperor of Germany. This discrowned pair, however, by their daughter Sophia, who married the Duke of Brunswick, were the ancestors of the family which now reigns in Britain. James was greatly blamed by his subjects for not entering into a war with the emperor for the purpose of replacing his son-in-law—a contest which would have been very popular, in so far as it had a Protestant object, but was otherwise unadvisable. James was also blamed, in the course of his reign, for successively giving himself up to the company of trifling young men, who became his favourites, though they had no other recommendation than that of an agreeable aspect; indeed, his fondness for these favourites—the most remarkable of whom were Robert Carr, created Earl of Somerset, and George Villiers, who became Duke of Buckingham—can only be accounted for by supposing him to have prematurely fallen into a state of dotage. Though a man of much natural talent, and still more learning, he has left the general character of a timid, weak, and undignified prince; he was so good-natured, however, that, notwithstanding the frequent contests he had with his Parliament, he never became decidedly unpopular.

One of the first proceedings of Charles the First was to marry Henrietta Maria of France, a Catholic princess, who is supposed to have exercised a great control over her husband at every period of his life. After breaking off the proposed match with the Princess Mary of Spain, Britain eagerly threw itself into a war with that country, which was still continued. To supply the expenses of that contest, and of a still more unnecessary one into which he was driven with France, he applied to Parliament, but was met there with so many complaints as to his government, and such a keen spirit of popular liberty, that he was obliged to revive a practice followed up by other kings, and particularly Elizabeth, of compelling his subjects to grant him gifts, or, as they were called, *benevolences*; and also to furnish ships at their own charge, for carrying on the war. Such expedients, barely tolerated under the happy reign of Elizabeth, could not be at all endured in this age, when the people and the Parliament were so much more alive to their rights. There was, therefore, a great deal of discontent over the nation. The Commons, seeing that if the king could support the state by self-raised taxes, he would soon become independent of all control from his Parliaments, resolved to take every measure in their power to check his proceedings. They also assailed him respecting a right which he assumed to imprison his subjects upon his own warrant, and to detain them captive as long as he pleased. Having made an inquiry into the ancient powers of the crown, before these powers had been vitiated by the tyrannical Tudors, they embodied the result in what was called a PETITION OF RIGHT, which they presented to him as an ordinary bill, or rather as a second Magna Charta, for replacing the privileges of the people, and particularly their exemption from arbitrary taxes and imprisonment, upon a fixed basis. With great difficulty Charles was prevailed upon to give his sanction to this bill (1628); but his disputes with Parliament soon after ran to such a height, that he dissolved it in a fit of indignation, resolving never more to call it together. About the same time, his favourite minister, the Duke of Buckingham, was assassinated at Portsmouth, and Charles resolved thenceforward to be in a great measure his own minister, and to trust chiefly for the support of his government to the English hierarchy, to whose faith he was a devoted adherent, and who were, in turn, the most loyal of his subjects. His chief counsellor was Laud, Archbishop of Canterbury, a man of narrow and bigotted spirit, and who made it his duty rather to increase than to diminish the ceremonies of the English church, although the tendency of the age was decidedly favourable to their diminution. For some years Charles governed the country entirely as an irresponsible despot, levying taxes by his own orders, and imprisoning such persons as were obnoxious to him, in utter defiance of the Petition of Right. The Puritans, or church reformers, suffered most severely under this system of things. They were dragged in great numbers before an arbitrary court called the Star-Chamber, which professed to take cognisance of offences against the king's prerogative, and against religion; and sometimes men venerable for piety, learning, and worth, were scourged through the streets of London, and their ears cut off, and their noses slit, for merely differing in opinion on the most speculative of all subjects with the king and his clergy. The great body of the people beheld these proceedings with horror, and only some opportunity was wanted for giving expression to the public feeling.

It is to be observed, that none of the taxes imposed by Charles were in themselves burdensome; the country was then in a most prosperous condition, and the taxes far less in proportion to every man's means than they have ever since been. It was only to the principle of their being raised without Parliamentary sanction, which had formerly been so necessary a control on the royal power, that the people were disposed to resist them. It may easily be supposed, that, though there might be a general disposition to resistance, the most of individuals would not like to be the first to come forward for that purpose, as, in such an event, they would have been sure to experience the severest persecution from the court. One man, however, was at length found—and let it never be forgotten that his name was John Hampden—who was determined to undergo any personal inconvenience rather than pay his twenty shillings of ship-money. The case was tried in the Exchequer (1637); and as the judges were then dismissable at the royal pleasure, and of course the humble servants of the king in every thing, Hampden lost the day. He roused, however, more effectually than ever, the attention of the people to this question, and means were not long wanting to check the king in his unfortunate career.

TROUBLES IN SCOTLAND.

An attempt had been made by King James to introduce the Episcopal church into Scotland, because it was thought dangerous to the English church that a form of worship, resembling that of the Puritans, should be permitted to exist in any part of the king's dominions. The same object was prosecuted with greater zeal by King Charles, and although the people were universally adverse to it, he had succeeded, after a visit which he paid to the country in 1633, in settling thirteen bishops over the church, by whom he hoped to govern the clergy as he did those of England. But when he attempted, in 1637, to introduce a Book of Common Prayer into the Scotch churches, as a substitute for extemporary prayers, the spirit of the people could no longer be kept within bounds. On the Liturgy being opened in the principal church at Edinburgh, by a dignitary styled the Dean, the congregation rose in a violent tumult, and threw their clasped bibles, and the very stools they sat on, at the minister's head, and it was not till the whole were expelled by force that the worship was permitted to proceed. It was found necessary by the Scottish state officers to withdraw the obnoxious Liturgy, till they should consult the king, who, not dreading any mischief, gave orders that it should be used as he had formerly directed, and that the civil force should be employed in protecting the clergymen. It was found quite impossible to obey such an order in the face of a united people, who, by committees assembled at Edinburgh, representing the nobles, ministers, gentry, and burghers, endeavoured to awe the king into an abandonment of all the late innovations. Charles endeavoured, by every means in his power, to avoid such a humiliation, which he calculated would give immense force to the innovators in England. But the Scotch, when they found him hesitating, bound themselves, March 1638, under a bond called the National Covenant, which was signed by nineteen-twentieths of the whole population, to resist their sovereign in every attempt he might make to bring in upon them the impurities of Popery—for such they held to be the forms of worship and ecclesiastical government which Charles had lately imposed upon their church. The king sent his favourite Scotch counsellor, the Marquis of Hamilton, to treat with his northern subjects; but nothing would satisfy this devout, and, at the same time, spirited people, but the calling of a General Assembly (a form long disused), for the purpose of settling all disputes. Charles, though he saw that this was only an appeal to the Scottish church itself, consented to the proposal, for the purpose of gaining time, in order that he might make warlike preparations against his refractory people.

The assembly met at Glasgow in November, and, as might have been expected, formally purified the church from all the late innovations, excommunicating the bishops, and declaring the government of the clergy to rest, as formerly, in the General Assembly, which consisted of a selection of two clergymen from each presbytery, with a mixture of lay elders, and no one to control its proceedings but the divine founder of the Christian religion. Early in the succeeding year, the king had, with great difficulty, collected an army of twenty thousand men, whom he led to the border of Scotland, for the purpose of reducing these despisers of his authority. The Scotch, however, strengthened by devotional feeling, and a certainty that the English, in general, were favourable to their cause, formed an army equal in number, which was placed under the command of General Alexander Leslie, an officer who had served with distinction in the long Protestant war carried on against the Emperor of Germany. The Scottish army was encamped on the top of Dunse Law, a hill overlooking the border, where the duties of military parade were mingled with prayers and preachings, such as were never before witnessed in a camp. The king, seeing the wavering of his own men, and the steadfastness of the Scotch, was obliged to open a negociation, in virtue of which it was agreed to disband both armies, and to refer the disputes once more to a General Assembly and a Scottish Parliament.

The king now adopted a new policy with the turbulent people of Scotland. It is consistent with the self-love of a king, who, by mismanagement, has brought his people into a state of resistance, to suppose that it is not so much the discontent of the mass, as the ambition of the leaders, that causes the insurrection. In reality, the leaders, with all their ambition, are but the creation of the mass; beings called into existence, or at least into action, by the general sentiment. Charles, overlooking the radical evils altogether, thought that he should overcome all opposition, if he only could gain over the nobles who had hitherto taken the lead. He accordingly called a number of them to his court at Berwick, and, by blandishments and promises, endeavoured to make them his own partisans. He was successful only with the Earl of Montrose, an ambitious and unscrupulous person, though of great abilities, who was already dissatisfied on account of the ascendancy of the Earl of Argyle. Montrose is henceforth found at the head of a royalist party, which gradually began to gain strength.

In the new General Assembly and Parliament, the votes were equally decisive against Episcopacy; and though Charles prorogued the latter body before it had completed its proceedings, it nevertheless sat still, and voted every measure which it thought necessary. The king collected a second army, and, in order to raise money for a second attack upon the Scots, was reduced to the necessity of calling an English Parliament, the first that had met for eleven years; but finding it bent upon the redress of grievances, he thought fit to dissolve it, and trust for supplies to the clergy, and other friends of arbitrary power. The Scots did not wait for his attack, but, in August 1640, marched into the north of England, in the expectation of being supported in their claims by the English people in general. Throughout all these proceedings, the Scotch professed, and were no doubt sincere in professing, a rational loyalty towards the king, and only avowed a hostility to Archbishop Laud, the Earl of Strafford, and other royal counsellors, whom they professed to consider as alone blameable for the differences between the king and his people. On the 28th of August, the Scotch were opposed by an advanced party of the royal army at a ford on the Tyne, near Newburn; but they forced their way through all impediments, and, driving the English before them, took possession of Newcastle. Charles and his minister Strafford tried every means of exciting the old hostile feeling of the English against the Scots; but common objects in civil and religious liberty had now rendered them friends, and both nations conceived themselves to have no enemy but the king's tyrannical counsellors. Animated by such feelings, the English army showed a strong disinclination to meet the Scots on the field, insomuch that the king found it necessary to abandon all hope of reducing the latter people to obedience by arms. He once more opened a negotiation for peace; and it was soon after agreed at a council of peers, that all the present dissensions should be referred to the Parliaments of the two countries, the Scottish army being in the mean time kept up on English pay, till such time as they were satisfied with the state of their affairs.

SITTING OF THE LONG PARLIAMENT.

The English Parliament met in November, and immediately commenced a series of measures for effectually and permanently abridging the royal authority. There was even a large party, who, provoked by the late tyranny, contemplated the total abolition of the monarchy, and the establishment of a republic. Religion was to appearance the moving-spring of the revolution. The destruction of the Episcopal system was anxiously desired by an immense party, who conceived that large benefices, and a connexion with the state, were incompatible with pure religion. All were alike furious against the Catholics, but evidently not so much from a sincere fear of that body of Christians, as the conveniency of setting them up for the objects of popular alarm, and making all revolutionary acts appear as only so many necessary safeguards against their machinations. The first acts of the Parliament had little or no immediate reference to Scotland. The Earl of Strafford was accused of treason against the liberties of the people, and executed. William Laud, the Archbishop of Canterbury, another zealous counsellor, was impeached and imprisoned, but reserved for future vengeance. The remaining ministers of the king only saved themselves by flight. Some of the judges were imprisoned and fined. The abolition of Episcopacy was taken into consideration. The Catholics fell under a severe persecution; and even the person of the queen, who belonged to this faith, was not considered safe. It was not till August 1641, when the English Parliament had gained many of its objects, that they permitted the treaty of peace with Scotland to be fully ratified. They then gratified the troops, not only with their full pay at the rate of L.850 a-day, but with a vote of no less a sum than L.300,000 besides, of which L.80,000 was paid down, as an indirect way of furnishing their party with the means of future resistance. The king, on his part, also took measures for gaining the attachment of this formidable body of soldiery, and of the Scottish nation in general. He had agreed to be present at the meeting of their Parliament, in the autumn of this year. In his journey to the north, he passed through the army at Newcastle, and accepted an invitation to dine with General Leslie. On his arrival at Edinburgh, August 14, he squared his conduct most carefully with the rigour of Presbyterian manners. In the Parliament he was exceedingly complaisant: he at once ratified all the acts of the preceding irregular session; he yielded up the right of appointing the state officers of Scotland; and he ordained that the Scottish Parliament should meet once every three years without regard to his will—an immense point in the claims of freedom. The men who had acted most conspicuously against him in the late insurrections, now became his chief counsellors, and he seemed to bestow favours upon them exactly in proportion to their enmity. He created General Leslie Earl of Leven, putting on his coronet with his own hand. Argyle was made a marquis. Many others received promotions in the peerage. The offices of state were distributed amongst them. Thus, it will be observed, the affections of the Scots were in a manner set up to auction between the king and his English Parliament, and from both did they receive considerable gratifications.

But while thus intriguing with the covenanting leaders, Charles also kept up a correspondence with that royalist party which had been embodied by the Earl of Montrose. This nobleman was now suffering confinement in Edinburgh Castle, for his exertions in favour of the king. In the anguish of disappointed ambition, he concocted an enterprise in the old Scottish style against the lives of his political opponents. The king having refused his sanction to the scheme, he seems to have resolved upon executing one of a less ferocious character, without his Majesty's knowledge. The Marquis of Argyle had all along been the prime object of Montrose's antipathy, and the odium was now shared by the Marquis of Hamilton, who at this time held a nearly equal place in the Scottish councils, and by the Earl of Lanark, his younger brother. These three noblemen Montrose intended to be suddenly seized, and taken on board a vessel in the Firth of Forth. On the same night, his friends were to surprise Edinburgh Castle, and endeavour to bring about a complete revolution in favour of the royal cause. The plot was detected, and the three noblemen retired precipitately to the country. Charles himself was the only person who suffered: the scheme, though probably unknown to him, was universally laid to his charge, and it introduced suspicions of his sincerity, that tended to neutralise the effects of his late favours, and also to afford matter of reproach to the English Parliament, who had of course viewed his journey to Scotland with great jealousy. After spending about three months in Scotland, the king was suddenly called away, in consequence of intelligence which reached him from Ireland. The Catholics of that country, who formed the great majority of the population, and had for many years groaned under the oppression of the English, became infected by the example of the Scottish Covenanters, and resolved that they would also endeavour to obtain toleration and equal rights. Their proceedings led to an intestine war, during which the greatest cruelties were perpetrated on both sides. Though the poor Irish were struggling for both national and religious freedom, they gained no sympathy from the patriots of Britain, who, on the contrary, urged the king to suppress the Irish rebellion, being afraid that a religious toleration in that country would be inconsistent with the same privileges in their own. The Scottish Covenanters immediately sent over a large body of troops to assist in rivetting those bonds upon the Irish from which they themselves were just emancipated. It is by such traits of exclusive feeling that the religious sects of this age diminish their title to the sympathy of an enlightened posterity: for it is invariably found that the persecuted became the persecutor, whenever it obtained an ascendancy.

How this dispute with the king grew wider and wider, till it ended in open and general war, and how at length the liberties of the British nations were secured against the power of the crown, will form the subject of a future sheet.

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HISTORY OF MANKIND.

INTRODUCTION.

If the history of one man, whose life has been diversified by adventures, be interesting to his fellow man, how much more interesting must be the history of the whole human race, viewed as the collective members of one family, the branches of which have extended through all regions of the globe! By ancient records, by monuments that have been preserved through the revolutions of ages, and by numerous other kinds of evidence, we are enabled to look back through the mist of time to that remote period, when this world was in its infancy, and when man had only just gone forth, like a labourer at day-break, to commence his arduous pilgrimage. At first we behold him, an isolated being, standing alone on the yet unpeopled earth; then we find him increase and multiply his species, build cities, invent arts, and disperse into different and far distant countries, where both his body and mind become assimilated to the most opposite extremes of climate. At every step of his progress, we observe his character modified or changed, by the effects of external circumstances operating upon the peculiar pliability of his nature. In one position, we find him degraded into the condition of a savage; he lives naked in the forests; his food consists only of the roots and herbs which grow wild in the fields; his time is passed in the repose of sloth-like indolence; or his actions are wild, fierce, and brutal, prompted by the darkest and the most unhallowed passions that can rend the human heart. In another, we observe him surrounded by all the glowing luxuries of civilisation; his person is swathed in gorgeous silks and golden tissues; his steps rest only on the softest carpets; his bed is swelled with luxuriant down; his table loaded with all the delicacies which the animal or vegetable creation can provide; he is attended by a retinue of his fellow-creatures, habited as beings of an inferior order; he has been born to fortune, and is, perhaps, the envied scion of royalty! But, instead of taking either of these extremes, let us look into the origin and history of nations; let us view man as he existed in ages far remote, and as he still exists in all regions of the world. Surely it will afford us no ordinary interest and pleasure thus to trace the stream of our existence, through all its deviations, down from its fountain head. If we could read the history of our own race aright, how much would it contribute to our own happiness! for every condition in which man may be found must suggest its own moral. Here do we see how energy, activity, and industry, have delivered him from the miseries of savage life, and surrounded him by all the comforts that are required to redress his wants and satisfy his desires; there do we observe how misgovernment may enthral the most civilized society with slavery, and how excessive luxury may undermine the stability of the proudest empire. In the one instance, we read the lesson which should urge us to subdue and govern our own individual passions; in the other, we observe the elucidation of those political principles which can alone link nation to nation in the bonds of peace and friendship.

ORIGIN OF MAN.

That man did not exist from all eternity, but was created, is obvious; for we see that nations increase according to a certain rate of progression; so that the further we recede in our calculations, the more we must reduce the existing number of inhabitants, until we reach a period when only a single family could have existed. But this is not all; a more conclusive proof remains, which is, as it were, lettered in the structure of the globe itself. We find that this earth is constructed of numerous rocks and soils, laid in regular succession, one above the other—the lowest being the most simple, and the oldest; the highest the most complex, and the most recent. We observe, in like manner, that there are various gradations of living beings—plants constituting the lowest, man the highest link in the chain; between which extremes, we find fishes, reptiles, birds, and quadrupeds. Now, when the structure of the globe is examined, it appears to have undergone prodigious revolutions, all of which have been more or less destructive to the beings which were then in existence. We first find rocks, wherein no remains of plants or animals are found. We next find another series, where the remains of plants and the simplest kind of animals abound; then we excavate the bones of reptiles, birds, and numerous quadrupeds, each in successive strata; yet the remains of man we do not discover. At the present time caves are continually opened, which appear to have been the abodes of wild and savage beasts, proving that when they prowled abroad, mankind were too few in number to subdue them. Animals multiply quicker (generally speaking) than the human species; and before the flood which imbedded their remains, they had wandered far into the woods, extending their dominion over the greater part of the uninhabited world, while the human race, few in number, was confined to a single region. Since, then, amidst the vestiges of those great revolutions which have occurred in the globe itself, we do not find the bones of man, but only the remains of inferior animals, it is evident that only few of the human species could have existed when these catastrophes took place; therefore, the multiplication of mankind must be (comparatively speaking) very recent; but let not this be misunderstood, for all we mean by recent, is, that, in the sight of eternity, three or four thousand years are but as a day, or as a wave in the bosom of a passing stream.

Accordingly, there was a time when man first began to exist: that he did not create himself, is obvious; therefore he must have been created. The tales of the gravest philosophers on this subject rival in extravagance the most ludicrous nursery stories that ever beguiled the ear of childhood. But it is unnecessary to enter into these absurdities: it only remains for us to ask ourselves—by what kind of evidence are we to explain the origin of man?

When we examine the human body, we find it composed of many parts, all of which harmonize together for the production of a certain system, exactly as the stars we see in heaven, by their mutual relations, compose the system of the universe. But no examination of the human body can elucidate its origin. The anatomist may unravel its most intricate machinery, and lay bare, with his dissecting-knife, the course of the minutest nerves—the physiologist may explain how the structure of the eye may be adapted to the sense of sight, and how every organ has a structure appropriate to its particular use—the chemist, when death has sealed down the eyelids, and the vital spirit has departed, may, in his turn, analyse and explain the principles which composed the decaying frame—but not all their combined sagacity can approach even to the remotest explanation of how these elements could so arrange themselves as to produce an organization so complete and so perfect, that its contemplation alone cannot fail to humble the pride of the most daring philosophy. Since, then, no effort of ingenuity can solve this mystery, nor any examination of the body itself afford us the slightest assistance, there is only one other kind of evidence to which we can have recourse—it is the evidence of History.

The most ancient history in existence was discovered about the fifteenth or sixteenth century before the birth of Christ, and is thus described by Sir William Jones, whose knowledge of eastern languages, and extensive erudition, are of the highest character:—"The oldest composition," says he, "perhaps in the world, is a work in the Hebrew, which we may suppose at first, for the sake of argument, to have no higher authority than any other work of equal antiquity that the researches of the curious had accidentally brought to light; it is ascribed to MUSAH, for so he writes his own name, which, after the Greeks and Romans, we have changed into MOSES. After describing, with awful solemnity, the creation of the universe, he asserts that one pair of every animal species was called from nothing into existence; that the human pair were strong enough to be happy, but free to be miserable; that, from delusion and temerity, they disobeyed the Supreme Benefactor, whose goodness could not pardon them, consistently with his justice; and that they received a punishment adequate to their disobedience, but softened by a mysterious promise, to be accomplished in their descendants."*

Trusting, then, to this historical testimony—which can only guide us through this and other perplexing mysteries—we must come to the conclusion that man was formed by a Creator; and although it is not necessary for us to advance any further proofs in support of this belief, we may observe, that, notwithstanding this account is handed down by tradition, yet the events which took place before the deluge have been transmitted to us almost as directly as any of those which took place after that epoch. This was occasioned by the very great longevity of the Patriarchs. Noah lived some hundred years with thousands of persons who had conversed with Adam; and Abraham lived with Shem, the son of Noah; so that from the time of Adam to that of Abraham was comparatively no greater a length, even for tradition, than from our father's grandfather to ourselves.

The birth-place of man—or that region of the world in which he was created—has attracted much notice; and, independently of all higher authority, natural historians have come to the conclusion that both men and animals originally migrated from Asia. The illustrious naturalist Linnæus says, that the "hill of creation" exists in nature, not only as a single acclivity, but as an extensive amphitheatre—a constellation of mountains, the arms of which stretch out into various climates. In the early history of the world, while other parts of the earth were covered with water, or presented only a dreary surface of bogs and morasses, the high land of Asia was already crowned with forests, and abounded with multitudes of animals, which have since dispersed themselves into every latitude of the globe. Here roamed in freedom the wild ox or buffalo, the musimon (whence is derived our common sheep), the camel, the wild cat (from which our domestic cat is sprung), the jackall, which (by intermixture with the wolf, and even, as some suppose, with the hyæna) originated our domestic dog; the rein-deer, the sagacious elephant, the cunning ape. Here, too, the grape, olive, pomegranate, orange, and all the most luxuriant fruits, grew wild. In many places even corn grew spontaneously. In this delightful region was man created; here did our first parents enjoy the brief sunshine of primeval innocence; here all was happiness, until their disobedience to Heaven's high decree "brought death into the world, and all our woe;" then were they driven forth, under the Divine pleasure, to till the land whence they had derived their own existence; then commenced the sorrowful and perilous wanderings of the human race.

The world was all before them, where to choose
Their place of rest, and Providence their guide.

* Asiatic Researches, Vol. III. p. 424.

THE MULTIPLICATION AND DISPERSION OF MAN.

When mankind had existed 1656 years,* an event took place, so awful in its nature and so terrible in its consequences, that its vestiges may yet be traced on the summits of the highest mountains and in the bosoms of the lowliest vallies. The human race, like all other animals, in the beginning, was created both male and female, for the obvious purpose of reproduction; and between the period of the fall and that of the flood, we find that mankind had increased to a prodigious amount, owing partly to the very great longevity to which many of the antediluvians attained, and partly to the numerous intermarriages which then took place. All nations, even the most unlettered, have some tradition of this disastrous event, which destroyed the whole human race then existing, with the exception of Noah and his three sons, with their wives, who, escaping in the ark, and taking along with them such animals as were necessary for the repopulation of the earth, remained in safety until the ark rested on Mount Ararat, which signifies the "Mountain of Descent," and is one of the highest mountains in Armenia.

When the waters had subsided, and the face of the earth became again uncovered, Noah and his family took up their abode in the plains of Shinar, where it appears they dwelt in tents, which were the kind of dwellings first adopted, and used until some of their descendants began to build houses. Here Noah pursued the art of husbandry; here his family increased in numbers, and remained for about 150 years, when the confusion of tongues took place, and they were dispersed into different and distant regions of the earth. The confusion of tongues did not affect the issue of Shem or Japhet, but that only of the impious Ham. To describe the routes which the different groups took, is not necessary; but it must appear obvious, that, as the descendants of Shem and Japhet yet understood each other, they would unite into small societies, and continue to practise those arts which had already been acquired; while the descendants of Ham, not understanding each other, would separate, and degenerate into a state of barbarism. The descent of mankind, originally from a single pair, and the multiplication of the families of Noah, may be proved, by arithmetical calculation, to have been sufficient to supply the earth with its present number of inhabitants; nay, had not wars, plagues, and famines reduced the population, their descendants alone would have over-peopled the world.† Here, therefore, we shall simply explain how the multiplication and dispersion of the families of Noah gave rise to numerous nations.

SHEM, THE SON OF NOAH.—His sons were: Elam, Ashur, Arphaxad, Lud, and Aram.

The region to which they migrated.—The south part of Asia.

The nations to which they gave rise.—The Assyrians and Persians.

HAM, THE SON OF NOAH.—His sons were: Cush, Mizraim, Phut, and Canaan.

The regions to which they migrated.—Africa and the West of Asia.

The nations to which they gave rise.—Cush gave rise to the Ethiopians, and American tribes; Mizraim, to the Egyptians, Cyrenians, and Lybians.

JAPHET, THE SON OF NOAH.—His sons were: Gomer, Magog, Madia, Javan, Tubal, Meshech, and Tiras.

The regions to which they migrated.—North of Asia and North of Europe.

The nations to which they gave rise.—Gomer gave rise to the Gauls, Germans, and Celts; Madia, to the Medes; Javan, to the Ionians and Greeks; Tubal, to the Spaniards; Meshech, to the Muscovites; Tiras, to the Thracians.

Besides the direct dispersion of mankind through the regions of the globe specified, they were occasionally dispersed to detached islands by accidental causes. Cook, Forster, and other celebrated travellers, have remarked, that parties of savages in their canoes must often have lost their way, and been driven on distant shores, where they were forced to remain, deprived both of the means and of the requisite intelligence for returning to their country. Thus, Captain Cook found on the island Wateoo three inhabitants of Otaheite, who had been drifted hither in a canoe, although the distance between the two islands is five hundred and fifty miles. In 1696, two canoes, containing thirty persons, who had left Ancorso, were thrown by contrary winds and storms on the island of Samar, one of the Philippines, at a distance of eight hundred miles. Captain Beechey, in his late voyage to the Pacific, fell in with some natives of the Coral Islands, who had been in a similar manner carried to a great distance from their native country. They had embarked, to the number of a hundred and fifty souls, in three double canoes, from Aran or Chain Island, situated about three hundred miles to the eastward of Otaheite. They were overtaken by the monsoon, which dispersed the canoes; and, after driving them about the ocean, they were left becalmed, so that a great number of persons perished. Two of the canoes were never heard of, but the other was drifted from one uninhabited island to another, at each of which the voyagers obtained a few provisions; and at length, after having wandered for a distance of six hundred miles, they were found, and carried to their home in the Blossom. Kotzebue, when investigating the coral isles of Radack, at the eastern extremity of the Caroline Isles, became acquainted with a person of the name of Kadu, who was a native of Ulea, an isle fifteen hundred miles distant, from which he had been drifted with a party. Kadu and three of his countrymen one day left Ulea in a sailing boat, when a violent storm arose, and drove them out of their course; they drifted about the open sea for eight months, according to their reckoning by the moon, making a knot on a cord at every new moon. Being expert fishermen, they subsisted entirely on the produce of the sea, and, when the rain fell, laid in as much water as they had vessels to contain it. Kadu, the best diver, frequently went down deep into the sea, where it is known that the water is not so salt. Thus, with a cocoa-nut shell, with only a small opening, he occasionally relieved their want. When they reached the isles of Radack, every hope, and almost feeling, had died within them; their sail had long been destroyed; their canoe had long been the sport of winds and waves; and they were picked up by the inhabitants of Aur, in a state of insensibility; but by the hospitable care of those islanders, they soon recovered, and were restored to perfect health. "Accidents similar to these (says Professor Lyell) might suffice to transport canoes from various parts of Africa to the shores of South America, or from Spain to the Azores, and thence to North America; so that man, even in a rude state of society, is liable to be scattered involuntarily by the winds and waves over the globe, in a manner singularly analogous to that in which many plants and animals are diffused." There is yet another fact connected with the dispersion of man worthy of our notice, because it explains how he may have emigrated into countries which appear now far separated from each other. There is no doubt that the whole aspect of the globe has, in the course of ages, undergone the most remarkable changes, owing to the action of the water breaking down the land, against which its waves constantly heave; and owing, also, to the action of volcanoes, which, it is well known, have uplifted hills, and even vast ranges of mountains; and islands, and groups and clusters of islands. Hence there is every reason to believe that the continent of America was once united with that of Asia; for while the destructive action of the waters is impressed visibly on the American coast, Asia, from the earliest periods, has been subjected to the most violent earthquakes. Voltaire has triumphantly asked how man could have emigrated into North America; but, independent of the explanation just given, navigators have discovered that the north-east part of America is very nearly connected with the north-west part of Asia, the distance between the coasts being so trifling, that both men and animals may even yet pass across without much difficulty. Thus does the progress of knowledge triumph over the doubts and errors which our ignorance and credulity too often upraise; nor do we despair of a time when truth will establish her dominion, and one faith prevail throughout the world.

* Hebrew calculation.

† "Various are the ways," says Stackhouse, in his History of the Bible, "which have been attempted by learned men to show the probable increase of mankind. For our present purpose, it will be sufficient to suppose, that the first three couples, *i.e.* Noah's three sons and their wives, in twenty years after the flood, might have thirty pair; and, by the gradual increase of ten pair for each couple, in forty years' time, there would, in three hundred and forty years after the flood, have arisen a sufficient number to spread colonies over the face of the whole earth."

In some parts of North America the population is supposed to double itself every twenty-five years. In the year 1717, the Russian subject were computed at not more than 10,000,000; in the year 1763, a space of forty-six years, the numbers were 20,000,000. This is doubling, in no favourable climate, and during even the devastation of many bloody wars. With the rapid increase of the population of Great Britain, every person is well acquainted; but how much faster must men have multiplied at the period we are considering, when the climate was more favourable, the habits of men less sophisticated, and fewer checks to population existed!

THE EXTERNAL FORM OF MAN—HIS STATURE.

All the productions of nature—no matter whether we contemplate the curiously constructed fabric of animal bodies, the structure of plants, or the regularly arranged particles of minerals—are in themselves perfect; and, as if it were intended that the eye of every observant being should be gratified, all we behold seems to have been moulded in a cast of beauty such as must in every instance excite admiration. In the vegetable kingdom—from the oak of the forest to the gracefully drooping willow of the valley, from the rarest flower of foreign climes to the most common weed—we behold the most agreeable variety; so, too, in the animal kingdom—from the lions and tigers which prowl wild through the woods, down to the lizards and serpents that creep along the grass or desert sands—from the eagle that builds its eyrie on the loftiest cliff, down to the little humming-bird which flits about like a mote in a sunbeam—all we see excites wonder and admiration. Yet, amidst all that has been created, the human form, by universal consent, has been esteemed the most admirable; so just are all its proportions; so exquisitely do they harmonize together; and so obviously is the whole stamped with the expression of superior intelligence. Let us, then, proceed to examine the various peculiarities by which the human frame is distinguished in different regions of the world.

The variable stature of man first claims our attention. In this country, the average height of men is five feet eight inches;* the average height of women five feet five inches; and all who exceed or are beneath either of these measurements, may be considered above or below the ordinary standard. In the temperate climate of Europe, the stature of the human race may be said to vary from five feet and a half to six feet; but in the high northern latitudes, where the growth of animals and vegetables is checked by the intensity of the cold, the stature of man is low. The Laplanders, Greenlanders, and Esquimaux, are all very short, measuring only from four to a little above five feet; but there is no uniformity between any particular climate and variety of human stature. It is true that the Laplander is short, but the Norwegian, living nearly in the same latitude, is tall; so, also, while the Hottentots, living in the south of Africa, are very short, the Caffres, a neighbouring tribe, are tall, robust, and muscular. In Asia, the Chinese and Japanese are nearly of the same stature as ourselves; but the Mongols, and some other tribes, are remarkably short. The inhabitants of America present us with very striking differences. In the regions north of Canada, the tribes are very tall; among the Cherokees many exceed the height of six feet, and few are below five feet eight or ten inches. The western Americans of Nootka Sound, near the Columbia, are of low stature; so also are many tribes in South America. The Patagonians, however, who occupy the north-eastern part of this country, are of prodigious stature; most of them are six feet five or six inches, and many eight feet high.

Individuals of very remarkable height have frequently existed, and among them the following examples, which we believe to be well authenticated, may be adduced:—

	Ft.	In.
Duke John Frederic, of Brunswick, Hanover, measured	8	6
One of the King of Prussia's guards - -	8	6
Gilly, a Swede (exhibited as a show) - -	8	8
Reichardt of Friedberg, near Frankfort - -	8	3
Martin Salmeron, a Mexican - - -	7	8½
An Irishman (skeleton in the London College) -	8	4
A Danish female, named La Pierre - - -	7	0

But while we call to recollection these and other gigantic personages, we may also remember, that a remarkable diminution of stature is likewise frequently observable.

Beke, King of Poland, measured only -	33 inches (French)
Boruolaski, a Polish nobleman (skilled in many languages) - - - -	28 do. do.
Stoberin, a female in Nuremberg -	3 feet.

In some instances, these varieties of stature appear to have been hereditary; thus, the father and sister of the gigantic Reichardt, above mentioned, were gigantic; the parents, brothers, and sisters of Stoberin, dwarfs. It is well known that the King of Prussia had a body of gigantic guards, consisting of the tallest men who could be collected from all the neighbouring countries. A regiment of these men was stationed, during fifty years, at Potsdam. "And now," says Forster, "a great number of the present inhabitants of that place are gigantic, which is more especially striking in the numerous gigantic figures of women, and is certainly owing to the connections and intermarriages of these tall men with the females of that town."

All such cases, showing an excess or a diminution of the developement of the human body, may be regarded as irregularities of nature, or as species of monstrosities. Accordingly, those men who have much exceeded the ordinary standard, are generally ill proportioned, and have not possessed strength corresponding to their size. In general, in such cases, the nervous system seems as if insufficient to supply with muscular vigour, or intellectual energy, the demands of the preternaturally sized body. It may indeed be remarked, that a sort of healthy balance should exist between mind and matter; and if, therefore, from the original formation of the body, or from habits of luxury, the human frame make too great a demand on the nervous influence by which all its parts are animated, the mind itself must be enfeebled and impaired. Dwarfs are, for the most part, the victims of disease; they are in general ill-made; their heads are very large, and their powers, physical and mental, very feeble. It may be concluded, then, that few healthy well-made men, having all the attributes of their race, will be found to exist who are much above or much below the average height of their fellow-countrymen. The causes which produce these varieties of stature are not well understood; but, doubtless, a simple mode of life, nutritious sustenance, and a salubrious atmosphere, will be found to favour the full, healthy, and natural developement of the human body. The influence, indeed, of these causes, may be well illustrated by the following observations of the traveller Barrow:—"There is perhaps no nation on earth," says he, "that can produce so fine a race of men as the Caffres; they are tall, stout, muscular, well-made, excellent figures; they are exempt, indeed, from many of those causes which in more civilized societies contribute to impede the growth of the body; their diet is simple, their exercise of a salutary nature; their body is neither cramped nor covered by clothing; the air they breathe is pure; their rest is not disturbed by violent love, nor their minds ruffled by jealousy; they are free from those licentious appetites which proceed frequently more from a depraved imagination, than a real natural want; their frame is neither shaken nor enervated by the use of intoxicating liquors, which they are not acquainted with; they eat when hungry, and sleep when nature demands it. With such a kind of life, languor and melancholy can have little to do. The countenance of a Caffre is always cheerful, and the

* The late Dr John Gordon of this city observes, that this measurement is rather above the average.

whole of his demeanour bespeaks content and peace of mind."

The causes producing such varieties of stature are not confined to man alone, but extend through inferior races of animals; as may be observed by comparing the small Welsh cattle with the large Herefordshire cattle, or the Shetland pony with the tail-backed mares of Flanders. In the interior of Ceylon, according to Mr Pennant, there is a small variety of the horse, not exceeding thirty inches in height; so, too, in the Island of Celebes, a race of buffaloes is found, not exceeding the size of our common sheep. The Padnan fowl, likewise, is double the size of the common fowl; and we are all aware how the Bantam breed is prized for its superior size and strength.

The human race has been supposed to have degenerated in stature; many persons, indeed, believe that men are now much shorter than they were at a former period in the history of the world. The Scriptural statement, that "there were giants in those days," has, indeed, given rise to much useless discussion; for while some have maintained that all men before the deluge were giants, others have argued, more correctly, that no giants ever existed, but that the term simply refers to men noted for their crimes, and the violence they committed. There is certainly no reason to suppose that the general stature of man differed before the flood from that which we at present observe; yet, that some few very gigantic men did exist, is recorded on authentic testimony; nor, from the instances above mentioned of men of extraordinary stature, could such occurrences be regarded as marvellous, or out of the ordinary course of experience.

The remains of Egyptian mummies preserved from the earliest antiquity prove satisfactorily that the stature of the Egyptians did not exceed the ordinary height of the human race; many of these being five feet six inches, five feet eight inches, &c. Besides which, from the helmets and breast-plates preserved, from the buildings designed for their accommodation, and from monuments and works of art that have escaped the vicissitudes of ages, we may be satisfied that men were not formerly any taller than they are at present. Immense bones have often been dug up, and exhibited as the bones of men, which, on inspection, have proved to be those of animals. In 1613, the bones of the great giant Teutobachus were shown through Europe; but these, on inspection, turned out to be the bones of an elephant. It is remarkable, that even the great natural historian Buffon fell into a similar blunder, which has been corrected by Blumenbach.

It is a fashion with all poets, and with early historians, who often encroach on the land of fable, to describe giants as originally composing the nations whose praises they sing, or whose history they record; but such narratives are, for the most part, founded only on popular traditions, which have been sometimes suggested by superstition, and not unfrequently by the premeditated craft of interested and better informed persons. To excite the energies of the people, and to goad them on to war, their leaders often represented their enemies to them as gigantic beings, who would destroy them, unless they prepared themselves for the most enterprising and daring feats. Every poetic hero or heroine is yet expected to undertake some marvellous achievement—to encounter some appalling danger—to surmount some tremendous obstacle: hence, in Fletcher's introduction to the *Worthy Citizen and his Wife*, the Knight of the Burning Pestle is made to ask what the principal person of the drama shall do?—to which the following pithy desire is responded:—"Marry! let him come forth and kill a giant!"

THE COMPLEXION OF MAN.

As the inferior animals over which man claims dominion, present us with diversities of colour, corresponding to the climates in which they live, so does the human race present us with certain varieties of complexion, in all the different latitudes of the globe. Beneath the burning rays of a tropical sun, the complexion of man is of a deep jet black, as may be observed in the numerous tribes of African negroes; but as we proceed from the equator into more temperate climates, the complexion loses its darkened hue, and passes through all varieties of shade, until it becomes delicately fair. If, passing from the extreme of heat to the extreme of cold, we extend our observations to the highest northern latitudes, we shall there find that the human body becomes of a brownish or dusky hue, such as may be observed in the Laplander, Greenlander, and Esquimaux. We may, indeed, establish the following classification of complexions:—1. The white. 2. The yellow, or olive-coloured. 3. The red, or copper coloured. 4. The brown, or tawny coloured. 5. The deep ebony jet black. The original complexion of man has afforded matter for much speculation; but the general opinion of those who have examined the subject is, that he was not, as we flatter ourselves, of a white or fair, but of a dark complexion. When we consider that man was created in Asia, there is no extravagance in conjecturing that his complexion may have been of such a character.

Many persons have argued that such varieties and contrasts of complexion as are observed among different races of men, could not have arisen from external circumstances; wherefore they conclude, that more than one species of man must have been originally created. But the truth is, that the influence of light, heat, dry or moist air, food, soil, artificial habits, and very many other causes, which it is difficult even to enumerate, may, through a long succession of ages, have effected these changes. We have a proof of this in the Jews, who are undoubtedly derived from one parent stock; yet the English Jew has a fair complexion, the Portuguese Jew is swarthy, the American Jew is olive, the Arabian Jew is copper-coloured, and the African Jew is black. Here, then, we distinctly see the influence of climate on a people, who seldom or never intermarry with others of a different sect, and who have preserved their peculiar character, as a distinct nation, entire, amidst all the other inhabitants of the world.

Even in this country, the influence of climate on the complexion is very obvious, as may be noticed by comparing the countenance of the rustic who toils in the open fields, or the seaman who traverses the "boundless plains of ocean," with that of the literary man in his retirement, or the mechanic, who, from sunrise to sunset, toils in a manufactory. Compare, too, the daughter of a rich noble, who has had the misfortune to have been born an heiress, and is educated for the display of her beauty in the fashionable world, with the daughter of the cottager, who has, from her childhood, been accustomed to exercise in all weathers; in the one, the skin is exquisitely soft and smooth, and emulates in whiteness the purity of the winter snow; in the other, the skin is less smooth and fair, and the tinge of the life-blood is seen mantling below it; the one is a complexion indicative of a delicate or perhaps sickly constitution, which cannot withstand a winter blast or a summer shower; the other indicates a being continually cheered by the conscious and animating glow of health. In a foreign country, where the sun's rays fall more directly, and, therefore, with greater force, on the earth, exposure to their influence undoubtedly tans and darkens the complexion, as may be observed in all those who have returned from a long residence in India. Even among the natives in Africa, the women of the higher classes, who live much under shelter, and seldom expose themselves to the sun's rays, are of a lighter complexion than those who move about in the open air. It may be observed, too, that negro children, when born, are as fair as Europeans, and gradually afterwards become black. Besides this, the palms of the hands, the soles of the feet, and other parts of the body which are concealed from light, are not so dark in the adult African as those that are more exposed.

Here, too, as in many other instances, a striking analogy may be traced between the causes influencing the complexion of man, and those influencing the colour of animals; for as plants and flowers spread forth richer hues in the cheerful light of the sun, than they do when drooping beneath continued clouds, so do the birds and animals of a tropical climate wear a gaudier plumage and a gayer covering than those which are destined to live in the snowy and gloomy regions of the north. Within the tropics, trees and plants generally attain the most luxuriant growth, and the air is often loaded with delicious perfumes. Here the peacock, the parrot, and the bird of paradise, sport their beautiful plumage; and the tiger with his bright stripes, the leopard with his spots, and the lion with his noble mane, seek the solitude of the forests; where, too, serpents, with the most glowing and dazzling hues of skin, may be seen either reposing beneath the boughs of trees, or not unfrequently turning round their trunks. Even in Britain, birds that fly by day have a brighter and more varied plumage than those that only venture out by night; as may be seen by comparing the feathers of the goldfinch with those of the owl. Animals, too, such as hares, rabbits, moles, &c., which burrow in the earth, and conceal themselves from light, generally assimilate in colour to the soil they frequent. Nor does climate limit its influence only to the colour of animals; it affects the texture and nature of their coverings. Hence the dogs of New Guinea are nearly naked; those in the northern latitudes are covered with coarse woolly hair. In Africa, the wool of the sheep degenerates into coarse hair. The colour of the plumage of birds, when domesticated, undergoes many changes. Some singing birds—principally those of the lark and finch kind—are known to become black when fed upon hempseed. Owing to the varied influence of such causes, wheresoever we rest our eye on the surface of the globe, there do we behold a character peculiar to that region, not dependent alone upon the relations of its mountains or its vallies, its lakes or its rivers, but on all animate nature—the trees of the forest, the birds of the air, the animals both wild and tame, and man himself, who, like the rest, in the succession of ages, has localized himself, and found an appropriate habitation in every climate.

EFFECTS OF ART IN CHANGING THE FORM AND FEATURES OF THE HUMAN BODY.

All nations, even in their infancy, have recourse to such customs and fashions as gratify that feeling of vanity which appears natural to man. It is not alone in civilized society that fashion exercises her tyranny; she extends her influence over even the most uninformed of the human race. Savages almost universally delight in painting their bodies, in hanging rings through their noses and lips; and the natives of almost all countries, at an early period of their history, have undertaken to fashion particular parts and features of their bodies into a happier mould. In infancy, especially just after birth, all the bones of our frame are soft and pliable, and admit of being compressed into shapes such as were never designed by the provident wisdom of nature. The head, the face, the breasts, the feet, and other parts of the human body, have been subjected to the most capricious interference, the inquiry into which is not so much a matter of curiosity, as of importance, because we may hereby discover the origin of certain peculiar appearances, which are now characteristic of particular races of men. The head, the configuration of which, in early infancy, is changed with great facility, has been submitted to many alterations in figure. The Scythians, as a sign of their nobility, chose to have it shaped like a sugar-loaf, which was effected by the midwives binding the infant's head with cloth bands. Anciently, the women of Peru had recourse to this absurd fashion; so also had many Indians; and, that this form was occasionally transmitted to their children, is evident, from the birth of several infants, with this congenital monstrosity, having been recorded. A remarkable length of head, by other nations, was conceived a beauty. This the ancient Portuguese produced in the same artificial manner. The Germans esteemed a short head as the most preferable, wherefore we are informed that the German mothers took especial care to lay their children in their cradles in such a manner that the back part of the head should be compressed. Other nations preferred round heads, a fashion which was affected by the Greeks, and also by the Turks, who considered it the most commodious form for the turbans they wear; and the Turkish skull, at this day, is observed to be remarkably round. In the province of Old Port, in the West Indies, the men, admiring the square head, gave it that form by compressing the infant head between boards, which enclosed it on all sides like a square wooden box. The forehead has, in like manner, been made the subject of many capricious fashions. The Mexicans judged those to be most beautiful who had little foreheads. The Spaniards, on the contrary, accounted a high forehead a happy distinction; wherefore the ladies drew back their hair, to extend its height beyond its natural dimensions. The Russians admired broad foreheads, to acquire which, they compressed the head from above, so as to increase its breadth. The Italians, on the other hand, endeavoured, by artificial means, to render the forehead more prominent than natural. If possible, a more singular fancy prevailed with some nations, who were accustomed to burn letters on their foreheads. The Siamese, Thracians, and the people of Malabar, adopted this fashion; among whom, both men and women cut into the flesh of their brows, crosses, letters, and numerous fanciful characters. A very receding, or sloping forehead, has been and is still considered a beauty by many of the African tribes, and this they give their children, by making them wear a flat compressing instrument, which has been often exhibited in this country.

Not only has the head been subjected to these capricious changes, but the nose and the ears have likewise been submitted to the ingenious contortions of fashion. "The Indians," says an old author, "have their noses slit like broken-winded horses." The truth seems to be, that they made an incision in the centre, down the length of the nose, and used to keep the aperture gaping by pieces of bone or wood stuck in as ornaments. The Chinese consider a short nose a beauty; but some tribes in Africa, and also the Peruvians, reverted this decree of taste, and esteem a large nose the most desirable. The inhabitants of the Island of Zanzibar turned the nose from its point upwards, and thus gave it a curved upward direction. The Tartars, and Caffres, and many tribes both in North and South America, took particular pains to flatten the nose in infancy; and this still is a feature desired, and prevailing among most of the natives of Africa. In consequence of their king, Cyrus, having had a hawk-like nose, the Persians considered this shape a mark of nobility, and adopted every artifice to produce it. This fashion, we find, was also highly esteemed among the Romans, wherefore it has been termed the "Roman nose." Another very preposterous custom adopted has been that of lengthening, by artificial means, the lobes of the ears, and the length to which they have been dragged is indeed almost incredible. We are informed that some Indians, having extended them to half the length of their body, used to lie upon them, making them, as it were, a couch to rest on. In the West Indies, among some tribes the same fashion prevailed, and the elongation was effected by hanging weights to them, which they gradually increased. The Hollanders adopted the custom, and decorated them with heavy jewels. The travellers Condamine and Ulloa saw the lobe of the ear, in many instances, hanging down to the shoulder. Very large ears having likewise been deemed less asinine than at present, were considered beautiful, and diligently cultivated by being continually dragged beyond their natural size. This the Caribs took great pains to effect, as also did the inhabitants of Zanzibar, as well as the Peruvians. Not only were the ears subjected to this species of torture, but many nations esteemed it a very great beauty to have the lobe pierced with a large hole, the great dimensions of which constituted its principal charm. This was effected by means of pegs of wood, the diameter of which they gradually enlarged; this custom was adopted by the people of Malagar. "The gentlewomen of Indostan," says an amusing old author, "have the flaps or nether part of the ears bored when they are young, which they daily stretch and make wider, by things kept in for that purpose, until it at last becomes large enough to hold a ring as big as a little saucer, made for its sides to rest in the flesh; besides which, round about their ears they make other holes for pendants, that when they please they might wear rings in them also. The Brasilians, on the authority of Mr Southey, insert gourds in the slits of their ears, and increase them in size, until the fist can be put through, and the ears reach the shoulders. The practice of wearing many rings in the ear was common among the natives of Virginia, among the Brasilians, and many nations. The custom of perforating the lobe of the ear, and wearing ear-rings, is extremely ancient, and was condemned by many older moralists, who affirmed that it would have been nothing to wear vain ornaments about the neck and hair, but that it was most absurd and monstrous to "let them into their bodies." We cannot pursue this subject further; but may observe, that we do not think that the beauty of the human form, such as we behold it in the most lovely of the female sex, can be enhanced by the dangling of any jewel from the ear; but, as our learned authority quaintly observes, "the conceit worked very strong in their head who first introduced this fashion."* Almost every person has heard of the practice of the women of many countries, who draw out and enlarge the bosom of their children as soon as they become developed; a custom which prevailed among the Mexican women, and is still practised by the Hindoos, who, while they carry their children on their back, afford them milk by throwing their bosom over the shoulder. It appears, too, that this was once a custom among the Irish; for Meubsel observes, that "the Irish-women at this day (1653) would give suck to their babes behind their backs, without taking them in their arms;" and adds, "that their breasts were fit to be made money-bags for East or West Indian merchants, being more than half a yard long." The Portuguese of the present day are said to be remarkable for the large size of their bosoms; while the Spanish women, on the contrary, take pains to compress them, and prevent their luxuriant growth. The hands have been, in like manner, made notoriously the subjects of similar fantastic interferences. The ladies of Portugal were formerly ambitious to display long and narrow hands; wherefore the hands of children were, in early years, tightly bandaged, to prevent their increase in breadth. The Hindoos, Chinese, and Esquimaux, are remarkable for their small hands; the sabres of the Hindoos brought into England have the handles too small for the European hand. Among the ancient Spanish women, large hips were deemed desirable; to procure which, they compressed, with cloth bands, the neighbouring superior and inferior parts of the body. In China, from the very earliest period, small feet have been considered so essential to the beauty of personal appearance, that the custom of bandaging the feet of infants to retard their growth prevails among all classes. If a mother, says a traveller, were to break this custom, she would incur the note of infamy, and be punished. But while we are gratifying our curiosity, and smile at these fantastical customs adopted by other nations, we must not forget that we have ourselves, even in these enlightened times, given way to customs as absurd, and as injurious to the healthy condition of the human body. It is not more than ten or fifteen years since the London dandy, then known as the "Bond Street lounger," assumed invariably a fashionable stoop, lifting up the shoulders, and turning down the neck, till the chin nearly met the chest; and, as if to convey a satire on her own subjects, this despotic genius of fashion immediately afterwards reversed the order of her decrees; and then the same loungers were seen with their bodies erect as ramrods, and their chests stuffed prominently out, as if they were desirous of emulating the breasts of women. We are all too well acquainted with the false notion adopted by ladies, who fancy that a preternaturally small waist contributes to the beauty and gracefulness of their figure; to acquire which, the pernicious habit of tight lacing was introduced, which has given rise to curvatures of the backbone, and deformities of the chest, which are too hideous to contemplate any where, excepting in the cases of a surgical museum. Another abominable practice is, or very recently has been general in this country, that of binding tightly the tender limbs and delicate body of the child just born; another most obvious means of producing deformity in after life. How far the changes of form and feature which we have now enumerated, by transmission from parent to child, may have become permanent, remains to be considered; but, in the meantime, it may be laid down as an axiom, that if we wish to give the body a graceful form, we should encourage its natural and healthy developement, and allow all its muscles full freedom of action.

VARIETIES OF MANKIND.

Notwithstanding the differences of stature, complexion, and general habits exhibited by different nations, the whole human race, multiplied and dispersed as it is through all parts of the world, constitute but one species; the apparent varieties of which, occasioned by the influence of climate and other external circumstances, pass so insensibly, and by so many shades, into one another, that it is impossible to separate them by any definite boundary. But, notwithstanding this, philosophers have attempted to establish certain varieties of mankind, as if, indeed, there had been original and specific differences between those races of men which appear somewhat different in appearance from one another. It generally happens in science, that if one man start into a new path, and announce the discovery of facts before unknown, the majority of those who succeed him content themselves with reiterating his statements, and founding on them the inferences they wish to establish. Hence the learned Malte Brun, the ingenious Lawrence, and all who have written on the history of man, follow, with little or no variation, the classification proposed by the celebrated Blumenbach, who reduces the human race to five varieties; the Caucasian, the Mongolian, the Ethiopian, the American, and the Malay. But the truth is, that this and all other divisions are perfectly arbitrary, and we doubt much whether they should be received. The differences so established depend principally on the various configurations of the skull; but the truth is, that there is almost as much difference between the skull of an Irishman and that of a Scotchman, as there is between the skull of a Circassian and that of Mongolian; nay, not only in the same country, and among the same inhabitants, but even in the same families, the most remarkable differences, in the form of the head and the features of the face, are observable; yet we do not dream of classifying them into any definite order of varieties. Indeed it is very questionable, notwithstanding the greatness of his authority, how far the accounts given by Blumenbach, of the different skulls of nations, should be admitted; his observations were, for the most part, founded on individual skulls, which can never be relied on as representing correctly those of the bulk of any nation. We hold, therefore, that excepting as a matter of fancy, it is not right to speak of the varieties of mankind at all; for, instead of reducing them to five, we may make fifty or a hundred, in fact as many as our ingenuity or pleasure may choose to suggest.* The method most agreeable to nature, perhaps, would be to describe the organisation of man only in reference to the latitude or climate in which he lives, proceeding from the equator to the poles; but owing to the free communication between nations, and the continual intermarriages that occur, every step we proceed is beset with difficulty. If we wished a specimen of the form of a Scotchman, we should not rest contented with taking an individual who happened to have been born in Scotland, even from Scotch parents; but we should inquire how far his lineage had been exposed to corruption, or gradation of form, by intermarriage with the natives of other countries; yet it is sufficient for many, esteeming themselves observers of nature, to place as specimens on the shelves of museums, skulls labelled Chinese, German, Hindoo, simply because these skulls happened to be picked up in those countries, or belonged, perhaps, to individuals whose genealogy could never be ascertained. We know well, that, owing to the effects of climate, and many causes, some of which have been already referred to, the inhabitants of different parts of the globe present us with varieties of stature, feature, shape of head, proportion of limbs, &c.; but it would be indeed highly absurd for any person to pretend to establish distinctions of permanent varieties, by referring only to the differences observable in the form of the head, which is a part only of the human system, the *whole* of which should be brought into evidence. Here, therefore, we shall deviate from the arrangement usually adopted, and notice only some of those nations or tribes of people whose *general* physiognomy and habits seem to establish for them a prominent position in the History of Man.

ALBINOS.

In Asia, Africa, America, and even in Europe, we occasionally meet with a very remarkable variety of complexion, which is exhibited by those persons denominated white people, or Albinos. The skin of these individuals is remarkably white; the hair, which in the European Albino is flowing, is of a soft silky texture, and likewise of a yellowish white, or cream colour; their eyes appear at first of a rose colour, but, on examining the pupil in the light, are discovered to be decidedly red; the iris, too, or that delicate fringe which surrounds the pupil of the eye, has a constant tremulous motion. During our stay in Otaheite (says Captain Cook), we saw about five or six persons, whose skins were of a dead white, like the nose of a white horse, with white hair, beard, eyebrows, and eyelashes, red tender eyes, a short sight, and scurfy skins, covered with a kind of white down." Mr Bankes and Dr Solander thus describe an individual seen on the same island:—"His skin was of a dead white, without the least appearance of what is called complexion, though some parts of his body were, in a small degree, less white than others; his hair, eyebrows, and beard, were as white as his skin; his eyes appeared as if they were bloodshot, and he appeared to be very short sighted." Here we may observe, that nature, ever provident in her designs, has, in constructing the eye, placed, on a particular coat within it, a dark colouring matter, for the purpose of absorbing those rays of light, the intensity of which would otherwise injure the nerve of vision. It is, we may add, this matter which gives the eye its peculiar colour; in some instances it is black, in others brown, and, according to its different shades, gives rise to blue, grey, hazel, dark, or black eyes. Furthermore, we may observe, that there is generally a sympathy between the nature of this colouring matter and the hair, whence people with light hair have often blue or greyish eyes, while those with black hair have generally dark or black eyes. The same principle is also observable in animals, among whom variety in the colour of the skin and hair is accompanied by variety in the colour of the eyes; which may be observed in dogs, cats, rabbits, and other variously spotted or coloured animals. Accordingly, it is the want of this colouring matter in the eye of the Albino which gives it the rose or red colour, and, at the same time, renders it painfully sensible to light. Hence a traveller, describing them, informs us that "they see not well in the sun, poring in the clearest day, their eyes being weak, and running with water if the sun shines towards them; so that, in the day time, they care not to go abroad, unless it be a cloudy dark day. Besides, they are a weak people in comparison to the other, and not very fit for hunting and other laborious exercises, nor do they delight in any such; but, notwithstanding their being thus sluggish and dull in the day time, yet, when moonshiny nights come, they are all life and activity, running about in the woods, and skipping about like wild bucks, running as fast by moonlight, even in the gloom and shade of the woods, as the other Indians do by day." Another traveller says, "They have this distinguishing peculiarity, that they cannot endure the light of the broad day. While the sun is up, they cannot look steadily at any object, and, during all that time, they contract their eyelids so, as apparently to exclude vision. But, in return, they are gifted with the faculty of seeing every object in the dark. By the Hindoos they are looked upon with horror, and their bodies, like those of persons labouring under skin diseases, are cast upon a dunghill, or left to be eaten by wild beasts."

In Africa, among the black races, Albino negroes are frequently born; they are looked upon as great curiosities, and are often collected by the black kings, and kept as objects of wonder and ornament. One of the kings of Ashantee is said to have collected nearly a hundred white negroes. Buffon has given a minute description of a white negress, born in the island of Dominica, of parents who were natives of Africa. She was not quite five feet high, but well proportioned. Another is described by Dr Winterbottom, who informs us, "that she had all the negro features, with woolly hair of a dirty white colour, and a skin equalling in whiteness that of a European, without any thing disagreeable in its appearance or texture. Her eyes were between a red and white hazel, and not much affected by light."

Albinos have been said to appear most frequently among dark people, and in hot countries; but they may occur among all races of men, and in every latitude of the globe. This peculiarity is not, we may add, restricted to mankind, but often found among the inferior animals, especially in the horse, cow, cat, mice, rats, and moles.

PYEBALD OR PARTY-COLOURED BLACK AND WHITE PEOPLE.

Nature presents us with so many varieties of production, both in the vegetable and animal world, that our incredulity is often excited, merely because the related fact happens not to be in accordance with our own individual experience. This disposition to scepticism should not be encouraged; the duty which in such cases devolves upon us being simply to weigh well the evidence on which the narration has been founded. It is certain that instances have occurred of people having been born pyebald; that is, the surface of the body has been found marked by blotches distinctly defined, and not running into one another—exactly as is observed in pyebald horses, which are very common in this country. In these instances, the prevailing contrast is between black and white. Thus, in the Zoological Magazine, we read that a girl was born in Somersetshire, with the hair of her head of two remarkable distinct colours; after she had grown up, the hair on the left side was that of a jet black—that on the right side of a carroty red. In Southwark, a few years ago, a person was born with the right side of the body white, and the left side black; another was born with the lower half of the body white, and the upper black. Instances have certainly occurred of negro women, who have been married to Europeans, giving birth to twins, the one completely white, the other completely black. It is impossible for any effort of human ingenuity to explain these irregularities; but certainly they are not more wonderful than numerous other monstrosities that have been recorded, and still occasionally appear.

THE PROPORTIONS OF THE HUMAN BODY AND STRENGTH OF MAN.

The beauty of the human form depends very much on the proportions which the head, trunk, and limbs

* See Bulwer, whose amusing book on this subject has the following droll title:—"Anthropometamorphosis—Man Transformed—or the Artificial Changeling Historically Presented in the mad and cruell Gallantry, foolish Bravery, ridiculous Beauty, filthy Fineries, and loathsome Loveliness, of most Nations fashioning and altering their Bodies from the Mould intended by Nature." A. D. 1653.

* M. Virey divides the human race into two species; Desmoulins into *seven*; Bory St Vincent into *fifteen*. Such divisions, and other subdivisions, are very amusing; but little better than a romance.

bear to each other; and artists therefore, have taken great pains to determine these, which they have in general done by measuring those celebrated ancient statues that have been esteemed the wonders of their art. But as many of these statues are colossal or diminutive in size, and, more especially, as every variety is observable in the height and proportions of men, no standard so taken can be universally applicable; indeed, no definite rule of beauty can be established, for it must depend entirely on the model we may choose to prefer. Hence our varieties of taste are interminable. The Greek statues are considered very beautiful, and are those generally chosen by artists; but if we go into nature, and behold man as he actually exists in all climates, what infinite varieties of form and proportion shall we find, and these, too, compatible with remarkable bodily vigour! It is probable that all these differences were originally owing to the influence of external circumstances, more especially to artificial habit, which more or less prevail among all nations.

The ancient Germans were remarkably tall and well-proportioned. The ancient Britons were likewise strong well-proportioned men, capable of undergoing great fatigue and exertion. The Romans were notoriously a fine race of people, until their intermingling with the inferior Asiatic races, and their habits of luxury and effeminacy, vitiated their forms and reduced their strength. Many of the American, and also African tribes, that have not yielded to those sophisticated habits which are engendered by a high degree of civilisation, present us with admirable models of symmetry; they have been poetically, but not less truly, described as the "naked Apollos of the woods." The healthy developement of the human body must depend much on the nature of the food by which it is nourished; wherefore those tribes that subsist on a scanty and inferior diet have their growth checked, and become ill proportioned and enfeebled. The natives of New Holland are small in stature, with long and slender limbs, which may be attributed entirely to this cause, for we are informed that their food is always of the least nutritious kind, and very scarce; indeed, the scarcity is often aggravated to all the horrors of actual famine, under which they are reduced to the appearance of spectres, and not unfrequently perish. The stature and proportions of the negro have often been compared with those of the European, by which it has been shown, that the trunk of the negro is more slender, particularly about the loins, the arm and forearm longer in proportion to the height of the body, and the calf higher up on the leg. While the savages of New Holland have their legs so extremely long, the Mongolians and Americans have their legs and thighs too short in proportion to the rest of the body. Such differences in the stature and proportions of the body necessarily occasion considerable differences in strength; for, as we have observed, it is not on the height of the body, but on the just proportions of all its parts, that physical power is dependent. The art of training men to run races, fight, lift heavy weights, &c., is founded entirely on the principle of supplying the body with just sufficient solid and nutritious aliment to support it, and to enable it to undergo additional exertion.

It has been often supposed that man in a savage state possesses a superior degree of bodily strength; but this does not appear to be the fact. A French philosopher, M. Peron, made numerous experiments on this subject, which he communicated to the French Institute; and these have been regarded as perfectly satisfactory. He took twelve natives of Van Dieman's Land, seventeen of New Holland, fifty-six of the Island of Timor, seventeen Frenchmen, and fourteen Englishmen, and, by the aid of an instrument, which indicated by a dial-plate the force of the individuals who experimented, he determined the strength of the arms and loins. The Englishmen proved the strongest; then came the Frenchmen; after them the natives of Timor; then those of New Holland; and, lastly, those of Van Dieman's Land: hence it was fairly concluded that civilization, always excepting its abuse in the luxuries to which it often gives rise, does not impair bodily strength. Desanguilier states, that, by means of a certain harness which he has contrived, and by which every part of the body was proportionally loaded, a person was enabled to support, in the erect posture, a weight of not less than 2000lbs. Besides the nature of the climate and the quality of the food, habits of exertion have a great influence on the developement of muscular power; hence gymnastic schools were instituted by the ancients, who encouraged their children to persevere in using athletic exercises. The South Sea Islanders, by practice, are enabled to swim about in the strongest surf, which would instantly destroy a boat or vessel. Men accustomed to running will outstrip the speed of horses. The royal messengers of Ispahan, who are trained to running, go thirty-six leagues in fourteen hours. And we are assured by travellers, that Hottentots outstrip lions in the chase, and that those savages who live by hunting outrun and catch deer and other fleet animals. In some efforts of muscular exertion there is a peculiar knack; thus in the Highland games it is observed, that the man who will throw the bar farthest often fails with the hammer, or with instruments of equal weight, but of a different shape. So, too, a porter will carry a greater weight than a sailor; but the sailor will haul a rope or drag a weight with much more ease than the porter. Both in ancient and modern times, individuals have exhibited themselves who displayed the most extraordinary feats of strength. The power of an individual named Echeberg, a German, and the strength of another named Topham, attracted the attention of many men of science, who bear testimony to the very wonderful actions they achieved. Erkeberg, by the strength of his hand, doubled a thick piece of iron, and, taking another bar of the same hard metal, he twisted it into a corkscrew shape. Topham rolled up in his hand a pewter plate, and lifted the enormous weight of eight hundred pounds. The French philosopher to whom we have referred, Desanguilier, has, from his observations, concluded the strength of very weak men to be equal to 125lbs., that of very strong men 400lbs. The effects of exertion in increasing the size and the power of muscles may be observed by noticing the arm of the blacksmith, and also the arms and chests of prize-fighters. We observe, too, that dancers have the calves of the legs fully and well developed, while waggoners, who are accustomed to walk without duly raising the arch of the foot, have those muscles very small and weak. Athletic exercises are at present very fashionable in this country, and the use of poles or clubs is now common in almost all schools; but it is not to be forgotten, that all inordinate muscular exercise is prejudicial to health, and tends to shorten the duration of life. When great exertion is made, the action of the heart and blood-vessels becomes increased; and when this is often repeated, they become impaired. Hence blacksmiths are particularly liable to diseases of the heart: besides, when, from very great and repeated exertion, the muscles are drawn out into the highest possible state of tension, the fibres that compose them are brought into the condition of overdrawn wires, which will give way on the slightest occasion. When one [illegible] tic men, who has devoted his whole [illegible] ance of feats of strength, is thrown upon a sick-bed, his whole frame becomes speedily unstrung, and reduced to a state of the most miserable debility. Prize-fighters wrestlers, men who practise violent gymnastic [illegible]ses continually, seldom or never arrive at old age; they concentrate, and, as it were, bring into a focus the whole vigour of their constitution; they are, for a time, all-powerful and triumphant, but their victory is short-lived, their pre-eminence not enviable; they too soon find that they have exhausted the fountains of their strength, and must sink to rise no more. Exercise, moderate and healthy, and also gymnastic amusements, are not only proper, but essential to good health; but let them not be carried to excess—let not the bow be too far bent, lest it become irrecoverably broken.

THE INHABITANTS OF ASIA.

When we consider that Asia was the cradle of the human race, it is natural, in taking a general survey of the globe, to fix our attention on this region, which, although no longer illumined by the arts which once shed over it a glory, still retains, even amidst its ruins, sufficient vestiges of the past to excite our interest and animate our contemplations. Owing to the peculiar aspect of this country, we here find every variety of climate; spring, summer, autumn, winter, seem here to have chosen regions for their perpetual abode, and may be found co-existing beneath the same sky in the same territory. It is no wonder, then, that such varieties of character should here be impressed on the yielding and susceptible frame of man; that he in one district exhibits all the energies of the hardy, bold, and fearless mountaineer or warrior; and that he in another betrays all the effeminacy and weakness incident to excess of languor and luxury.

CIRCASSIANS AND GEORGIANS.

Proceeding on the principle of selection, we may perhaps with impunity begin with describing those people who are considered to exhibit the finest models of the human form, and whose surpassing beauty has become proverbial throughout Europe; we allude to those particular races living on the great chain and at the foot of the Caucasus—the former the Circassians, the latter the Georgians. Blumenbach is inclined to believe they represent what was the primitive form of man; but this, of course, is a mere fancy, founded only on the fact, that the human race was created in this region, and that here the human form seems to exist in its highest state of perfection. The Circassian men, especially in the higher classes, are mostly of a tall stature; their form is thin, but Herculean in structure; they are slender about the loins, have small feet, and uncommon strength in their arms. The women are distinguished by a white skin, regular features, and dark brown or black hair, which some travellers describe to be intermixed with red, constituting, perhaps, what we term an auburn colour. It is the fashion among them to compress the waist by means of straps in early infancy, considering, like the Turks, that a very small waist adds to the grace or elegance of the form. Painting the face is considered to denote a want of chastity, therefore never practised; but the girls are allowed to dye their nails. At the foot of the Caucasus live the Georgians, who, like the Circassians, are considered to be the most beautiful women in the world; indeed, one traveller assures us that they are more beautiful than the Circassians, but the complexion is not so fair. Chardin, describing them in the French language, says—"The Georgian race is the most beautiful in the East, I may say, in the world. I have not observed an ugly face in the country, neither among the one nor the other sex; they are all angelic. Nature has spread graces over the most part of the women we find no where else. I hold it impossible to see without loving them; we can neither paint more charming countenances, nor more beautiful forms, than they possess." But while nature has thus gifted them with pre-eminence of personal beauty, she has left them, like the Turkish women, in a state of intellectual and moral degradation, inasmuch as they are deplorably ignorant, and possess no mental activity; they have no idea of commerce, but indulge in that species of traffic from which human nature recoils, viz. the sale of their own children—sometimes sold to gratify the animal passions of the purchaser, and sometimes to be converted into slaves.

THE TARTARS.

The Tartars, who occupy immense regions in Asia, present considerable variety in their persons, as well as in their manners and customs. They are distinguished by large and wrinkled foreheads, very short noses, and eyes deep sunk in the head. Their cheek-bones are high, and the lower part of their face very narrow; their chin is long and prominent, and their upper jaw falls in; their teeth are long, and distinct from each other; their eyebrows thick, and cover a part of their eyes; their skin tawny; their hair black; and their bodies of middle stature, neither strong nor robust. We have mentioned the length of the teeth, a part of physiognomy seldom noticed, yet in some nations possessing characteristic differences: thus the teeth of the Egyptians are found very thick, and the crowns of them obtusely cone-shaped; the incisors or front cutting teeth of the Greenlanders are short and flat, more resembling grinders than cutting teeth; the same, too, has been observed in the teeth of the Esquimaux. Among the Tartar race, the Calmucks are notorious for their remarkable ugliness. Their faces are so flat, that their eyes, which are very small, are situated five or six inches asunder; their noses are so low, that, instead of nostrils, two holes are often only to be seen; their knees bend outwards, and their legs inward. The little Tartars, or those of Norway, are not so ugly as these Calmucks; they, however, have small eyes, and large flat faces, with a short and sunk nose, and tawny complexion. The Tartars are a wandering people, very fierce and warlike, and renowned for their invincible courage and striking conquests.

THE INHABITANTS OF EUROPE.

Europe, when compared with Asia, Africa, or America, appears to occupy only a small space on the surface of the globe, and all the features which it presents are as it were softened down into a gentler or milder character. Its mountains, even the loftiest of them, are diminutive when compared with the Andes, or the Himalaya; its lakes, even the most extensive, are insignificant when contrasted with those we meet with in America; its vallies, if lovely, are only of small extent; and all its productions, inanimate as well as animate, appear less endowed with rich and valuable qualities. Its mines do not abound with precious minerals; its trees, such as are indigenous, do not put forth luxuriant blossoms, nor droop beneath loads of fragrant and delicious fruits; its animals, too, such as exclusively belong to it, do not amount to more than a very few species, which are not of the most useful kind: yet, notwithstanding all this, the enterprise and the diligence of man has rendered it perhaps the richest and most enviable region of the world. All the grasses, herbs, and trees that we most prize, have been transplanted from foreign climes—the peach from Persia; the orange from China; the potato from America. The most esteemed animals, too, the useful horse, the tractable ox, the faithful dog, have been transported from abroad. Industry and care have toiled, and not in vain; for now the once poor and barren fields afford rich and abundant harvests; cities, adorned with palaces, and boasting of all the conveniences and luxuries that can contribute to the wants and happiness of man, now flourish. Their inhabitants have explored the burning deserts of Africa, and the forests of America; they have gone forth as settlers to people the most distant continents, carrying along with them the knowledge to rescue the slave from the chains of his oppressor, and the poor savage from the superstitions and ignorance by which he was enthralled. Such is the omnipotence of the human mind, that it has thus raised a comparatively small and ungifted territory into the most important region of the world.

Europe fell, there can be no doubt, to the lot of JAPHET and his posterity; and it is clearly proved that his son GOMER gave birth and name to the GOMERIANS: whence were derived numerous European nations. The Gomerians were also called the GOMÆREI and GOMERITÆ; after which they obtained the name of CIMMERIANS, which was contracted into CIMBRI—a name which prevailed not only through Germany, but through Gaul. Nor is this all; for not only did the Gauls derive their name from GOMERITÆ, but it is said that the Celts also were originally called Cimbri: and this, too, explains to us their origin. These descendants of Japhet peopled Europe gradually, spreading themselves by degrees through the adjoining or the nearest countries. Thus they peopled Italy before France, and France before England. Malte Brun remarks, that there are still ten distinct races of men observable in Europe; but we apprehend that these races run so much into each other, that it is impossible to recognise any real distinction between them. Thus the Goths avowedly resemble the Swedes; the Swedes the Germans; and, in like manner, we may trace a gradation, as it were, passing insensibly through the Goths, Swedes, Germans, Swiss, French, Irish, Scotch, English; indeed, through all the nations of Europe, the deviations from the original family likeness having been occasioned by the difference of climate, and other external causes, which exert an analogous influence on the human frame in every latitude of the globe. Compare the stinted form of the Laplander with the hardy frame of the German or the Scotch Highlander. The difference is very striking; but we should no more doubt their being descendants from the same stock, than we should doubt the identity of the same plants, which, transported into a barren soil and cold climate, refuse to put forth the same luxuriance as they exhibited in a more congenial region.

THE GREENLANDER.

The Greenlander, Laplander, and Esquimaux, may either of them be instanced as examples of the character presented by the human form in those dreary and desolate regions, where winter, arrayed in all her sternest horrors, seems to hold an eternal reign. There, in those snowy solitudes which appear fit only to be disturbed by the prowling of the arctic bear, does man exist, shrunk and withered in aspect, like the lichens that cling to the barren rocks by which he is surrounded. Here his frame, as we have elsewere observed, appears of diminished size; his stature seldom exceeds the height of five feet, and has an appearance of imbecility; his face is broad and flat; his eyes, nose, and mouth very small, and the under lip somewhat thicker than the upper. It has been observed, that the expression of the countenance is somewhat similar to what we observe in this country, when the features have been drawn in, and, as it were, shrivelled by intense cold. Their bodies are dark grey, but their face appears more of an olive colour; their skin is unctuous, and unpleasantly cold to the touch; and their hair long, straight, and jet black. The female countenance, without pretension to regular beauty, is said to be often agreeable, having a frank and good-humoured expression. They are extremely nimble with their feet, and dexterous with their hands; they manage their canoes with much skill, and carry burthens which we could not lift. Such is the appearance of man in these cold and forbidding regions. Happier, indeed, is the lot of those born in more temperate climates, which alone are favourable to the full developement of those attributes which alone give man that moral and intellectual importance which raises him so high in the scale of created beings.

SCOTCHMEN AND ENGLISHMEN.

We have observed, that the human race, having migrated from the east, always proceeded to colonize the adjoining or neighbouring countries; thus Cyprus was peopled from the neighbouring country of Asia, Crete and Sicily from Greece, Zeland from Germany, Iceland from Norway. Britain, in like manner, derived its inhabitants from Gaul, the people of which, having crossed the Channel, landed on its southern coast. These Gauls were descended from Gomer, the son of Japhet, and they derived their name from the Gomeritæ. Much dispute has existed concerning the origin of the word BRITAIN. The learned Camden is of opinion that it was derived from the practice which the ancient Britons had of painting their bodies; it having been with them the custom to call whatever was painted or coloured, BRITH: whence was derived the word BRITHA, used by the Saxons, which was then turned into BRITHON, and afterwards into BRITAIN.

The ancient Briton is thus described by an old historian:—"The Britons are taller than the Gauls; their hair is not so yellow, and their bodies are looser built. In proof of their tallness, I must observe, that I saw at Rome some of their young men half a foot taller than the tallest men; their legs are weak, and the rest of their bodies far from well made." These ancient Britons adopted the superstitious rites of the Gauls, from whom they sprung; they lived in tents, they went uncovered, and were habituated to many barbarous customs. The method of staining their bodies which they adopted, was that of burning into their flesh certain marks, and then infusing into the burned part as deep a dye as they could procure. This was done in very early infancy; the colour chosen was obtained from *woad*, which gives a deep blue; and the figures impressed were generally those of various animals. Living in this unprotected state, their island was invaded by the Romans; after which, they were so much harassed by the incursions of the Picts and Scots from the north, that, unable to defend themselves against the fierce and rapacious attacks of their enemies, they invited over the Anglo-Saxons from Germany, to assist them in their emergency. But this turned out to have been very wretched policy; for no sooner had the Picts and Scots been driven back, than the Saxons turned their arms against the miserable Britons, put most of them to the sword, or compelled them to slavery, and then took possession of their country. In the midst of these calamities, many of the unhappy ancient Britons sought refuge in the western parts of the island, now called CORNWALL and WALES, where nature, by mountains and friths, seemed to open for them the path of protection. As every thing foreign was at that time called *Walsh*, those people soon derived the name of the Welsh, which they still retain. Thus did Britain become inhabited by the Anglo-Saxons; but the numerous nations which afterwards broke in upon them, and destroyed their constitution, together with the subsequent division of the kingdom, peopled and governed by so many clans, have been the sources of confusion which perplex the most learned historian and antiquarian. While England thus became peopled, the Scots or Celtic tribe made their appearance in Ireland,* whence they migrated into this country, and the first territory of which they took possession is supposed to have been Argyleshire.

Having thus given a general account of the origin of the inhabitants of this country—a digression which we thought would not be unacceptable to our readers—we may revert to the appearance of the external form and features of man in this climate; and yet this is scarcely necessary, as with these all of us cannot fail to be familiar. Yet are there some essential differences in the physiognomy, which amount almost to national peculiarities; insomuch, indeed, that he who leaves Scotland to make a tour through Ireland or England, will soon recognise the very marked differences observable in the persons of the people by whom he becomes surrounded. The frame of the Scotchman is, generally speaking, hardier, more robust, and stronger than that of the Englishman; we might almost assert that the bony skeleton of the one is made on a larger or stronger scale than that of the other—not that the difference may be appreciable in height, but in the compactness and strength of its construction. The people of Scotland have generally high cheek bones, and their features are strongly marked. The formation of their heads approaches much to what we observe among the Germans; that is, the skull is broad, and somewhat flattened at the back. The features of both the English and Irish herein present a marked difference, not only in the character of the face, but also in that of the head. Their features are less strongly brought out; their cheek bones smaller; the head, too, has a different contour. Among the English, in particular, the head is more flattened at the sides, and less so in its posterior region; however, with them the upper part is commonly well developed. With the Irish the whole frame and countenance has a more active character; their features are more variable—we should rather say, breathe a greater variety of expression—and their head presents a different configuration, having the upper region just above the forehead (especially among the lower classes) much depressed, and being narrower in breadth than either the English or Scotch. While the whole skeleton of the English seems more slender than that of the Scotch, the difference as in other nations is the most perceptible about the hands and feet. It is certainly the custom in Scotland to put children to walk at a much earlier period than they do in England, which, we have no doubt, brings out into a stronger developement the muscles of the ancle and foot. Among the lower classes, the practice of going barefooted also gives a coarse character to the feet; for it may be observed, that all those nations which pride themselves on having small and delicate feet, are careful to protect them from exposure. The Chinese, and especially the Circassians, always have their feet covered; the former wear, when going out, boots of silk, satin, or cotton, and, when at home, loose shoes or slippers made of silk stuff; the latter are especially careful in using a covering for their feet, to which is generally added, when they go abroad, wooden clogs.

THE INHABITANTS OF AFRICA.

Africa, unhappily by its very name, suggests to our mind many very painful associations, such as are inseparably connected with the recollection of those abominable atrocities which have been systematically committed for the purpose of enslaving and oppressing many of its defenceless natives, and such as are also necessarily excited by the memory of those enterprising and amiable men who sacrificed their lives in vainly endeavouring to explore its sandy deserts, for the purpose of carrying the light of Christian truth into the habitations of those uninstructed and unfortunate beings who live amidst the gloom of its impenetrable forests.

Africa, ranking next in respect to its size to Asia and America, was undoubtedly peopled originally by the descendants of the impious Ham; and while these constitute what may be called the native inhabitants, there are, besides, numerous races met with, which migrated from Arabia, and other Asiatic countries. Here we find Moors, Turks, Arabs, Jews, and various tribes, existing in a state of society that is involved in all the darkness which must ever attend on the want of Christian civilization. We have not space to enter into a consideration of the condition of ancient Africa; here we shall speak only of the African negro, the slavery to which he has been subjected, and the improvement of which his moral and intellectual nature is susceptible.

THE AFRICAN NEGRO—NEGRO SLAVERY.

Not only have the African negroes been forced to submit to all the cruelties and degradations of political oppression, but even men of science, whose minds no prejudices should darken, have endeavoured to represent them as beings of an inferior order—a connecting link between man and the lower class of animals. But, indeed, no idea can be more false, certainly no prejudice more abominable, than this; for although his skin may be black, the heart that beats within his bosom still heaves and groans and bleeds under affliction, and is sensibly alive to every act of kindness and humanity. With the external form and appearance of the African negro, with his dark complexion, depressed forehead, woolly hair, flat nose, thick lips, we are all acquainted, but we must not thence conclude that his soul cannot be illumined by one ray of Christian charity, and that he is a being proscribed beyond the limits of all possible civilization. Such a conclusion would not only be uncharitable, but false; for all travellers have agreed, that, notwithstanding the disadvantages under which they have laboured, notwithstanding the cruel despotism under which they have writhed, they often manifest some of the kindliest feelings which can do honour to humanity. If, indeed, we for a moment ask ourselves wherefore they cannot be put on an equality with other civilized nations, we shall be sorely puzzled; for surely we do not recognise inherent disability in their depressed foreheads; for if so, how many of our own fellow countrymen would be disqualified for freedom, and fit only to wear the chains of slavery! Again: we surely cannot discover any cause for their perpetual degradation in the circumstance of their forearms being a little longer in proportion to the height of their bodies than our own, or in that of the calves of their legs being half an inch higher up; such reasons as these we should never dream of entertaining; therefore we are driven to the inevitable conclusion, that, although, like the inhabitants of other countries, they may always retain certain characteristic peculiarities, yet they must be as capable of being civilized as the barbarous Anglo-Saxons from whom we ourselves derived our origin. African negroes, under all the disparaging circumstances by which their progress has been retarded, have been known to make considerable intellectual advancement; thus they have been known in America to make sufficient money by their musical exertions to purchase their freedom. A negro named Hannibal, a colonel in the Russian artillery, and another named Lislet, on account of their meteorological observations, were elected corresponding members of the French Academy. A negress at Yverdun is celebrated by Blumenbach for having made considerable progress and acquired great dexterity in a particular practical department of medicine. A. W. Arno, an African from the coast of Guinea, in the year 1734, took his degree as a doctor of medicine at the Wurtemberg university. John Capitein, who was bought by a slave-dealer when only eight years old, studied theology, and published several sermons and poems. Lastly, Ignatius Sancho and Gustavus Vasa distinguished themselves as literary characters in this country. Accordingly, the physical organization of the African negro by no means offers any insurmountable obstacles to his intellectual improvement—not that we would pretend to define the exact height to which he might attain, for we know that the intellectual qualities of all nations of Europe differ extremely, and that there is even among them a scale of gradation which it might seem invidious to describe. In the whole History of Man, there is no chapter so humiliating, none, certainly, more appalling, than that which records the infamous and blood-stained atrocities that have arisen from the slave-trade, which inhuman traffic appears to have been first adopted by the Portuguese, then by the Dutch, then, in the reign of Queen Elizabeth, by the English. Happily we live in an age in which the cause of humanity at length begins to triumph over the tyranny of political interest, for all parties of the state have now agreed that reason, justice, and religion, alike imperiously demand the abolition of negro slavery; and the only doubt or difficulty that remains, respects the mode in which the emancipation of the present slaves should be effected most judiciously for their happiness, and for the peace and security of those who have been their proprietors. Into this perplexing subject of discussion it would not become us to enter; but we despair not of a time when the interior of the vast continent of Africa will be fully explored, and when the poor African will be able to sit down by his domestic fireside, surrounded by as many comforts as those that cheer the hearth of the Scottish cottager.

THE INHABITANTS OF AMERICA.

America, which is perhaps one of the finest countries of the world, when first discovered was found to be only thinly inhabited by a few scattered tribes, who dwelt by the sides of the majestic rivers or magnificent lakes, or, like other uncivilized people, led a solitary and savage life amidst the intricate paths of its extensive forests. We are all aware how its different regions became populated by emigration from other countries; but with these settlers we shall not interfere, as it is the original natives of America alone who here claim our attention and interest. It is presumed, as we already explained, that this continent was peopled by migrations from the north-east part of Asia—a fact borne out by the circumstance, that when America was discovered, no natives were found to be acquainted by tradition with the most remarkable events narrated in the Mosaic history; in addition to which, the American language appears to have been founded on the Asiatic.

* Ritson's Annals of the Caledonians, Picts, and Scots

The natives of America possess a large and robust frame, and a well-proportioned figure; their complexion is of a bronze, or reddish copper hue, as if it were rusty coloured, not unlike cinnamon or tannin; their hair is black, long, coarse, and shining, but not thick set on the head; their beard is thin, and grows in tufts; their forehead low, and their eyes lengthened out, and their outer angles turned up towards the temples; their eyebrows are high; their cheekbones prominent; the nose a little flattened, but well marked; the lips extended; and their teeth closely set and pointed. In their mouth there is an expression of sweetness, which forms a striking contrast with the gloomy, harsh, and even stern character of their countenance. Their head is of a square shape, and their face is broad, without being flat, and tapers towards the chin. They have a high chest, massy thighs, and arched legs; their foot is large, and their whole body squat and thick set. The stature and complexion of the native Americans vary considerably in different parts of this continent; but, on the whole, they bear, in their physical and moral character, so strong a resemblance to each other, that there can be little doubt that they derived their origin from the same stock.

JEWS.

Notwithstanding that the Jews have suffered the most ruthless persecution, and that their blood has stained almost every altar in Christendom, they yet remain, though scattered far and wide amidst all nations, a distinct race, and afford, perhaps, the best example that can be adduced of the transmission of a very singular physiognomy through successive ages, from one generation to another. The head of the Jew is considered to be extremely well formed; indeed, the Jewish skull is observed to approach very nearly to the Caucasian model, which, as we have it explained, is the most perfect yet known. Although the Jews existing in every climate present us with varieties of complexion, they are naturally fair; and, though born beneath the glare of an African sun, their children possess the same fairness. According to West, the late celebrated painter, and President of the Royal Academy of London, the peculiarity of their physiognomy consists principally in the nose, the bridge of which is curved, or crooked, giving them much the resemblance of Lascars; but, besides this, there is obviously a peculiar expression breathing over the whole countenance, which does not admit of being easily described. The Jewish women have always been considered beautiful; hence poets and novelists frequently introduce into their fictions the Jewess, arrayed in all the most glowing charms of female loveliness.

GIPSIES.

Very analogous to the Jews are the Gipsies, a vagrant, though distinct, race of people, who, deriving their origin either from Egypt or Wallachia,* overspread most of the countries of Europe. They led an Arab-like, wandering, desultory life; carrying with them tents, and such utensils as they required, they secluded themselves in the recesses of forests, until, having exhausted their ill-gotten booty, they again went forth on their errands of depredation. It is a curious fact, that the inhabitants of many of the towns in Italy and Spain, subdued by their own ignorant fears, regarded them with superstitious wonder, and seldom or never ventured to recover their stolen property. Among the gipsies, both women and men were generally tall; their complexion was swarthy; their features prominent and sharp; but the expression of the whole face can only be conveyed by the pencil or brush of the painter. It had a character of its own, which was, and still remains, characteristic of a distinct race; and this (as in the instance of the Jews) has been occasioned by their keeping themselves, as much as possible, apart from the rest of mankind, marrying only individuals belonging to their own tribes, and preserving in every country the customs and the habits peculiar to themselves.

We have now shown, on distinct evidence, that the transmission of particular forms and likenesses, however they may have orginated, may take place in such a degree, and to such an extent, as to impress, with specific differences, families, and whole races of men; and applying these and the preceding facts to the inhabitants of the many nations to whom we have referred, we may legitimately conclude, that the differences we have described arose gradually from the operation of external circumstances, and were rendered permanent by transmission from one generation to another.

THE TRANSMISSION OF NATIONAL VARIETIES OF THE HUMAN FORM.

Having now considered the very remarkable differences which the human form presents in various regions of the globe, having alluded, in a general manner, to the effects of climate, and other external causes, and having explained, too, the methods which have been adopted for the purpose of altering the original shape or character of many of its features, let us proceed to consider how far peculiarities so induced may be transmitted from generation to generation. How happens it that the Circassian mothers give birth to forms as fair and lovely as their own? that the negro woman gives birth to a child with a low brow, flat nose, thick lips, and all the other negro characteristics? Assuredly it would appear that the stream of human blood, through whatever channel it may flow, carries along with it qualities derived from its original source; so that hereby nation is preserved distinct from nation, and one race of men from another We are all aware that certain temperaments of constitution, certain dispositions, and certain diseases, are hereditary in particular families; and such evils no education or efforts of art can eradicate. Occasionally, too, we remark, that a certain character of physical frame, such as the height of stature, the form of the head and chest, the resemblance of features, &c., prevails through all the members of one family, derived either from father or mother.

* Muratori insists that they come from Wallachia, and denies the popular notion that they were originally natives of Egypt, deprived of their settlements by one of the kings of Hungary.

The life of man does not extend long enough for him to observe the progress of these changes which can only be effected in the course of successive generations; therefore, on this subject we can only reason from analogy, or from what may be observed to take place among inferior animals. If we instance the dog, it may be observed that we do not find greyhounds, terriers, spaniels, pointers, existing in a state of nature; these which we may term different races of dogs, result from the artificial intermixture of particular breeds; they are all descended originally from the same stock, but, in the course of successive generations, have severally acquired forms, habits, and dispositions of the most opposite description. Again, in almost every county we observe similar deviations among cattle; thus the red oxen of Devonshire appear of a very different race to the white-faced oxen of Herefordshire; the hornless breed naturalized from Poland presents an equally striking contrast with the brown oxen of Yorkshire; then, let any one or all of these be compared with the straight black heifer which browses on our Scottish hills, and we shall at once perceive what varieties may, by artificial causes, be permanently established among animals of the same species. Horses vary no less remarkably, which cannot fail to be observed when we compare the breed of the racer with that of the clumsy and bony draught-horse of Lincolnshire, and when we contrast these in their turn with the Scotch Galloway or Shetland pony. It is perfectly evident that the differences here exhibited between individual animals belonging to the same species are by no means greater than the differences exhibited by the human race in different parts of the world; and we may, therefore, reasoning from analogy, conclude, that, if such differences as these could in these animals be induced by external causes acting upon them, so likewise might differences as remarkable in the human frame arise from analogous causes, operating, doubtless, with not less power upon it.*

The hereditary transmission of certain peculiarities of structure has been attested on indisputable authority, and many singular facts, in illustration, have been recorded. But the truth is, that although certain variations of existing features and limbs may be presented, such as the nose of one race being more flattened than that of another, or the legs of one more elongated than that of another, no change can ever take place which can transform one species of animals into another. The barrier seems to be this—the impossibility, through all changes, of adding any additional faculty or organ of sense to the animal. The sense of smell may be improved in the dog, as it is in the American Indian; the sense of hearing may be also brought, in an animal already possessing that sense, to a higher state of perfection, as it is likewise in many savages; but all the art of man cannot develope either a new sense or a new function in any class of animals. It is this which separates, by an everlasting and insurmountable barrier, the highest class of apes from the lowest and most miserable class of savages. The former may be taught every kind of trick but never can they acquire the gift of speech, because the organisation in their windpipes exhibits a defect which must prevent their ever attaining this faculty. It appears that the greatest variety, or the most remarkable deviation from any original animal organization that has yet been propagated, amounts to a supernumerary toe on the hind and forefeet; but it is observed, that there is a continual effort on the part of nature to recur, after any such digression, to the original type. On this principle may perhaps be explained the very curious fact, that in picture galleries the likeness of the members of the same family may be seen to pass through various gradations, receding from, then returning to, a very exact resemblance of the original; so that it is presumed, that, in the course of generations, individuals arise who are the exact facsimiles of one or more of their very remote ancestors.

DURATION AND END OF HUMAN LIFE.

The life of man has been likened to a dream—a falling star—a taper-flame—a leaf—a dew-drop—and, most assuredly, that object which is the most fragile in creation, be what it may, it will most resemble; for frail, though mysteriously subtile, is the power which confines the soul within its earthly tabernacle. We have viewed man as the inhabitant of all regions of the world; yet, whatever variety his external form has

* Blumenbach affirms that there is less difference between the skulls of the most dissimilar of mankind than there is between the elongated head of the Neapolitan horse and that of the Hungarian horse. He also states, that the difference which exists between the skull of a negro and that of an European is not more striking than that which may be observed between that of the wild boar and the domesticated swine.

presented to us, the blood is of the same nature which throbs within his heart, the mind is of the same essence which animates his frame. We may now, therefore, narrow our view, and look into our own breasts, for man is complete in every individual man; one regarded as an isolated being is the type of the whole human species. It has been beautifully said by Wordsworth—

> "Our birth is but a sleep and a forgetting;
> The soul that rises with us, our life's star,
> Hath had elsewhere its setting;
> And cometh from afar.
> Not in entire forgetfulness,
> And not in utter nakedness,
> But trailing clouds of glory do we come
> From God, who is our home—
> Heaven lies about us in our infancy."

But the joyous smiles of infancy, and the reckless pastimes of boyhood, must soon be exchanged for the gravity and sedate habits which are summoned into existence by the anxieties and cares of advancing life. That the path we have to tread is beset with thorns, and overgrown with weeds, there is no doubt; but still even the most wretched consider that life is preferable to death—existence to non-existence. It has, therefore, been a matter of care to ascertain those causes which are most conducive to human longevity; and these are reducible to a narrow compass, comprising their dependence almost entirely on the climate in which we live, and on the habits to which we have recourse. In the savage state, life is shorter than it is in the civilized state. The savages in Africa and America seldom live beyond forty years; but, during that period, they are not subject to so many diseases as man is afflicted with in civilized society. Those who attain the greatest longevity are generally the inhabitants of temperate climates, and amongst them very notable instances have occurred. Lewis Cornaro, a Venetian nobleman, having recovered from a severe illness in his thirty-sixth year, enjoyed good health, living on twelve ounces of solid food and thirteen of liquid, until he reached the hundredth year of his age. Thomas Parre, a peasant of Shropshire, died in 1635, at the great age of 152 years and 9 months; and it appeared, from the inspection of his body after death, that he might have lived several years longer, had not a plethoric state of his lungs been induced by his exchanging the coarse fare and pure air of his country for the luxurious diet and dense atmosphere of the palace in London. The Countess of Desmond, in Ireland, lived to her 145th year; and numerous instances of longevity, equally surprising, might be adduced. It is observed, that such cases are principally supplied by the country; indeed, living in towns is so unfavourable to life, that the expectation of its duration is there greatly reduced; thus the greatest expectation of life at six years of age for London is only thirty-six years; but it is forty-one for Northampton, and forty-five and a half for Sweden. Some few curious, but well-attested particulars, concerning the duration of life, may be here enumerated:—1. Dr Fothergill states, that he has not found a single instance of a person who has lived to be eighty, who had not descended from long-lived ancestors. Dr Franklin, who died in his eighty-fourth year, was descended from long-lived parents—his father died at eighty-nine, and his mother at eighty-seven. 2. More persons who have married live to be very old than persons who have remained single. "I have only," says the same author, "met with one person beyond eighty years of age who was never married." 3. More women live to be old than men; but more men live to be *very* old than women. Indeed, there appears to be a provision in nature for the mutual accommodation of the sexes; for, at those periods of life when women are the weakest and most subjected to disease, men are stronger than at any other period of their lives; then, when men, by old age, become weakened, women again have the superiority of strength. 4. It is observed that the number of births exceeds, in town and country, the number of deaths, but the proportion varies in different districts, according to a variation of political and moral causes. 5. A numerical proportion of births always exists between the sexes; but more males are born than females, which appears to be a provision of nature for maintaining a due equality between the number of the sexes; for the life of man, independent of destructive wars, is more exposed to accidental causes inducing death, than that of women. Sadler has pointed out a curious fact, which seems established by the tables he has published, viz. that if a man marry a woman younger than himself, the number of boys in their family will exceed the number of girls; but if the man be younger than his wife, then, according to the disparity between their respective ages, the number of girls will equal or predominate over the number of boys. 6. Of all newborn infants, one out of four dies the first year; two-fifths only attain the sixth year; and, before the twenty-second year, nearly one-half the generation is consigned to the grave. Attained, however, to the age of maturity, one out of every thirty or forty individuals dies annually. Such are the general facts which appear to have been established concerning the duration of human life; but it is not to be forgotten that its extension and accompanying happiness must be materially modified by the habits which each individual in his own sphere is led to adopt. An ingenious medical author, Mr Thackrah, has explained the influence which particular trades have on the health of the persons engaged in them; but we are not aware that any attempt has been hitherto made to ascertain the influence which the pursuit of the several professions must have on the lives of those by whom they are pursued. This deficiency we have endeavoured to supply, by classifying together the ages which have been attained by the most celebrated men engaged in different professions, and deducing the average period to which the life of each has been found to extend. By this it appears, that statesmen have attained the longest duration of life; then come physicians; then divines and theologians; next to them musical composers; next, philosophers and mathematicians; then artists and literary men; and last, poets—those men whose vivid sensibilities and susceptible feelings render them too often little fit to encounter the common-place annoyances and difficulties of the world.

Statesmen and Lawyers.		*Physicians.*		*Divines and Theologians.*		*Musical Composers.*		*Philosophers and Mathematicians.*		*Artists.*		*Miscellaneous Literary Men.*		*Poets.*	
Alberoni	60	Armstrong	47	Abbot	71	Arne	60	Abelard	63	Angelo	89	Ainsworth	63	Addison	47
Bacon	65	Avicenna	58	Abernethy	60	Boyce	69	Bacon	60	Albani	82	Ascham	53	Akenside	49
Blackstone	57	Boerhaave	70	Andrews	71	Cervetto	110	Boyle	64	Alberti	58	Barthelemy	80	Ariosto	59
Bolingbroke	79	Becker	69	Anselm	76	Corelli	60	Brahe	55	D'Aarsens	66	Boccaccio	69	Byron	36
Burleigh	77	Cullen	80	Aquinas	50	Handel	75	Bernard	58	Breugel	67	Boswell	55	Burns	37
Coke	85	Dimsdale	89	Atterbury	69	Kelly	64	Bradley	70	Caracci	49	Buffon	81	Butler	68
Egerton	77	Galen	70	Barrow	47	Lully	55	Blondel	67	Callioi	70	Bunyan	60	Buchanan	76
Colbert	64	Gregory	68	Bentley	80	Pepusch	85	Copernicus	71	Claude	82	Camden	72	Beaumont	60
Cavendish	67	Haller	73	Blair	83	Heidegger	88	Cotes	34	Corregio	40	Colman	61	Boileau	75
Fleury	90	Haller	69	Butler	60	Weber	40	Cole	68	Dominichino	60	Defoe	68	Camoens	62
Forbes	69	Harvey	79	Bede	70	Gluck	73	Cassini	77	Durer	57	Farquhar	29	Chapman	77
Hale	67	Hoffman	82	Berkeley	73	Haydn	78	Digby	62	Fontenay	61	Fielding	47	Chaucer	72
Hardwicke	71	Hunter	65	Burnet	72	Mozart	35	Descartes	54	Gainsborough	61	Fontenelle	100	Churchill	33
Hutchinson	79	Monro	70	Bossuet	77	Geminiani	96	De la Caille	49	Giorgione	33	Foote	56	Collins	36
Hyde	66	Paracelsus	48	Calvin	55	Rameau	81	Dee	80	Guido	67	Garrick	63	Congreve	59
Holt	67	Parsons	63	Collier	76	Purcel	37	D'Alembert	66	Hogarth	66	Gibbon	57	Corneille	78
Fox	58	Pinæus	69	Diodati	73	Kalkbrenner	81	Euler	76	Holbein	56	Goldsmith	45	Cowley	49
Hanmer	70	Pitcairne	60	Doddridge	49	Kamp	46	Epicurus	72	Jordano	85	Guicciardini	58	Crebillon	88
Keeble	78	Radcliffe	60	Duns Scotus	33	Burney	88	Ferguson	66	Kneller	78	Holinshed	60	Dante	56
Jourdain	35	Scaliger	69	Fenelon	64	Gibbons	83	Flamsteed	73	Hemskirk	76	Hume	65	Drayton	68
North	60	James	73	Hall	82	Gow	80	Franklin	84	Laresse	71	Johnson	75	Drummond	64
Mazarin	59	Mead	81	Heathcote	74	Jomelli	60	Fahrenheit	50	Lanfranco	66	Jones	48	Dryden	70
Masson	67	Vanderlinden	68	Henry	52	Jackson	70	Gassendi	64	Lutti	58	Josephus	56	Fontaine	74
Pasquier	87	Pott	75	Hervey	44	Hullmandel	72	Grotius	62	Netscher	48	Kelly	39	Gay	44
Patru	77	Sloane	92	Hooker	47	Holzbauer	65	Galileo	78	Bernini	82	Henault	86	Glover	73
Prynne	69	Homberg	63	Horne	60	Hawkins	70	Gunter	41	Guercino	75	Lillo	48	Gower	82
Pitt	70	Kunchel	72	Hoadley	85	Gretry	72	Herschel	84	Canova	65	Linnaeus	71	Gray	55
Pole	58	Malpighi	66	Jansen	53	Gerbert	73	Halley	86	Du Fresnoy	54	Livy	76	Guarini	78
Pratt	81	Huysch	43	Jortin	72	Gaillard	62	Hooke	68	Maratti	88	Lucian	90	Jonson, B.	63
Richelieu	57	Solander	40	Kippis	70	Duni	60	Horrox	22	Ostado	75	Lilly	47	Juvenal	60
Savilie	65	Rhases	80	Laufrano	84	Cimarosa	48	Huygens	66	Parmegiano	36	Lyttelton	64	Malherbe	73
Sully	81			Knox	67	Calcott	55	Keill	50	Pellegrino	76	Mably	76	Menander	52
Temple	71			Leo X.	48	Bach	66	Kepler	59	Penni	40	Lavater	60	Metastasio	84
Thurloe	52			Limborch	79	Keiser	62	Kircher	79	Poussin	71	Machiavel	58	Milton	66
Villiers	61			Lowth	76	Leo	81	Kirch	60	Raphael	37	Meursius	60	Moliere	53
Walpole	71			Loyola	64	Naumann	60	Lilly	79	Rembrandt	62	Montaigne	59	Otway	34
Walshyngham	90			Luther	63	Paisiello	76	Locke	72	Reynolds	69	Montesquieu	66	Ovid	60
Wolsey	59			Kennet	68	Piccini	72	Longomontanus	85	Rubens	63	Montfaucon	84	Petrarch	70
Mirabeau	42			Malebranche	77	Palestrina	45	Lyons	36	Raeburn	67	De la Motte	60	Pitt	40
Ximenes	80			Melancthon	63	Pistocchi	60	Le Clerc	79	Sacchi	60	Tournefort	52	Pope	56
				Middleton	67	Woelfl	30	Hevelius	76	Salvator Rosa	58	Quevedo	70	Prior	57
				Mosheim	60			Leibnitz	70	Del Sarto	42	Rabelais	70	Perseus	28
				Newton	78			De la Hire	78	Teniers	67	Regnard	62	Pindar	60
				Overall	60			Lalande	75	Titian	99	Richardson	72	Roscommon	51
				Penn	74			M'Laurin	48	Vandermeeren	63	Robertson	72	Rowe	45
				Potter	73			Mayer	39	Vandervelde	74	Rochefoucault	67	Schiller	46
				Massillon	79			Molyneux	42	Vandyke	42	Rollin	80	Sackville	79
				Secker	75			Napier	67	Vernet	81	Rousseau	66	Savage	45
				Sacheverell	52			Muschenbroeck	60	Da Vinci	75	Cervantes	67	Shakspeare	55
				Sherlock	33			Newton	85	Lebrun	70	Le Sage	60	Suckling	28
				Tillotson	64			Nonnius	80	Reni	66	Scarron	50	Swift	78
				Usher	70			Pascal	39	Pl. Veronese	56	Selden	70	Racine	60
				Warburton	80			Reaumur	79			Smollett	51	Thomson	48
				Watts	74			Saunderson	57			Sterne	55	Tasso	51
				Wesley	88			Simpson	51			Burke	68	Ramsay	73
				Whiston	85			Wallis	87			Rapin	64	Scott	61
				Wickliffe	60			Toricelli	39			Sheridan	65	Waller	83
				Whitfield	30			Playfair	70			Voiture	50	White	21
				Walton	61			Watt	83			Zimmerman	67	Young	84
								Maupertuis	61			Mezeray	73	Cowper	69
								Saurin	76			Father Paul	70	Virgil	81
Average	69.5	Average	68.	Average	67.4	Average	55.7	Average	65.5	Average	64.5	Average	62.6	Average	59.6

FALL OF NATIONS—EXTINCTION OF RACES OF MEN.

History teaches us that all nations, after attaining the meridian of their glory, and after being crowned with laurels of triumph and victory, sink down into decay, even as the oak of the forest has it leaves scattered by the wind, and its trunk uptorn and laid prostrate upon the spot on which it flourished. It is a melancholy fact, and one that cannot fail to teach a stern lesson, "where Athens, Rome, and Sparta stood, there is a moral desert now;" nay, the very site on which mighty cities have flourished are no longer to be discovered. Hence, a noble poet has said—

"I've stood upon Achilles' tomb,
And heard Troy doubted—time will doubt of Rome."

The causes of this decline and fall of nations are sometimes not easily unravelled; but there are at least two which stand forth more prominently than the rest, viz. moral degradation, and the extermination effected by the sword of tyranny. When nations are in their infancy, the struggle to advance forward leaves them no time to indulge in luxury and licentiousness; but when they have attained the summit of their imperial ambition, then their energies relax, their habits become vitiated, and their blood tainted by intermixture with other races that have already succumbed to similar degradation. When the emperors, whose robes of royalty were most of them dyed with blood, reigned over Rome, once "the mistress of the world," these causes were in full operation. "In reality, the citizens of Rome (says a very accomplished author) were a new race, brought together from every quarter of the world, but especially from Asia. So vast a proportion of the ancient citizens had been cut off by the sword, and partly to conceal this waste of population, but much more by way of cheaply requiting services, or of showing favour, or of acquiring influence, slaves had been emancipated in such great multitudes, and invested with all the rights of citizens, that, in a single generation, Rome became almost transmuted into a baser metal, the progeny of those whom the last generation had purchased from the slave merchants. * * * Scarcely a family has come down to our knowledge that could not enumerate a long catalogue of divorces within its own contracted circle. Every man had married a series of wives, every woman a series of husbands. * * * Thus, the very fountain of all the 'household charities' and virtues was polluted; and, after that, we need little wonder at the assassinations, poisonings, and forging of wills, which then laid waste the domestic life of the Romans."[a] We apprehend, that, with all other nations that have been gradually swept from the face of the earth, a similar train of causes have been in operation. Mutato nomine de te fabula narratur—moral depravity, political misrule, and unjust and exterminating wars, are the steps by which all nations descend into their grave. The extinction of particular races of men has no doubt often occurred; thus Malte Brun observes—and the fact is well known, and independent of any authority—that "the Indian tribes, continually forced back by the advancing tide of white population, are fast disappearing from the eastern section of America. It is to be lamented that the cruelty of Europeans completely exterminated that unhappy race of people, the Red Indians of Newfoundland. In 1828, a journey was undertaken by Mr Cormack, for the purpose of making inquiries into the customs and habits, and tracing, if possible, the remnants that might remain, of this race of people; but although they reached the spot which had been their settlement, and discovered the various implements they had used in their domestic life, they could not discover one of the unfortunate Indians left to recount the afflictions which his tribe had endured. One particularly affecting incident is related. The local government, having, among other of its sanguinary decrees, offered a reward for those who would "bring a Red Indian to them," its emissaries carried away by force a Red Indian female, whom they named, from the month in which it happened, "Mary March." Her husband, in defiance of the fire-arms and fixed bayonets of her captors, made a noble attempt to rescue her, and in so doing was cruelly shot. His tribe built a cemetery for him, in which they placed his body. Shortly afterwards, the same government, influenced by interested motives, adopted a different line of policy, and ordered Captain Buchan to repair to the lake by which she was captured, and restore her to her tribe, for the purpose of opening a friendly intercourse with them. Unfortunately, she died in Captain Buchan's vessel at the mouth of the river; but they took her body to the lake, and, not meeting with any of her people, left it exposed on the bank, for them to meet with it. It appears that the Red Indians were at this time encamped on the banks of the river Exploit, and observed Captain Buchan's party passing up the river. They retired from their encampment in consequence; and, some weeks afterwards, by a circuitous route, went to the lake, where, finding her body, they removed it from the place on which it was left, and laid it in the cemetery by the side of her husband. Captain Cormack, finding all their villages untenanted, at length determined to repair to the Red Indian Lake, which was known to be their favourite rendezvous. "After much fatigue," says he, "we approached the lake with hope and caution, but found, to our mortification, that the Red Indians had deserted it for some years past. My party had been so excited, and so sanguine, and so determined to obtain an interview with these people, that, on discovering, from the appearances around us, that the Red Indians—the terror of the Europeans, as well as the other inhabitants of Newfoundland—no longer existed, the spirits of one and all of us were deeply affected. The old mountaineer (who accompanied us) was particularly overcome. There were every where indications that this had long been the central and undisturbed rendesvous of the tribe when they had enjoyed peace and security; but these primitive people had abandoned it, after having been tormented by parties of Europeans during the last eighteen years. We spent several melancholy days wandering on the borders of the east end of the lake, surveying the various remains of what we now contemplated to have been an unoffending and cruelly extirpated people."[a] There is little or no doubt that many other tribes or races of men have in like manner become extinct. Indeed, says Professor Lyell, "few future events are more certain than the extermination of the Indians of North America and the savages of New Holland, in the course of a few centuries, when these tribes will be remembered only in poetry and tradition." But it is not among small tribes or races of men alone that these exterminating causes are in gradual operation; for if we examine the peerage of every European state, we shall discover that families of the highest celebrity and the proudest distinction have died out, and become extinct. The Medicean family, once the glory of Europe—the ancient nobility of France—the Tudors and Plantagenets of England—have all passed away; their names live only recorded in their epitaphs. Yet, in the extinction of particular tribes and classes, we find no evidence that the world is in its dotage, or that the human race is in its decay. Mankind are yet, after the lapse of thousands of years, in the infancy of their moral and intellectual strength; and ages will yet pass away before they exhibit, on a great and universal scale, the latent virtues and possibilities of excellence with which they have been endowed by a beneficent Creator.

[a] The Cæsars, Chap. III. Blackwood's Magazine for Jan. 1832.

[a] Edinburgh New Philosophical Journal, Vol. XI., p. 318.

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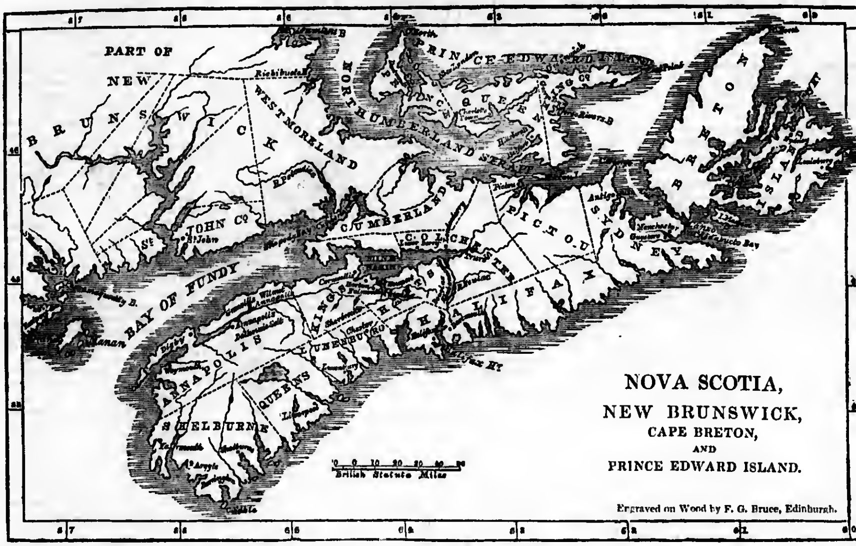
EMIGRATION TO NOVA SCOTIA, NEW BRUNSWICK, PRINCE EDWARD ISLAND, AND THE CANADAS.



NOVA SCOTIA,
NEW BRUNSWICK,
CAPE BRETON,
AND
PRINCE EDWARD ISLAND.

Engraved on Wood by F. G. Bruce, Edinburgh.

WHILE the flood of British emigration has been poured chiefly into Upper Canada, whose unoccupied lands offer a boundless scope for the efforts of a large and industrious population, the American colonial possessions lying nearer home, and situated chiefly about the mouth of the great river St Lawrence, have also received a considerable body of settlers; but the territories for the reception of emigrants in this quarter have never yet been sufficiently made known to the people, and it is now our design to do so in as [illegible] and popular a manner as possible.*

The British possessions on the sea-coast of America (exclusive of Lower Canada and Newfoundland) are Nova Scotia, New Brunswick, Prince Edward Island, and Cape Breton. The first two form part of the mainland; the other two are islands, and, as may be seen on the map, they are all near to each other—Nova Scotia lying furthest to the south, while New Brunswick bounds with the United States. The whole lie within the 43d and 47th degree of north latitude, and from about the 60th to the 68th degree of west longitude. These countries are not so warm or genial as Upper Canada; they are what Scotland is to England, more rugged and mountainous, and more unpromising in their outlines; but they are not less healthful and pleasant, and they possess, what many will esteem a great advantage, the property of being the nearest colonial possessions of Great Britain, with the likelihood of remaining longest under its paternal government.

NOVA SCOTIA.

Nova Scotia is a peninsula of the mainland, with which it is connected by a narrow isthmus. It measures about three hundred miles in length, but is of unequal breadth; altogether, it contains 15,617 square miles, or nearly ten millions of acres. One-third of this superficies is occupied by lakes of various shapes and sizes, spread in all directions on the face of the peninsula. There is no part of the land thirty miles distant from navigable water, and in all parts there are fine streams and rivers. The southern margin of Nova Scotia is broken and rugged, with very prominent features, deep indents, and craggy islands. The features of the northern coast are soft, and free from rocks. It is bounded on the north by part of the Gulf of St Lawrence, which separates it from Prince Edward Island; on the north-east by the Gut of Canso, which separates it from the island of Cape Breton; on the west by the Bay of Fundy, which separates it from New Brunswick; and on the south and south-east by the Atlantic Ocean. Including Cape Breton, which is now a part of the same government, it is divided into ten counties, namely, Halifax, Lunenburg, Cumberland, King's County, Hants, Annapolis, Shelburne, Sydney, Queen's County, and Cape Breton. The chief towns are Halifax, Truro, Londonderry, Onslow, Lunenburg, Amherst, Horton, Cornwallis, Windsor, Newport, Falmouth, Annapolis, Digby, Granville, Shelburne, Barrington, Yarmouth, and Liverpool. Halifax is the capital.

No part of the British American settlements has occasioned so many contests, or has been so often granted and purchased, conquered and ceded, as Nova Scotia. It became known to the French, who called it Acadia, about the year 1603; and, till 1712, it was alternately possessed by the French and English, when the latter became its permanent possessors. It is placed under the management of a governor, legislative council, and assembly of representatives, similar to the other colonies. At an early period of its history, it became distinguished by the name of *Nova Scotia*, which signifies *New Scotland*, an appellation not inappropriate, considering the number of its inhabitants from North Britain. The population of the province, including Cape Breton, amounted, in 1827, to nearly 143,000. About a twentieth part are the descendants of the French colonists; there are about 600 native Indians remaining; about 1500 free negroes; and the remainder of the inhabitants are the descendants of British settlers and refugee loyalists from the United States. The public revenue is raised from imposts on imported goods, and is at present rapidly increasing. Direct taxation is practically unknown.

TOWNS.

Halifax, we have said, is the capital of this flourishing colony. It is a town pleasantly situated on the slope of a rising ground, facing a fine spacious bay or natural harbour in front, on the east, or more accessible side of the peninsula. It resembles some English county towns in appearance, and is gradually improving, there being now a number of good houses of stone and brick. There are churches of the Episcopal or established religion, and chapels for different bodies of dissenters. The town possesses barracks for military, and government buildings. It has likewise several schools, a banking-house, and various institutions of a useful nature; also several newspapers. A description of the place is thus given by Macgregor:—

"Halifax is in length rather more than two miles, and about half a mile in breadth. The streets are wide, and cross each other generally at right angles, but that only next the water is paved; most of the others, however, are macadamised, and, from the ascent and nature of the ground, usually dry; but in summer, the dust, which is often whirled furiously along by the winds, is exceedingly disagreeable. The appearance of Halifax from the water, or from the opposite shore, is prepossessing and peculiar. The front of the town is lined with wharves, alongside of which, vessels of all sizes, and variously rigged, are incessantly discharging or loading their cargoes

* Our chief authority is a Description of Nova Scotia, &c., printed at Halifax, and of which there are probably few copies in this country. We have likewise had recourse to the works of Bouchette and Macgregor, and the letters of Captain Moorsom, besides official documents and pamphlets.

Warehouses rise over the wharves, as well as in different parts of the town; and dwelling-houses and public buildings rear their heads over each other as they stretch along, and up the sides of the hill. The spires of different churches; the building above the town, in which the town clock is fixed; a rotunda-built church; the signal posts on Citadel Hill; the different batteries; the variety of style in which the houses are built, some of which are painted white, some blue, some red, and some built of brick and stone, intermixed with those built of wood; rows of trees showing themselves in different parts of the town; his Majesty's ships moored opposite the dock-yard; the establishments, and tall sheers of the latter; the merchant ships under sail, at anchor, or alongside the wharves; the wooded and rocky scenery of the back ground, with the islands and the small pretty town of Dartmouth on the eastern shore; are all objects which strike most forcibly on the view of a stranger when sailing up the harbour. The number of dwelling-houses is estimated at about 1700, the public buildings 62, and the population, exclusive of the army and navy, about 16,000. The houses are very irregularly built, some being one, some two, some three, and a few four stories high. Handsome stone and brick buildings are built and furnished in the English style; and many of the houses built of wood are really more imposing in their appearance, being large, neatly finished, and painted white, than the best stone houses."

Halifax has the advantage of being the principal naval station of British North America, and this distinction it will, in all likelihood, enjoy as long as our government possesses an acre of land on the western shores of the Atlantic. It is the seat of government, and the principal commercial mart in the province. Its manufactures are still in an imperfect state: they consist of a sugar refinery, distilleries of rum, gin, and whisky, breweries of porter and ale, and factories of soap, candles, leather, flour, and cordage, and a few minor articles. It is now a free warehousing port. According to Bouchette, "In 1828, the exports, exclusive of the coasting trade, amounted to L.246,852, in 553 vessels, containing 61,511 tons, and navigated by 3323 men; and the imports L.733,392, in 544 vessels, containing 62,829 tons, and navigated by 3340 men. There were owned at Halifax, in 1828, seventy-three square-rigged vessels, and seventy-seven schooners; of which, seventy were employed in the West India trade, four between Halifax and Great Britain, six in the trade with foreign Europe, and Brazil, and the remainder in the fishery. The Falmouth, or English packet, regularly arrives with the mails once a month."

The fashions of Halifax are imported from Great Britain, towards which there is a strong feeling of attachment; and, in respect of dress and manners of the inhabitants in general, the place resembles a provincial town in England. The gayest season is winter. The first fall of snow is hailed as the signal for commencing amusements. Sleighs built, decorated, and trimmed in all the different shapes and forms that the fancy of the owner can desire, immediately make their appearance, some driven with four horses, and some with two. So long as the snow continues on the ground, the amusement is prosecuted with great eagerness and spirit. In the winter, also, there are public assemblies for dancing got up by subscription among the inhabitants, or by the officers of the different regiments. Besides these, balls are occasionally given by the governor. From the character of the society, cheapness of living, &c., Halifax is a place well fitted for the settlement of persons on limited but fixed incomes from this country, and is much preferable to the dull and dear country or sea-side towns in the United Kingdom.

Windsor, the county town of Hants, is situated nearly in the centre of the province, on the banks of the river Avon. The town, or village, as we would call it, is small, but well built, and one of the prettiest in America. The scenery in the neighbourhood is remarkably fine, and the undulation of the land such as to present a variety of landscape. The scene is diversified by the serpentine windings of the Avon and St Croix rivers, which are bordered on either side by rich and fertile meadows. The neighbourhood is not devoid of trees and groves. After leaving Windsor, and proceeding on the western road, the traveller is very much struck by the extent and beauty of a view which bursts upon him very unexpectedly on descending the Horton mountains. A sudden turn of the road displays at once the townships of Horton and Cornwallis, with the Basin of Mines, and the Gasperaux and Horton rivers. The great breadth and extent of this view, the still retired verdant vale at the foot of the mountain, the extended townships of Horton, interspersed with groves of wood and cultivated fields, form an assemblage of pleasing and interesting objects in this juvenile country. The post road, after passing through parts of Horton, Cornwallis, Aylesford, and Granville townships, brings the traveller to Annapolis, a place of little importance, but remarkably salubrious and agreeable in summer, by a cool sea breeze. Annapolis is situated near the shore of the Bay of Fundy, and a packet plies weekly to St John's, in New Brunswick, on the opposite coast. Liverpool is a town of some importance on the coast of the Atlantic, and carries on a considerable trade in the fisheries, West India produce, and timber.

Pictou is one of the principal towns in Nova Scotia, and has, perhaps, more connexion with Scotland than any other sea-port. It is situated on a harbour of the same name on the north coast, opposite Prince Edward Island. "Although (says Bouchette) not very regularly laid out, the houses are generally better than in any of the other provincial towns; many of them are built of stone. It contains four places of worship—an Episcopal, a Roman Catholic, and two Presbyterian chapels. There are also the Pictou academy, a grammar school, court-house, and public library. The population cannot now be less than 2500 or 3000 souls. Pictou is a free warehousing port, and its trade is very considerable in lumber (wood in a rough state), coal, and the fishery. Coasters from all parts of the Gulf of St Lawrence resort to Pictou, and its exports have amounted to L.100,000 in a single year. One hundred vessels have been loaded here with timber for Great Britain, and its exports to the West Indies were not less extensive and important. There are still in this district some considerable portions of ungranted land in the interior, on the borders of Sydney county; the aggregate may be about 70,000 acres, upon the whole tolerably good land; and although not immediately adjacent to the sea, yet in no place above twelve or fifteen miles from it, and, in all instances, intersected by rivers." Captain Moorsom describes Pictou as a place agitated by the violence of sectarian strife and feudal prejudice, brought from this country, but he anticipates a great change for the better, in the manners and comforts of the people, in the course of a few years. "The Highland bonnet (says he), which slouches like a nightcap over the eyes of the present generation of settlers, will be worn out, and replaced by the best of native straw, plaited by the hands of their children. A soil generally rich, and a climate available for the modes of Scottish husbandry, are facts less presumptive of its future prosperity, than t[illegible] [illegible]ndance of mineral, which, from the limited ex[illegible] [illegible] has hitherto undergone, we are warran[illegible] [illegible] its substrata contain."

[illegible]TE AND PRODUCTIONS.

It has [illegible] peculiar misfortune of this portion of the North American continent to be represented by almost every writer as a gloomy sterile region, constantly enveloped in fogs which obscure the sun and impede vegetation; whereas nothing can be more distant from the truth. This strange representation can only be accounted for, by supposing that the travellers who have visited it did not extend their investigations farther than the vicinity of Halifax, where the land has a bleak, and by no means agreeable aspect; but this is only a local characteristic, and the interior possesses much fine land, with a pleasant climate. The ground is generally covered with snow from the 25th of December till the 5th of March, which is, we believe, nearly the case with Upper Canada; and during this period of winter, the farmers draw upon sleds their wood and poles from the forest, and carry their produce to market. It is difficult to say when spring commences, as it is rather late and irregular in its approaches. When vegetation commences, it is very rapid, and two or three days make a perceptible change in the verdure of the foliage. The summer heat is moderate and regular, and by no means intense, there seldom being more than a week of very warm weather. The autumns are peculiarly delightful: the temperature in the middle of the day is similar to that of May, moderated by a fine, clear, elastic, healthy air, which gives a great cheerfulness to the spirits. This weather continues sometimes until the 1st of December, the evenings and mornings being, however, a little colder. Altogether, the climate of Nova Scotia is as good as that of Scotland, if not much superior. The air is healthy and pleasant, and never visited by any of those local or epidemical disorders with which other countries are frequently afflicted. Although the winters are intensely cold, they are not so disagreeable as the raw changeable winters of this country, nor nearly so fatal to human life. Besides, if the settlers work during three quarters of the year, they will have ample provision for the remaining quarter, and they therefore look forward to winter as their season of holiday enjoyment and relaxation.

Few parts of the world are so well watered as Nova Scotia. The rivers, brooks, springs, and streams of different kinds, are very numerous. Some of the lakes are extremely beautiful, containing, in general, one or more small islands, which are covered with a luxuriant growth of wood, and vary in every imaginable shape. The land in the neighbourhood of them is often undulated in the most romantic manner. These lakes will, in time, be of great service to the province; in several instances they nearly intersect the peninsula, offering scope for inland navigation. Already, by the efforts of art in connecting a chain of lakes or rivers (like our Caledonian Canal), there is a water communication across the country from Halifax, which will be of immense benefit to commerce and agriculture.

The fruits of this country form a good criterion of the climate. Besides a great variety of wild fruits, gooseberries, strawberries, cherries, and raspberries, there are pears of various kinds, all the varieties of English plums, apples of a very superior quality, quinces, peaches, apricots, and grapes, if assisted by the shelter of wooden fences. The other vegetable products are cucumbers, potatoes, artichokes, cauliflowers, cabbages, beans and peas. Hops are an invariable and sure crop, and may be raised in great abundance. Pumpkins and Indian corn are cultivated to a great extent. Carrots, onions, parsnips, beet, celery, and most other kitchen herbs, are produced with ease. The grains cultivated by the farmers, are summer and winter wheat, rye, buckwheat, barley, and oats. The natural forests are elm; cherry; white, black, yellow, and grey birch; red oak; beech; white and yellow pine; white, red, and black spruce; maples, &c. Some of these woods produce bark for tanning leather; and the sugar maple, as in Canada, affords sap for the manufacture of sugar. Potashes may also be made from the burnt ashes in eradicating the timber. It is mentioned that there are a variety of herbs and roots which are used by the inhabitants instead of tea, but the cheapness of that article of luxury hardly renders it worth while to resort to such expedients.

The mineral products of this part of America are valuable, but none is so much worthy of consideration as coal, which is found at Sydney, in Cape Breton, to a great extent, and of better quality than in any part of America: it is as highly valued as that from Newcastle in England, and will bring as good a price in the market. In the district of Pictou, coal is discovered in many places. There can be no doubt, therefore, that the possession of this fossil will constitute one of the chief superiorities of these provinces over every other. Limestone, freestone, and slate, abound, of the best qualities, and there is plenty fine clay for bricks. Iron ore has also been discovered in several places. The province has no animals of a troublesome nature. There are foxes, mice, squirrels, and rats. Among the feathered tribe there are a number of birds of the same kind as in Britain, including those called game in this country, all of which may be shot and used as food without any restriction. The only troublesome insects are the musquitoes and black flies, which are the torment of America, but they disappear in a great measure as the land becomes cleared and drained. It may be added, that the rivers abound in the finest fish, among which are salmon and trout; and the shores yield large supplies of white and shell fish of different kinds.

CHARACTER OF DISTRICTS.

The soil of a country of such an extent as Nova Scotia must necessarily be various in different parts. If an imaginary line be drawn, dividing the province in the exact centre, from east to west, the north-western half will be found to contain by far the greatest portion of good land. On the side towards the Bay of Fundy, the soil is very rich and free from stone, and contains many thousand acres of dyked marsh land. This is alluvial land, and is made by the deposit of the tides, a sediment composed of the finer particles of soil, brought away by the rivers and torrents in their course to the Bay of Fundy, of putrescent matter, salt, &c. This land called marsh, after it has attained a suitable height, is dyked, and the waters of the rivers excluded. Nothing can exceed its fertility. In many places, particularly about Windsor and Truro, it yields three tons of hay per acre, and has continued to do so without manure for fifty years past. There is a difference in its quality. Where the tide which overflows it is not much enriched, by a long course through the country, it is thin, and of an inferior quality; and on the other hand, that which is partly marsh and partly intervale, that is, composed as well by the sediment of salt water as that of fresh water, it exceeds in luxuriance any land in the province. The quantity of these dykes is very great. At the head of the Bay of Fundy, there are seventy thousand acres in one connected body. There is one marsh in Cumberland containing nearly as much land as Romney marsh in Kent, and of a quality vastly superior. There is something peculiarly agreeable to cattle in the grass growing upon these marshes, which has a wonderful tendency to fatten them. This land is found in great quantities in Cumberland, Macan, Napan, Londonderry, Truro, Onslow, Shubenacadie, Noel, Kennetcook, Newport, Windsor, Falmouth, Horton, Cornwallis, Granville, Annapolis, &c. The next best quality of land is called by a term peculiar to America, *intervale*, an alluvial soil made by the overflowing of large fresh-water brooks and rivers in the spring and autumn. The quantity of intervale is incalculable. It is to be met with in every part of the province, and is frequently found covered with a long natural grass, several feet in length, and is sometimes called wild meadow, and sometimes intervale. The quality varies according to the size of the brook or river by which it is made, but in general it is very fertile and rich. The upland varies so much that it is difficult to give a general description of it, but one tract deserves notice, from its extent and quality. It commences at Cape Blomidon in Cornwallis, and runs in one continuous ridge of high land for upwards of one hundred miles in the direction of Digby, and varies from three to seven miles in breadth. This is a very strong soil, and, with little exception, of a most excellent quality throughout, producing wheat and other grains in abundance. In Horton and Cornwallis the upland has something of a uniform character, and consists of a light sandy loam, which possesses the double advantage of being early and easily worked; and the crops raised upon it are as great as from any land in the country. But almost every other township contains a great variety of soil, varying from the heavy clay land to the lightest gravelly loam, and from the richest to very indifferent. The south-western part of Halifax county is in general stony, and requires a great deal of labour to fit it for cultivation, but the eastern part, about the three rivers that empty into Pictou Basin, the Gulf Shore, Mount Thom, and the whole district of Colchester, contains a large portion of excellent land, consisting of dyke, intervale, and upland. Sydney county consists more of upland and intervale, having but few marshes, and is in general an excellent tract of country. The best proof of the opinion usually entertained of a place, is the state of its population, and this county has greatly increased of late years.

Cumberland, including all its different townships, possesses more valuable land than any county of its size in North America. It is an immense prairie, extending in places as far as the eye can reach, and, being principally under grass, presents in the autumn of the year, with its numerous hay-stacks and extensive herds of cattle, an interesting scene.

Hants and King's counties rank high in value in point of soil, containing larger portions of intervales and marshes of superior quality than either of the remaining four counties. The upland of these two counties also is more invariably good land.

Annapolis county is very extensive, being one hundred miles in length, and containing seven large townships, and exhibiting every variety of soil. The upper half, or the part between the borders of King's county and Digby, may be considered as much the best land. The valley of the Annapolis river is one of the most picturesque and fertile parts of the Province, and retains this character for a distance of nearly forty miles. The land upon both sides is, at some distance from the river, high, and gradually slopes with various undulations, until it descends to the meadows, which, on either side, border the river.

Shelburne, Queen's, and Lunenburg, contain a large portion of stony land, and being principally inhabited by a commercial population, less attention is paid to the improvement of their interior than that of the other counties. In each of these three districts the quantity of inferior land preponderates. The counties which have been thus cursorily alluded to, contain the whole of Nova Scotia Proper.

Of the fertility of the forest land of America, where the soil is naturally good, a stranger can form but little conception. Nature has been enriching it for centuries, and has fitted it to yield the settler good crops for successive years, without the additional aid of manure. Dr Robertson, speaking of America, says, "If allowance be made for the diversity in the degree of heat, the soil of America is naturally as rich and fertile as in any part of the earth. As the country was thinly inhabited, and by a people of little industry, who had none of the domestic animals, which civilized nations rear in such vast numbers, the earth was not exhausted by their consumption. The vegetable productions to which the fertility of the soil gave birth, often remained untouched, and being suffered to corrupt on its surface, returned with increase into its bosom. As trees and plants derive a great part of their nourishment from air and water, if they were not destroyed by man and other animals, they would render to the earth more, perhaps, than they take from it, and feed rather than impoverish it. Thus the unoccupied soil of America may have gone on enriching for many ages. The vast number and enormous size of the trees in America indicate the extraordinary vigour of the soil in its native state. When the Europeans first began to cultivate the New World, they were astonished at the luxuriant power of vegetation in its virgin mould, and in several places the ingenuity of the planter is still employed in diminishing and wasting its superfluous fertility, in order to bring it down to a state fit for profitable culture."

The growth of the wood is generally an index to ascertain the quality of the soil. When it produces black and yellow birch, and rock maple, or either of those trees, intermixed with hemlock and oak, or elm, ash, and beech, the land is in general of superior quality. Its strength is also manifested by the height and bulk of the wood, and the distance between the root and the first limb of the tree; but spruce and fir, or white birch and poplar, are in general marks of an inferior quality. Land bearing beech of a good growth, and pines of large dimensions, forms a medium between the two, and is of an ordinary description. Although the first mentioned wood is a sure proof of good land, the latter is not an infallible mark of its inferiority.

Large fires have at different times raged in the wilderness, either by the neglected embers in the Indian camps, or by other accidents; and where these fires consumed the original growth, a new set of saplings arose, frequently of a different description from the first. This is not peculiar to Nova Scotia, but has been noted in England and Canada. Evelyn, a writer of the seventeenth century, who paid great attention to the rearing of forest trees, mentions, "That when his grandmother's woods were cut down, which consisted entirely of oak, there sprung up again not oaks, but beeches, and when they in their turn felt the axe, there arose spontaneously a third plantation, not of oak or beech, but of birch," which he does not set down as a thing singular, but merely because it happened under his own eye. M'Kenzie, in his North American Tour, speaking of the country bordering on Slave Lake, says, "It is covered with large trees of spruce pine and white birch; when these are destroyed, poplars succeed, though none were before to be seen." It is owing to this circumstance that the settler has been frequently agreeably surprised to find that land, which he supposed to be of an ordinary nature, has turned out upon cultivation to be of a very good quality. The growth, however, of the wood, as first observed, is most commonly a pretty good criterion by which to estimate the soil. The first kind never proves bad, the latter sometimes better than is expected.

Bouchette mentions, that the quantity of land appropriated in Nova Scotia amounts to 3,073,277 acres, and the quantity at the disposal of the crown about 5,000,000. "The first settlers (he continues) naturally selected the best land, both as to quality and situation; the ungranted, or crown lands, therefore, lie in the rear of the townships, and in the interior, and consist of almost all the inferior tracts, with a very considerable quantity of good land. There are extensive tracts of crown lands in the county of Cumberland, extending from one end of it to the other, a great part of which is of very excellent quality. The whole of the county of Shelburne is still undisposed of; some of it is well wooded, and the soil in many places of good quality. There are also considerable tracts of good crown land in the interior of the county of Annapolis, Queen's, and Sydney. In short, considerable tracts of superior and good land are to be found among the crown lands in all parts of the province. The value of land necessarily depends on the fertility of the soil, local situation, and state of improvement. It is impossible, therefore, to form any general estimate of the value of improved land. Wilderness or unimproved land varies from L.5 to L.40 per hundred acres. About L.10 per hundred acres is the full average value of improvable wilderness land.

"The process of bringing the wild land into a state of cultivation, and the operations of agriculture, are much the same in this province as in all other newly-settled countries. The first thing to be done is to clear off the wood. The trees are cut down at about three feet from the ground, lopped and sawn into convenient lengths, and then burnt; where this is not performed by the settler himself, the cost of the whole is about L.4, 10s. per acre, exceeding the rate at which the same service may be procured in the Canadas by about L.1, 10s. per acre. The wood, although green, burns freely, and the whole clearing may be, and generally is, performed in one season, from March to September. The land is then prepared, by manual labour, with the hoe, for the seed, and wheat, rye, maize, sown, or potatoes planted; grass seeds are always sown with the grain crops, and after they are taken off, the land remains in grass, producing hay for the food of the cattle in winter, until the stumps of the trees decay, and the plough can be used. The settler is enabled to keep a stock of cattle as soon as he can raise hay off his land, which is generally the third year. The settler carries on the same process on a portion of new land every year, either until his whole farm is cleared, or until, by the decay of the stumps, he is enabled to cultivate again the already-cleared land with the plough, which can generally be done in five or six years. New land yields the most abundant crops, and a farm, consisting of both new and cleared land, is considered more profitable than one entirely cleared. Farms of the former description are called "half-improved farms." Wheat is raised with some difficulty in Nova Scotia; if the seed be well selected, and sown early on good land, properly tilled, it will ripen in all ordinary seasons; it requires great care in its culture, and if that be neglected, it is probable it will not succeed. The average crop on good upland is from sixteen to twenty-five bushels; on intervale and marsh, much more: it has been known to yield forty bushels per acre. The quantity grown in the province is not nearly sufficient for its own consumption, and flour is consequently imported to a considerable extent. The climate is very congenial to rye, oats, and barley; they are raised without difficulty, and yield abundantly. The average crop on good land is oats, 25; barley, 20; and rye, 16 bushels per acre. Maize, or Indian corn, is indigenous in America; it is extensively cultivated in the western districts of this province, and is a most valuable vegetable. It is easily cultivated: the leaves and stalk afford good food for cattle; the grain is the very best that horses and swine can eat; and the meal the best for bread, next to wheat-flour. Indian corn bread, though very little used in this province, is in common use in the New England provinces and New York, indeed all through the United States; the average crop is about twenty-five to thirty bushels per acre.

"Potatoes thrive better in Nova Scotia than in any part of America, and are very much cultivated; the produce is about 200 bushels per acre. Turnips, beans, and buckwheat, are also cultivated very generally, and with success. Few places are regularly divided into fields, but a rotation of crops is generally adopted. On the virgin land, wheat, rye, potatoes, maize, and sometimes turnips, compose the first crop; then grass for a few years. On the breaking up of the grass land, generally oats, then potatoes, then wheat, succeeded by potatoes and wheat, and laid down with clover or timothy grass. Hay is indispensable for the subsistence of cattle in the winter in this province, and the culture of grasses is therefore a primary object with the Nova Scotian farmer, insomuch that the land laid down in grass is scarcely ever broken up until the failure of the grass crop indicates the necessity of renewal and change. New land requires no manure in the first instance, and some soils, marsh, and intervale, have been under crop for several successive years without the aid of manure. Dung is the most common manure used, particularly on upland; lime has come but partially and lately into use. Gypsum, of which such quantities are exported to the United States for manure, is not at all used for that purpose in this province; the alluvial deposit of the tide and rivers is, where it can be had, considered the best manure, and used as such."

FARMING OCCUPATIONS.

It is related by our authorities, that, until recent times, the operations of the husbandman were conducted in a rude style, little resembling the fine system of culture prevailing in the mother country. Great improvements in this respect have been effected, partly through the attention of the late governor, the Earl of Dalhousie, and by the establishment of boards of agriculture. The change produced by these societies is more visible in the improved breeds of cattle, in the variety and quality of seeds, and in the attention paid to manure, than in the different branches of work performed upon a farm. Ploughing is still (or was very lately) badly executed, and there is great room for conducting the cultivation of the fields in a better style. The rotation of crops is very simple. Potatoes, grain, and clover, constitute the usual routine; sometimes commencing with grain, but oftener with potatoes, of which two hundred bushels will be produced on an acre of good land. Turnips have not entered largely into the agriculture of the country, and they are not easily preserved during winter. Great quantities of oats, wheat, buckwheat, barley, and rye, are produced. Flax is seldom raised for sale, but the country is favourable to its production, and its culture is rapidly increasing.

The hay of the country consists of a variety of grasses. The intervales, when in their natural state, produce a grass vulgarly called blue joint, which is very luxuriant, but affords a coarse and inferior food. The dykes produce clover, or timothy mixed with clover. Sometimes they bear flat grass, which is a plant strongly partaking of a saline nature. A proportion of this flat grass land is very valuable to a farmer, as the crop may be gathered after all his other hay is secured, and receives but little injury from the rain. Working oxen sometimes prefer the hay made of it to clover, and it is always an agreeable change of diet for them. The undyked marshes produce a coarse salt grass, which is covered at high tides by the sea water without injury. Young cattle are fed upon this in winter, and continue in very good condition. This grass is also valuable for the manure made of it, which is of a much superior quality to that produced by cattle fed upon clover. White and red clover, timothy and brown top, are the grasses usually raised upon upland. The farms in the old townships consist generally of dyke and upland. The former is set apart for hay, with a small portion for grain. The latter is divided into two parts, one of which contains a small piece of ground for tillage, and the rest is a large pasture, in which the whole of the stock, cows, horses, sheep, pigs, and young cattle, feed at large during the summer. In the autumn, so soon as the hay is gathered, the stock is removed to the dykes to depasture upon the after-grass. The properties of this grass are so peculiar, that horses or horned cattle, however low in condition, become completely fattened in the course of six weeks.

This system among others is now undergoing an alteration. The proportion of tillage land is becoming greater, and the pastures consequently somewhat improved. The farmer is hereby enabled to raise potatoes or other vegetable products sufficient for stall feeding, and the markets are not so much glutted by grass-fed beef in the autumn as heretofore, but regularly supplied at different periods according to the demand. The quantity of manure is also proportionally increased, and the soil thereby rendered more rich and productive. The period of sowing differs according to the season and soil; but in general, oats and wheat are sown in April; Indian corn is planted according to local circumstances, at any time between the 10th of May and the 10th or 12th of June. Barley and buckwheat are sown about the 1st of June, and turnips about the 10th of July. Mowing commences about the 25th of July. Reaping begins in August, and is finished in September.

Dung is the only manure which has been used in Nova Scotia until within these two or three years. But since the establishment of agricultural societies, lime has been applied with much success, and composting has become a general practice. In most districts bordering on the Bay of Fundy, marsh mud (of which the dykes are composed) is applied as a superficial dressing for grass lands, and as a manure for grain crops. The effects of this application are very great, often producing two or three courses of wheat in succession, and afterwards a strong growth of grass for several years. In Hants, King's, and Annapolis counties, there are very extensive orchards of excellent fruit trees, and a very great quantity of apples of superior quality, and cider is annually exported to New Brunswick, Newfoundland, and the West Indies. Cumberland and Annapolis counties are remarkable for the great amount of butter and cheese which they export every season.

The routine of farming operations is thus pleasingly described by Captain Moorsom:—"As soon as the ground is clear from snow, the farmer is busily employed in piling his summer fuel, securing his sleds and other winter apparatus about the house, clearing his drains, and setting up his fences. These fences are either walls of loose stones, or rough trunks, or poles placed in a variety of ways; in winter they are frequently thrown down in order to allow a free track for the passage of sleds over the snow, and always require to be fixed afresh in spring. Much labour and expense is thus annually incurred beyond that which is called for in clipping an English hedge; but the readiness with which poles are procured from the woods, the facility offered of shifting the pole-fence in any desired direction, and, still more, the expense and trouble attendant upon first rearing a hedge where no such thing has been ever planted before, are the reasons which induce the employment of timber fences, even where a farm is at some distance from the forest; hedges, however, are slowly creeping up in the best cultivated districts. Ploughing, sheep-shearing, and seed-time, occupy every moment from the middle of April to the middle of June; and attending to the garden and field crops, and removing the accumulated refuse of winter, bring the farmer to the mowing season before he is nearly ready for it. The scythe comes into play in the middle of July; and in some seasons I have seen the hay left rotting on the ground, for want of time to secure it before the speedy ripening of the grain obliged the husbandman to employ the sickle. The sheaves are commonly brought into the barn or stacked by the middle of September. Digging potatoes, gathering Indian corn, and fall-ploughing, both for winter grain, and as a preparative for the soil against the following spring, occupy the farmer till frost and snow compel him to put on mitts and woollens, and labour with his axe in the woods, in order to provide fuel and fencing-poles, which he brings home as soon as the snow renders 'hauling' easy. Amid such a variety of work there is but little time left for attention to neatness; much, however, might be done which is now neglected. The large quantity of land under cultivation, in proportion to the number of hands employed upon it, is another cause not only of slovenly farming, but of the general inferiority of produce, both in quantity and quality, below the real capabilities of the soil. The lower class of farmers seldom employ additional labour, other than the voluntary aid of his neighbour, for which he gives his own in return. About the Windsor country, the common practice is to hire labour on a farm for a period of six months, for which from fifteen to eighteen pounds currency, besides the man's 'keep,' are given; this is considered less expensive than giving twenty pounds per annum, as the keep of a man during winter is of more value than the labour he would then be required to perform. Part of this payment is generally made in produce. Farms are sometimes rented by the proprietor to the farmer for the half of the returns he raises; but labourers are seldom hired in this way. Upon any press of work, such as hay-making or harvest, a labourer will sometimes, though rarely, get as much as a dollar per day, and his keep. Mowers will sometimes engage for a dollar per acre, but they then find their own provisions; a good mower will get through his acre in the course of the day, by working after sunset. The wages of labourers, compared with the state of the market for agricultural produce, are the greatest drawback that the Nova Scotian farmer experiences; in this way he finds the greater part of his profits absorbed; and hence it is that a large family, instead of being a clog, is a direct source of wealth, so long as its members will combine in operating for the common benefit."

It appears by statistical returns that there are in the province about 10,000 acres under wheat, 22,500 acres under other grain, 22,500 acres under potatoes, and about 164,000 acres under hay; in all about 200,000 acres under crop. In 1828, the province owned 12,952 horses, 110,776 horned cattle, 174,053 sheep, and 71,904 swine. The country is intersected by excellent roads, which are every year improving and extending at the expense of the local government.

The inhabitants of Nova Scotia enjoy the advantage of having articles of foreign luxury, especially tea, at a very low expense. The East India Company annually sends one or two vessels direct from China, which arrive about June; and the cargo is sold to merchants or others free of the heavy duty payable in this country. "Tea (says Captain Moorsom) is more extensively consumed throughout Nova Scotia than any other article of luxury, except spirits. It is used in the poorer cottages at every meal, particularly among those settlers who originally came from New England. In the third year from the first experiment of the China vessels, the sale of the East India Company trebled its original extent. The Company's agent disposes of the consignment by wholesale, with a very moderate charge to meet contingent expenses; and tea, of the best quality, next to gunpowder, may be procured at Halifax, at an average, when mixed, of three shillings sterling per pound."

PURCHASING AND SETTLING ON LANDS.

Lands are now disposed of by government on a uniform plan in all our North American possessions—that is, by public auction or sale, an upset price being specified. The regulations for the disposal of lands are thus given in substance by Bouchette:—"That the Land Commissioner, having notified to the governor the quantity of land proposed to be sold the ensuing year, with the upset prices, the same to be published in the Gazette: that no lot contain more than 1200 acres: that the purchase-money be paid by four instalments, the 1st at the time of sale, and the 2d, 3d, and 4th at intervals of a year: that if instalments be not regularly paid, the deposit-money will be forfeited, and the land again referred to sale: that purchasers under 200 acres, unable to pay the purchase-money by instalments, may be put in possession under a quit-rent, equal to five per cent. upon the whole amount of the purchase money, to be paid annually in advance; upon failure, the lands to be again referred to auction: that the quit-rent be subject to redemption: that the party who shall have paid an instalment towards redeeming his quit-rent, and shall afterwards neglect to pay the accruing quit-rent, be liable to have his land resold so soon as the arrears of quit-rent shall have covered the amount of the instalment: that the names of purchasers failing in the regular payment of their purchases or quit-rents, be made public, and their lands the first to be put up to auction the following year: that no lands be granted but at the current sales in each district, except to poor settlers who may not have been in the colony more than six months preceding the last annual sale, in which case such poor settlers are entitled to purchase the lands at the upset prices fixed for the same at the previous year's sale: that settlers may, at any period within seven years from the date of those regulations, obtain lots of 200 acres, but no more, in unsurveyed districts upon a quit-rent, equal to five per cent. on the estimated value of the land at the time of occupancy, and that such quit-rent may be redeemed before the expiration of that term, upon 'payment of twenty years' purchase of the amount, and afterwards upon payment of any arrear of quit-rent which may be then due, and twenty years' purchase of the annual amount of the rent." No patent or transfer to be granted until the purchase money, or arrears of instalments or quit-rent, shall have been paid: that the purchase money and quit-rents be paid to the commissioner, or his delegate, at the time and place named in the condition of sale."

If settlers possess nothing but their industry, they will be under the necessity of acting for a time as the servants of others. To be enabled to go at once upon a farm, it will be necessary to possess a small stock of money, not only to pay the price of the land, whatever that may be, but to lay in some useful articles of furniture and provisions for a family. The provisions to be taken by an emigrant to his lot, if his family consists of five persons, are as follows:—

Fifty bushels of potatoes -	L.2	10	0
Two barrels flour - -	3	10	0
One barrel rye, Indian, or oatmeal	1	0	0
One barrel mackarel and one barrel herrings - - - -	2	0	0
Half barrel beef - - -	1	15	0
Five gallons molasses - - -	0	12	6
Three gallons rum - -	0	12	0
Three pounds of tea - -	0	15	0
Twelve pounds sugar - -	0	8	0
One milch cow - - -	5	0	0
	L.18	8	8

He will then expend L.10 on the following articles: Two axes (the axes got in this country do not answer for cutting down trees), four hoes, one saw, one or two planes, one adze, twenty or thirty pounds nails, two pots, one kettle, some tea mugs, gridiron, frying-pan, and some earthenware; all which he can advantageously purchase in the colonies.

LOCATIONS.

In a small pamphlet, entitled "The Emigrant's Friend," published at Glasgow, in which are many useful hints, we find the following good advices. "In choosing a property, *location* is generally the first thing looked to. 1st, Its vicinity to a good market town, or a principal road or canal, on both of which latter there are generally stores where you can dispose of your produce. 2d, The state of the bye-roads in its vicinity. Proprietors are assessed to work upon these a certain number of days every year, proportioned to the value of their property, and the better these are, or the more of them completed (for according to the district plans they are generally very numerous, although only one at a time is opened), the less are proprietors assessed, and the more valuable are their properties. I was amused, although sorrowfully so, some years ago, by a letter which was shown to me, from an emigrant to his friend here. He had been lured into the Canadian woods, by having land given to him *for nothing*. Along with his family, he had gone through six years of privations and hardships, which no earthly reward would induce him to go through again. One year they were well nigh starved, owing to the deers having eaten up the little crop of grain which they had sown in their partially cleared field, and to the bears paying a similar compliment to their Indian corn; for except during three months in the winter, they were cut off from all intercourse with their kind: a swamp 'like the Greenock harbour at low water' lying between them and the nearest settlement. Yet he thanked God that their difficulties were fewer now, for they were getting used to the fever and ague, and expected soon to have a wooden causeway completed through the swamp; and they were also able (after six years of toil) to get enough of produce off their farm to feed themselves, and to procure a few of the *luxuries* (knives and forks and spoons, I suppose) which they had been used to in Britain. Mind they were very poor people whilst here; from this you will perceive the importance of the word *luxuries*. The roads, however, he considered a great hardship; his son and he had to work two or three weeks in the year upon them; and he saw no end to this, for though the causeway through the swamp was nearly ready for going upon, 'yet there were twelve roads in the township, *and all these roads to be made*.' Here then is the price, or rather rent, paid by this poor man for his property—six weeks labour annually, which, considering that he kept himself, was equal to L.8, or 52 dollars; the generous bestower for nothing, be it observed, having his adjacent lands increased in value, to the amount of the roads made through them, independent of the advantage of having a neighbourhood commenced in them, and having probably purchased them himself at the rate of one or two shillings for each acre. 3d, The state and vicinity of schools to the intended purchase; as also of places of worship."

SQUATTERS AND BACKWOODSMEN.

"There are three grades of settlers (continues this amusing author), from one of which you will have to choose your neighbours, according to the age of the settlement which you fix upon. 1st, the *squatters*: these men are generally found upon the frontiers, a few miles in advance of other white settlers, and occasionally in all of the large unsettled tracts throughout the populated part of the country. They are usually either disaffected to society, or outcasts from it. They refuse to submit to the law of civilized governments, affect to consider that one man has as good a right to unoccupied lands as another, and *squat* down accordingly, wheresoever they choose, generally choosing, however, to keep a good distance from the more conformable settlers. They are tolerated because they are not very numerous; because they are serviceable, in as far as the first pathways for white men into the woods are made by them; and because they are rather dangerous people to pick a quarrel with. They seldom cut down more wood than what they need for their log-house and fires. A small patch of potatoes, and another of Indian corn, some poultry, and a litter of pigs, which feed and fatten upon the roots and acorns of the surrounding forest, are all that they have to depend upon, except what they obtain through the aid of the rifle; with this, the bears and the deers, which so annoyed our Scotsman, become valuable prizes to them, and it generally enables them to provide themselves with a few of the commodities of the settlements. 2d, The *backwoodsmen*: these are a restless, adventurous class of men; they always are, and require to be, able to do a little of every thing—to build log-huts, hunt and trap game, make sledges, mend shoes, &c., &c.; these are done rudely enough to be sure, but they are always first-rate wood choppers. They use an axe of a shape peculiar to America, which they swing round their heads dexterously, and even gracefully; and which few learn to handle well, unless they commence practising it in boyhood. They generally purchase a lot of wild land, and *improve* it; that is, *clear* from a quarter to a half of it, build a log-house, barn, &c., fence it, and open up one or two of the bye-roads in the vicinity. By this time the country is ready for the third grade, to whom they generally sell out, and again go into the woods. They know little or nothing of the art of farming, as known to good agriculturists; nor could they practise this art to good account if they did know it; very little tillage being necessary for the first crops from wild lands, which, by reason of stumps, &c., require to be cultivated after a manner of their own. The third grade of settlers I call the *capitalists*. They are made up of those who come with money and purchase the fruits of the backwoodsman's labour, and of others who were backwoodsmen, but who now choose to 'settle down,' and enjoy the advantages of their accumulated industry themselves. As the settlement thus increases in population and wealth, mechanics become in demand, and a blacksmith, shoemaker, and house-carpenter, are not long of finding their way to it, and are heartily welcomed; a "jack-of-all-trades" is never wanted. Some favoured spot begins to thicken into a village; which character it becomes fully entitled to on the arrival of a doctor, lawyer, tavern-keeper, and store-keeper, who soon follow the other more important, though less exalted members of society. In a year or two more, a pretty white-painted church, with a tall, light spire, completes the picture, of which you will see many counterparts in the country to which you are going.

"It is in or near one of these that I advise you to abide, if you can so rule it; and even in these you will have to put up with many inconveniences which you did not know in this country, owing to the more perfect division of labour here not requiring you to turn your hand to more than one employment, and enabling you to get other men's handiworks readily and cheaply."

NEW BRUNSWICK.

The province of New Brunswick, lying on the mainland of North America, contiguous to the United States and Lower Canada, consists of an extensive tract comprising nearly 28,000 square miles, the greater part of which is still covered with dense forests; the land, however, is generally fertile, and excellently adapted for the settlement of emigrants. Besides being recommended by a fertility of soil, it possesses innumerable rivers and streams, in all directions, suitable for purposes of trade or manufacture. The climate is salubrious; the natural products numerous and valuable; wild animals are plentiful; and the rivers and lakes abound in fish, while along the coasts, cod, haddock, salmon, and other fish, are yielded in plenty to the enterprising fisherman. The resources of the province are thus inexhaustible, and, according to Macgregor, suitable to the maintenance of at least three millions of inhabitants. As yet, New Brunswick has a small population, and the principal settlements are along the river St John and its lakes. On the northern side of the entrance to this large river from the Bay of Fundy, stands the town of St John, the largest in the province, though not the capital. Fredericton, the metropolis, and seat of goverment of the colony, is situated nearly ninety miles above St John's, on the same river; it is still a village in appearance. The chief buildings are the government house and a college.

The province of New Brunswick presents an extensive line of coast to the Gulf of St Lawrence on the east, while on the north it has part of Lower Canada, which separates it from the River St Lawrence upwards. Its latent capabilities for carrying on trade with the interior are thus very considerable. Miramichi is the chief river after the St John. It falls into the Gulf of St Lawrence, and is navigable for large vessels for about forty miles. Along its banks, here and there are seen the huts and houses of settlers, who have not made great advances in cultivation. The cutting and export of timber form the main trade of the district. About twenty miles up, on the south bank, is seen the village of Chatham, where many of the ships load, and where several of the merchants are settled, who have erected stores and wharves. Four miles farther up is seen the village of Newcastle. The Miramichi river divides into two great branches. "On coming down the south-west branch (says Mr Macgregor) in the autumn of 1820, from where the road from the river St John joins the Miramichi, about eighty miles above Chatham, I was astonished at the unexpected progress made during so short a period in the cultivation of the soil. Near where the road parts off for Fredericton, an American, possessing a full share of the adventurous activity of the citizens of the United States, has established himself. He told me that when he planted himself there, seven years before, he was not worth a shilling. He has now (1829) more than three hundred acres under cultivation, an immense flock of sheep, horses, several yokes of oxen, milch cows, swine, and poultry. He has a large dwelling-house, conveniently furnished, in which he lives with his family and a numerous train of labourers, one or two other houses, a forge, with a powerful trip-hammer worked by water power, fulling-mill, grist-mill, and two saw-mills—all turned by water. Near these, he showed me a building, which he said he erected for the double purpose of a school and chapel, the floor of which was laid, and on which benches were arranged so as to resemble the pit of one of our theatres. He said that all preachers who came in the way were welcome to the use of it. An English parson, a Catholic priest, a Presbyterian minister, or a Methodist preacher, should each, he said, get something to eat at his house, and have the use of the chapel, with equal satisfaction to him. He then showed me his barn, and in one place a heap, containing about ninety bushels of Indian corn, that grew on a spot scarcely an acre, which he pointed out to me. This man could do little more than read and write. His manners were quite unpolished, but not rude; yet he had wonderful readiness of address, and, as far as related to his own pursuits, quick powers of invention and application. He raised large crops, ground his own corn, manufactured the flax he cultivated and the wool of his sheep into coarse cloths; sold the provisions which his farm produced, and rum and British goods to the lumberers; kept a tavern; employed lumberers in the woods, and received also timber in payment for whatever he sold. He made the axes and other tools required by the lumberers at his forge; he ate, gambled, and associated with his own labourers, and with the lumberers, and all others, who made his house a kind of rallying point; he appeared, however, to be a sober man, and a person who had in view an object of gain in every thing he engaged in; he talked much in praise of the rich interior country, and how rapidly it would be settled and cultivated, if possessed by the Americans."

The following is a list of prices compiled from documents sent in to the Commissioners for Emigration from various parts of New Brunswick:—

	£	s.	d.		£	s.	d.
Wheat, per bushel	0	5	0	to	0	10	0*
Maize, per ditto	0	4	6	...	0	5	0
Oats, per ditto	0	1	6	...	0	2	6
Barley, per ditto	0	4	0	...	0	5	0
Potatoes, per cwt.	0	1	3	...	0	3	6
Butter (fresh), per lb.	0	0	9	...	0	1	0
Ditto (salt), per ditto	0	0	8	...	0	0	10
Cheese, per ditto	0	0	4	...	0	0	7
Eggs, per dozen	0	0	7½	...	0	1	0
Ducks, per pair	0	2	0	...	0	3	6
Fowls, per ditto	0	1	6	...	0	2	6
Geese, per ditto	0	3	0	...	0	5	0
Turkeys, per ditto	0	7	6	...	0	10	0
Hay, per ton	1	10	0	...	2	10	0
Straw, per ditto	1	0	0	...	1	5	0
Bread, per 4lb. loaf	0	0	10	...	0	1	0
Beef, per stone	0	3	3	...	0	4	0
Mutton, per ditto	0	2	4	...	0	4	0
Pork, per ditto	0	2	0½	...	0	4	0
Veal, per ditto	0	2	4	...	0	4	8
Flour, per 100 lbs.	0	16	0	...	0	17	0
Salt pork, per barrel	4	15	0	...	5	5	0
Ditto beef, per ditto	3	0	0	...	3	10	0
Malt, per bushel	0	6	2	...	0	6	4
Rye flour, per barrel	1	2	6	...	0	0	0
Indian flour, per ditto	1	2	6	...	0	0	0
Oatmeal, per cwt.	0	16	0	..	0	18	0
Salt cod, per 112 lbs.	0	10	0	...	0	12	0
Ditto mackarel, per barrel	0	17	0	...	1	0	0
Ditto alewives, per ditto	0	10	0	...	0	12	0

* Although some wheat fetched this price in the course of 1831, the price very rarely rises higher than 7s. 6d.

Coals are sold at 30s. per chaldron. House-rent at St John's is from L.5 to L.6 per annum for families occupying one room; and for families occupying two rooms, from L.6 to L.10. Common labourers receive from 3s. to 4s. a-day, finding their own subsistence; but, when employed at the ports in loading vessels, their subsistence is found for them. Mechanics receive from 5s. to 7s. 6d. per day, and superior workmen from 7s. 6d. to 10s.

Upon the foregoing statements it must be observed, that emigrants, especially such of them as are agricultural labourers, should not expect the highest wages named until they have become accustomed to the work of the colony. The mechanics most in demand are those connected with the business of house-building. Shoemakers, tailors, and ship-builders, also find abundant employment.

By order of the Commissioners for Emigration,

T. FREDERICK ELLIOT.

PRINCE EDWARD ISLAND.

This rich and productive island is situated in the Gulf of St Lawrence, betwixt Cape Breton on the east, and New Brunswick on the west, and is separated from Nova Scotia on the south, by a strait of about nine miles in breadth. It measures 140 miles in length, and is 34 at its greatest breadth. The account given by Mr Macgregor of this province is one of the best we have, and as the author, we believe, was a considerable period in the island, his details may be relied on. The following are a few of his observations:—"In coming within view of Prince Edward Island, its aspect is that of a level country, covered to the water's edge with trees, and the outline of its surface scarcely curved with the appearance of hills. On approaching nearer, and sailing round its shores (especially on the north side), the prospect becomes interesting, and presents small villages, cleared farms, red head-lands, bogs, and rivers, which pierce the country; sand-hills covered with grass; a gentle diversity of hill and dale, which the cleared spots open to view, and the undulation of surface occasioned by small lakes or ponds, which from the sea appear like so many vallies.

"On landing, and travelling through the country, its varied, though not highly romantic scenery, and its agricultural and other improvements, attract the attention of all who possess a taste for rural beauties. Owing to the manner in which it is intersected by various branches of the sea, there is no part at a greater distance from the ebbing and flowing of the tide than eight miles. It abounds with streams and springs of the purest water. There are no mountains in the island; a chain of hills intersects the country; and in different parts the lands rise to moderate heights, but in general the surface of the island may be considered as deviating no more than could be wished for the purpose of agriculture. Almost every part affords agreeable prospects and beautiful situations. In summer and autumn, the forests exhibit a rich and splendid foliage, varying from the deep green of the fir, to the lively tints of the birch and maple, and the character of the scenery at these seasons displays a smiling loveliness and teeming fertility. The island is divided into three counties, these again into parishes, and the whole subdivided into sixty-seven townships, containing about 20,000 acres each. The plot of a town, containing about 400 building lots, is reserved in each county. Charlotte Town, the seat of government, is situated on the north bank of Hillsborough river (east side of the island), and its harbour is considered one of the best in the Gulf of St Lawrence. The town stands on ground which rises in gentle heights from the banks of the river, and contains about 350 dwelling-houses, and about 3400 inhabitants.

"The climate of Prince Edward Island, owing to its lying within the Gulf of St Lawrence, partakes, in some measure, of the climate of the neighbouring countries; but the difference is greater than any one who has not lived in the colony would imagine. In Lower Canada, the winter is nearly two months longer, the frosts more severe, and the snows deeper, while the temperature during summer is equally hot. In Nova Scotia, New Brunswick, and Cape Breton, the frosts are equally severe, the transitions from one extreme of temperature to another more sudden, and fogs frequent along those parts that border on the Atlantic and Bay of Fundy. The atmosphere of this island is noted for being free of fogs. A day foggy throughout seldom occurs during a year, and in general not more than four or five that are partially so. As regards the salubrity of the island, it is agreed by all who have lived any time on it, and have compared its climate with that of other countries, that there are few places where health is enjoyed with less interruption.

"Large tracts of the original pine forests have been destroyed by fires, which have raged over the island at different periods. In these places, white birches, spruce-firs, poplars, and wild cherry trees, have sprung up. Poplars of great dimensions are plentiful. Many other trees are met with. Among the wild fruits, raspberries, strawberries, cranberries, (which are very large), blueberries, and whortleberries, are astonishingly abundant. Foxes and hares are numerous. Mosquitoes and sandflies are only annoying during the heat of summer in the neighbourhood of the marshes, and in the woods; where the lands are cleared to any extent, they are seldom troublesome. The varieties of fish that swarm in the harbours and rivers, or around the shores, and that abound on the different fishing banks in the vicinage of the island, are numerous, each abounding in great plenty.

"The excellence of its soil, its climate, and the configuration of the surface, adapt the lands of Prince Edward Island more particularly for agriculture than for any other purpose. All kinds of grain and vegetables raised in England ripen in perfection. Wheat is raised in abundance for the consumption of the inhabitants, and a surplus is exported to Nova Scotia. Both summer and winter rye, and buckwheat, produce weighty crops; but the culture of these grains is scarcely attended to. Barley and oats thrive well, and are, in weight and quality, equal to any met with in the English markets, and superior to what are produced in the United States. Beans of all kinds yield plentiful returns. Peas, when not injured by worms, which is often the case, thrive well; and turnips are sometimes liable to flies and worms. In no country do parsnips, carrots, beets, mangel-wursel, or potatoes, yield more beautiful crops. Cucumbers, salads, cabbages, cauliflowers, asparagus, and, indeed, all culinary vegetables common in England, arrive at perfection. Cherries, plums, damsons, black, red, and white currants, ripen perfectly, and are large and delicious. Flax is raised, of excellent quality, and manufactured by the farmers' wives into linen for domestic use. Hemp will grow, but not to the same perfection as in Upper Canada, or some parts of Nova Scotia and New Brunswick. The principal grasses are timothy, red and white clover, and a kind of soft indigenous upland grass, of which sheep are very fond; also marsh grasses, on which young and dry cattle are fed during the winter months. As a few cold days and wet weather frequently occur in the latter end of April or the first week of May, wheat or oats are seldom sown until the first of the latter month. Barley will ripen if sown before the 20th of June, although it is generally more early. Potatoes are planted about the last of May, or before the middle of June, and often later. Turnip-seed is sown about the middle of July; some prefer sowing it in the first week in August, in which case the leaves are not so liable to injury from worms. Gardening commences early in May, and generally combines the different departments of fruits, flowers, and vegetables. Hay-making begins in the latter end of July, and as the weather is commonly very dry at this time, it is attended with little trouble in curing. Potatoes and turnips are left undug until the middle or end of October; the first are generally ploughed up, except on new land, where the hoe alone is used. Parsnips may remain on the ground during winter, and are finer when dug up in spring than at any other period.

"Milch cows, and such horses and cattle as require most care, are housed in November, but December is the usual month for housing cattle regularly. Sheep thrive better by being left out all winter; but they require to be fed, and it is necessary to have a shelter without a roof, to guard against the cold winds and snow-drift. Black cattle are generally smaller than in England; a good ox will weigh from eight to nine hundred pounds, but the common run will not exceed six or seven hundred. The beef is usually very fine and tender. Sheep thrive remarkably well; but until lately, very little care was observed in improving the breed. Swine seem to thrive here as well as in any country, and the pork brought to Charlotte Town by the farmers is probably equal in general to that met with in the Irish market. Little care is, however, taken of swine. The horses are, with few exceptions, small, but capable of performing long journeys, and enduring great fatigue with much spirit. The greater number of farmers, particularly the Highland Scotch, keep by far too many cattle for the quantity of provender they usually have to feed them with during winter. These people think if they can manage to carry their cattle through the winter, they are doing well; but the consequence is, that their cattle, especially milch cows, are in such lean condition in spring, that they are not in tolerable order till July. Various improvements are taking place by means of cattle shows, and exhibitions of agricultural produce, which have been established. It is also pleasing to observe the improvement in the mode of cultivating the land, which has spread over the colony during the last few years, and which may be attributed principally to the force of example set by a few of the old settlers, chiefly the loyalists and Lowland Scotch, and by an acquisition of industrious and frugal settlers from Yorkshire in England, and from Dumfriesshire and Perthshire in Scotland.

"The principal disadvantage connected with this island, and, in fact, the only one of importance, is the length of the winters, which renders it necessary to have a large store of hay for supporting live stock; and which also, from the abrupt opening of spring and summer, abridges the season for sowing and planting. About a ton of straw for each, taking large and small together, is requisite to winter black cattle properly. The winter season has also many advantages—wood and firing poles are easily brought from the forests, over the smooth slippery roads made by the frosts and snows, and distances are shortened by the bays and rivers being frozen over. The ground is also considered to be fertilized by deep snow and frosts, and there are few farmers who consider the winter an impediment to agriculture, otherwise than the spring opening so suddenly upon them, and the astonishing quickness of vegetation, leaving them only five or six weeks for preparing the soil, and sowing and planting.

"When travelling through the settlements of Prince Edward Island (continues Mr Macgregor), we discover the inhabitants to consist of Englishmen, who, though fewer than any others in numbers, are found from almost every county in England; Scotchmen, who form more than one-half of the population, from the Highlands, Hebrides, and the southern counties; American loyalists; and a few Dutch, Germans, and Swedes. The whole population may be estimated at 35,000. The English settlers, although for some time discontented with their condition, are generally found to thrive, particularly those from Yorkshire; and they are much more attentive to in-door comfort and cleanliness than most other settlers.

"The inhabitants of the colony, particularly the old farmers, are hospitable, kind, and obliging, and, generally speaking, a moral people. Litigation, which the timber business and the credit given by the tavern-keepers and small shopkeepers have produced, and the low price of rum, form the sole causes of immorality, and the most baneful evils connected with the island. The farmers are employed during the winter in attending to their cattle, thrashing out their corn, cutting and hauling home fire-wood for winter use, and a stock of fuel for summer; these occupations, with many other little matters connected with his farm, house, and markets, engage the constant attention of a managing industrious man. The farmers' wives and daughters are generally very industrious, decorous, and correct, and strictly domestic and attentive to household duties. They assist in the labours of the farm during seed-time, hay-making, and harvest, and, during winter, prepare their flax and wool for spinning and knitting, and many of them also weave their home-spun cloth. The different denominations of religion that have places of worship are the Church of England, as established by law the Kirk of Scotland, Scottish Dissenters, Roman Catholics, Methodists, and Baptists. All the members of these professions associate together as neighbours, and frequently attend the places of worship of each other with great good feeling. There is in Charlotte Town a very respectable grammar-school, a school on the Madras system, and schools in most of the settlements for elementary instruction. The Legislative Assembly vote money for the partial support of these schools. The island is governed by a lieutenant-governor, a council, and a House of Assembly of eighteen representatives, elected by the people.

"As to the prospects which this colony may present to persons in the United Kingdom who are desirous of emigrating, not more than 20,000 acres, if so much, are held by the crown. Woodlands in convenient situations may, however, be purchased for from 10s. to L.2 per acre; and leases, in perpetuity, or, what amounts to the same thing, for 999 years, can be obtained for the annual rent of from 1s. to 2s. per acre, and in some situations for less. So that, taking into consideration the advantages of residing in the vicinity of well-disposed society, the opportunity that is afforded of having children instructed in the rudiments of education, of roads communicating between all the settlements, of corn-mills and saw-mills, being almost every where in the neighbourhood, and having the convenience and benefit, by living near the shipping ports, of ready markets for the produce of the land or sea, it may be reasonably concluded, that the terms on which lands are now to be had in this island are much more favourable than those on which they can be had in the United States."

CAPE BRETON.

Cape Breton is a romantic and mountainous island, lying close to Nova Scotia on the east, and only divided from it by a narrow strait, called the Gut of Canso. On the western side is the Gulf of St Lawrence. The island measures upwards of a hundred miles in length, by about sixty in breadth, including the numerous bays which indent the land. The natural productions of this island resemble those of Nova Scotia, though wheat is less generally grown, and oats and potatoes are raised to a considerable extent. There are large tracts of good land in the lower parts, and the expense of clearing it of timber is estimated at L.3 an acre. The minerals of the island are valuable. Cape Breton is politically annexed to Nova Scotia, of which it forms a county. The number of inhabitants is about 30,000, who are of French, Scottish, English, and Irish origin. There are some small towns along different parts of the shores.—Farther information respecting the island will be found in the Parliamentary evidence.

NEWFOUNDLAND.

The island of Newfoundland is seldom made the place of settlement by emigrants, and it therefore requires little or no description here. It is situated on the north-eastern side of the entrance into the Gulf of St Lawrence, and measures about 1000 miles in circumference. It is a wild, rugged country, poorly wooded, and of a rocky and barren soil, unfit, it would appear, for agriculture, but celebrated for its extensive fisheries, which are the chief business of the inhabitants. In 1830, 700 vessels were employed in this lucrative trade, and the amount of the imports was L.640,000. The population are thriving and increasing, and may now amount to 75,000. Its government and laws have hitherto been exceedingly defective. St John's is the chief town, and lies on the east side of the island, being almost on the spot of land nearest to Great Britain of any part of the American continent or islands. The distance betwixt Valentia in Ireland and St John's is computed to be 1656 sea miles, or betwixt eighteen and nineteen hundred ordinary miles; and it has been proposed to have a line of steam-packets to sail to and fro from these places. A company was some time ago formed to establish this exceedingly excellent species of communication with America; but, though promising to be one of the most successful schemes of modern times, it is a matter of astonishment that nothing has been done to bring it into practical use. It was calculated that a steam-vessel fit for crossing the Atlantic with emigrants would consume 360 tons of coal per trip, which could be laid in at Valentia and Nova Scotia at L.1 per ton, or less, and that the wages and other charges on the voyage would be about an equal sum—making per voyage L.1440.

HOW TO TRANSFER YOUR MONEY TO AMERICA.

In carrying money to these provinces, the emigrant ought in the first place to turn it into sovereigns, which will pass in the colonies for from 21s. 6d. to nearly 24s., according to the scarcity of cash. But as there is always danger, and at least inconvenience, in carrying specie either about the person or among luggage, a better plan is to take Bank of England notes, which have also a premium. Persons proceeding to Canada have another fully as advisable plan. If in England, they can pay in their money to the bank of Smith, Payne, and Smiths, Lombard Street, London, and for which they will receive an order on the Montreal Bank. If in Scotland, they can pay in their money to the British Linen Company's bank in Edinburgh, or to any of their country agents, and they will receive a similar order on the same Montreal Bank, and perhaps on a bank at Quebec or York. No sum below L.20, however, will be taken in either case. The exchange, as it is called, being to a considerable extent in favour of this country, a person, by paying in this manner L.100, and seeking for a "letter of credit," which is the same as a "bill at sight"—that is, payable on presentation—will receive from the bank in Canada the sum of L.123, 6s. 6d., less or more, according to the fluctuation of exchange, of the currency of the place. In the event of death or disaster on the passage out, the heirs of the deceased here would, of course, receive the money.

PARLIAMENTARY EVIDENCE ON THE ADVANTAGES OF EMIGRATION.

We have now to bring forward some satisfactory information relative to these provinces, selected from the minutes of evidence before a select committee of the House of Commons, which sat on the subject of emigration, in 1826.

Colonel John Ready called in, and examined.

"You are Lieutenant-Governor of Prince Edward Island?—I am.

Have you had any opportunity since you have held the government of Prince Edward Island of becoming acquainted with the state of the waste lands in that colony?—I have.

What is your opinion with respect to an emigration directed to that colony; could it be maintained upon the terms which are involved in the proposed emigration to Upper Canada?—An emigration to Prince Edward Island might be carried on at considerably less expense, because the transport is shorter; emigrants could be sent out for probably L.2 a-head alone, with the advantage of being placed on their land the day after their arrival. When placed on his land, he would in all probability have a water conveyance for his produce, no part of the island being more than from eight to ten miles from water-carriage.

Where would be the market for the produce raised by the emigrant?—Independent of the island markets, the principal markets are Nova Scotia and Newfoundland; to Newfoundland they send their provisions, live stock and corn to Halifax, and to other parts of Nova Scotia their flour, oats, &c.

Is the quality of the land of Prince Edward Island more suitable for pasturage, or the growth of corn?—More suitable for the growth of corn than any other production.

Could you inform the committee as to the average production per acre of bushels of wheat from land of the best quality in Prince Edward Island?—The average production is considered about twenty bushels of wheat an acre; I have heard of more being grown on well cultivated land. My own opinion is, that twenty is a fair average; but there are persons that have asserted, and who have means of knowing, that it is upwards of twenty.

Is that wheat of good quality, so as to compete wi[illegible] other wheat in the market in that part of the wor[illegible]?—I think it is, though it is not the custom to grow the best quality of wheat.

Have you any estimate of the amount that is exported from Prince Edward Island to Newfoundland in a year?—The trade is carried on in small vessels from the numerous outports, so that I am unable to furnish any thing like a correct estimate; it is considerable.

Is the climate of Prince Edward Island healthy?—It is particularly healthy; the country is very dry, and it is well watered, and all wooded.

In what are the returns made [illegible] the corn that is exported?—They are West India [illegible]oduce, teas, British manufactured goods of all descriptions which they require; they have little direct trade with England; rum and money are what they principally bring from Newfoundland.

Richard John Unlacke, Esq. called in, and examined.

You are one of his Majesty's council, and Attorney-General for the province of Nova Scotia?—I am.

Are you of opinion that an emigration might be conducted to Nova Scotia with the same advantage that has taken place with respect to the province of Upper Canada?—I am of opinion that it may, with greater advantage. I have no doubt but what the province in Nova Scotia would absorb, every year at least, from 1200 to 1500 emigrants, taking them as they run, young and old, and provide ample subsistence for them, so that they should not be in want of any kind of necessary when they were landed on shore. A statement of a transaction that took place in the last year, and the year before, may give, perhaps, some insight with respect to the island of Cape Breton. Sir James Kempt made an allotment of land there; he appointed a land committee to allot the land to the settlers: as soon as it was known in Scotland that there was an allotment of land made in the island of Cape Breton, a number of poor people in the north of Scotland, where the custom-house regulations are not so strictly enforced, found the way to embark in three or four vessels; and there have, in the years 1824 and 1825, upon a moderate calculation, at least 300 settlers come from the north of Scotland, whose passage did not cost them more than fifty shillings, or three pounds, for those people provided for themselves. All that the master of the vessel looks to, is to see that they have a pound of oatmeal for every day, and half that quantity for a child, with, perhaps, about half a pint of molasses, a little butter, and a few eggs, and he provides them with water in the passage, they paying about thirty to thirty-five shillings. Those settlers came out here upon their own expense; there was not a mouthful of provisions or any thing given to them by government. They settled themselves upon the land that Sir James Kempt allotted to them, and I doubt whether there is in Scotland so happy a set of people as these. They have got their log-huts erected. The custom of settlers there is, that they cut down the trees that are just round, and put up a log-hut, and the bark of those trees makes the covering; so that, in point of fact, he is under cover and housed in a few hours. He then cuts down as fast as he can till the ensuing year, so that the wood lies all the winter upon the ground, cut up in ten or fifteen pieces. After burning the masses of wood, he does nothing but just cast his corn in, without plough or harrow, or any thing else, except scratching a little with a thing made like a dung-fork; he makes very little more scratching than a fowl in a dung-heap. A man and a woman will cover in an acre or half an acre in the course of a day, and the crop comes up as fine as any in the world; there is no finer crop raised in the world than the first crop that comes in that way; so that, in the first year, a man with any kind of industry will have, at any rate, his potatoes, perhaps not a full allowance of bread, but he would have a greater allowance if he could go to the mill with it; but the mills are at a great distance, and they are obliged to make what are called querns; in that way they grind their little crop of corn; but in the first year these people are all comfortable. I may make another remark, with respect to the great facility of settling upon the Bras D'Or Lake, which is this: the lands upon each side of it are remarkably good; an arm of the sea nearly divides Cape Breton in two islands, except the peninsula at St Peter's; that peninsula may be cut down, so as to make a navigation through at a very small expense, so as to unite the sea on both sides. The isthmus is not more than 150 yards broad.

You said you had no doubt that any number of emigrants, landing upon the shores of Nova Scotia, would be immediately absorbed?—I think any number of emigrants, distributed judiciously, that is, not all thrown on one spot, but scattered round to the different harbours, from 15,000 to 20,000 voluntary emigrants would be absorbed in the province every year.

For how many years do you imagine that that great annual absorption might take place?—When I first knew it, its population was under 11,000; its population is now upwards of 70,000; and when I speak of Nova Scotia, the committee will remember that I am speaking of New Brunswick also, because I consider New Brunswick as part of Nova Scotia; they are so much alike, that whatever applies to one part, applies to all the province of Nova Scotia; therefore, whatever I say applies to the one as much as to the

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other. I consider that Nova Scotia and New Brunswick would well provide for a population of 4,000,000 or 5,000,000, taking advantage of the fishery, coupled with the agriculture. In stating the population of Nova Scotia, I have set it much lower than it really is; I think it not short of 100,000; that of New Brunswick I think as great, say 100,000; the last census, about two years ago, made it 75,000.

How do you think that they would be immediately absorbed?—The single men would, of course, immediately hire themselves out to day labour; they would get immediate employment either in the fishery or in the farms of the country, so that all the single men and the children would be at once provided for. The demand for children there is beyond conception. If the father and mother are unable to provide for them, they can always be provided for there, because every farmer will take a child, or two or three children, from five to six or seven years of age, apprentice, as fast as you can give them to them. As the army and navy resort to Halifax, we generally have a very large portion of orphan children thrown upon the poor list; and our mode of disposing of these children is, that at four to five years of age we put them out apprentices to farmers, unless they choose a trade: if they choose a trade, of course they are bound to a trade. The stipulation that is made for those children with the person to whom each child is bound, is, that the first year he is to give that child a sheep, the second year a heifer calf; and as long as that child is under indentures to him, he is bound to preserve and keep that sheep and heifer calf, and all the produce of it, till the child comes of age, and then it becomes a portion for that child to settle with; if a female, in marriage; or if a male, as farming stock; he will generally have a stock of five or ten head of grown-up cattle, and eight or ten sheep, by that means. In fact, we never can supply half the number of children that there is a demand for. We take it month and month, acting as commissioners; and the last month I acted as commissioner, I left demands for upwards of fifty children, that we could not supply, upon the books. I am convinced that the country would, without any sort of pressure, receive at least a population of several thousands every year for these fifty years; and perhaps it would be increasing, because every year the ratio will increase. If they can provide for 20,000 this year, in the course of five years they will be able to provide for twice as many.

What is the site of this colony [or district in Nova Scotia]?—It lies between the Great Shubinacade Lake and the Windsor road. Every year brings out a little addition to that colony: the old settlers can now receive their countrymen and relations that come there without any trouble; there are potatoes and provisions for them. The last time I visited that place, I asked them how they were situated—"Tell our old masters at home that we would not exchange situations with them." The way they became possessed of their stock is this:—They go to a farmer and hire the use of a cow for 20s.; that cow they get in the spring of the year in calf; they keep that cow through the summer, and they keep it the next winter, for the sake of the calf that the cow will have, and then they pay the owner of the cow 20s., and return him his cow in the ensuing spring, in calf, as they got it. They begin with that calf which is in the cow, for their stock; that calf in time becomes a cow; and they hire a sheep and an ox in the same way; the produce of the ox is the use that he is of in harrowing in the corn. But now they have got a stock of their own; they have now got sheep, and cows, and oxen, and they have got horses, and they are living in a great degree of comfort. I state this to show from what an extreme degree of poverty those people can get into a tolerable degree of affluence.

Is that 20s. which you say they pay for the use of the cow, paid in labour or in money?—They agree to pay in money, but they generally pay in labour.

For what purpose are children required by the farmers?—A farmer takes an orphan child, and he uses it exactly as his own; it sleeps in the same bed that his own children do, it eats at the same table, and it is clad in the same dress.

For what purposes are they used?—A girl is brought up to spinning, and milking, and making butter; a boy is brought up to ploughing, and all sorts of agricultural work. In fact, the want of labour is so great that they will take any thing; but a boy of five years old is able to do something for his living, and he soon begins to earn his clothes and his maintenance. The boys are bound out till they are twenty-one; they then have the labour of a man, because he is trained up to the habits of labour. When a native of that country comes to a farmer to hire, he will never stipulate for less than from thirty-five to forty pounds a-year wages; he will sit down at the farmer's table to eat, and, besides that, the farmer must keep his horse for him to ride.

What is the average rate of labour in Nova Scotia?—The general rate of labour for a new comer is about 3s. a-day currency; 4s. 9d. would be the dollar in sterling; but a native of the country will not work under 5s. a-day; in harvest time, 7s. It is to me a matter of serious apprehension, the attack that will be made upon me when I go back to Ireland to take these people out, for I expect to be surrounded with thousands who wish to go. I suppose I have received more than L.200 from different persons to pay passages out.

Henry John Boulton, Solicitor-General of Upper Canada, called in, and examined.

Are you prepared to state in detail in what manner an emigrant from any part of this country would acquire property enough to make a payment of L.4 per annum quit-rent for his land, at the expiration of seven years, and how he would obtain the money for it?—In the first place, if he is tolerably industrious (and I will here say, that the Irish make equally good settlers after a short time, and readily acquire the use of the axe), an American will, in the course of a week, chop down the timber upon an acre of land; it is commonly considered a week's work for an able-bodied labourer to chop the timber off an acre of land; I am not prepared to say how long it would take him to burn it; it could not take him that length of time; but I may say generally, that an able-bodied man can, without over-working himself, clear, fence, and put into crop ten acres of land in the course of a twelve-month.

Having done that on that ten acres of land, what will he be able to raise?—That ten acres of land he can put into wheat, which is a profitable crop; but it is not proper for the first year, because he would require a crop that would come more early into use; he would possibly put in half an acre or an acre of potatoes; he would put in some Indian corn, but that would depend upon the season of the year in which he went upon his land; but if he put the land in wheat, the average crop of wheat, on medium land, depending upon the season, would be from fifteen to thirty bushels an acre; if it is a wet season, and badly put in, with bad husbandry, it might not be over fifteen bushels an acre, but it must be very badly done not to produce fifteen Winchester bushels. I have known as much as fifty bushels to an acre, but very rarely. I cannot name above one or two instances of it; but forty bushels an acre is not very uncommon, though it is not usual; but not being a farmer myself, I cannot speak very positively on the subject; but I have often inquired of farmers, and I should say that about twenty-five bushels an acre, or, to speak within bounds, I may certainly say that twenty bushels an acre, is commonly produced.

Do you mean upon an acre where the stumps of the trees are still standing?—Certainly.

With this corn so acquired, will you describe the process by which he is to replace his clothing and his general means of going on; where does he find a market for his produce?—If emigration was going on, he would find a market from the incoming emigrants, and there is frequently the best market in the most out-of-the-way parts of the country from that circumstance; within two years, I have known wheat selling for 6s. a bushel, that is, about 5s. sterling, back in the woods, when you could buy it for half that sum upon the lake shores, because the incoming emigrants required it, and the great difficulty of getting it there gave it its value when it was there.

Did you ever know the wheat which is sold for 5s. paid for in money?—No, very seldom; that is, by new coming emigrants.

Will you explain the process by which the settler would be enabled to pay his rent in money, as he receives the value of his produce chiefly in goods and barter?—When he had made such improvements upon his land as I presume he would have done, from the general proceedings of emigrants in the country who have no assistance, at the end of seven years he would have seven or eight barrels of flour at least more than he would want for his own use, and with those barrels of flour he would be perfectly certain to get L.4 for them at the neighbouring towns, and a great deal more.

There would be the transport to deduct for those barrels of flour; therefore, can you name any settled market to which the settler could take his produce, and get a fair remuneration in money for it?—The very lowest price that I ever knew a barrel of flour sell at was, I think, 12s. 6d. I have occasionally bought it at that price for the use of my own family, but I should say that 20s. is the average price throughout the country. Now, the expense of the farmer as to transport is not very great; the farmer is the producer; he is not selling his flour with a view to a profit over and above the value of his labour in raising it; but if he can afford to sow it, and raise it, and bring it to market at the price he gets for it in the market—namely, four dollars a barrel—and thereby obtain a fair rate of wages for his year's labour, that is all he ought to expect; it is not to be supposed that he is to buy his grain, and bring it to market, and make a profit upon it; and, therefore, if he can get eight barrels of flour, which he must certainly be a very idle person not to get, over and above the maintenance of his family, he can bring those to any of the neighbouring towns, where he will get 12s. 6d. a barrel for it at least, which will amount to L.4, 10s.

Is that currency or sterling money?—Upper Canada currency, which is in the proportion of ten to nine sterling. The value of a barrel of flour in Upper Canada currency is four dollars, and the dollar is worth 4s. 6d. sterling; a pound currency is 18s. sterling. He will, generally speaking, get 18s. sterling for his flour; but supposing he only got half that, which is a thing very unusual, and a thing which I should think hereafter never will occur again, because there is a market for the flour through Montreal and Quebec to the West Indies, and at present to the home market.

What would be the difference between the cost of transport and the value of the flour?—The cost that the farmer is at in transporting it is almost nothing, because he does it with his own team; and he brings his own bread and cheese in the vehicle he brings his produce in, and he is at no expense at all on the road.

What market are you alluding to in Upper Canada?—To the market in the town of York; but the same applies to any other town in Upper Canada. If a man lives forty miles from York, he puts his flour into his sleigh, with a sufficient quantity of provisions for his own use, and oats and hay for his horses, and he comes to York market, and sells his commodity, and whatever he gets is clear gain; and then he returns home again empty.

Is not the York market a very limited market indeed?—No, it is not a very limited market; it would purchase any quantity of produce, and so would the Niagara market, and so would all the principal towns, because the shopkeeper or merchant would buy up this produce, and send to Montreal for exportation what is not required for home consumption; and I never knew the prices so bad as not to admit of the merchants giving 12s. 6d. for it in the town of York, for the purposes of exportation.

When you particularize eight barrels of flour as the probable amount of surplus produce in seven years, is that the result of any accurate calculation?—No; it is an accidental quantity that I have named, as being sufficient, under any circumstances, to insure the payment of the L.4 annuity.

Do you think you could, by attending to the subject, make some more definite calculation as to the quantity which it might be presumed could be produced upon a property of that sort?—I think I could; but it is impossible for any person in my situation to be so acquainted with the detail of the management of a poor man's estate, as to enter into a calculation of that sort very minutely. I have known countless instances of persons who came there without a shilling in their pockets, and have asked me to give them a meal of victuals, whom I have known in a few years afterwards living very comfortably at their own house, and coming to the town and getting credit for five, or six, or ten pounds' worth of tea and sugar, or whatever they wanted, as readily as I could.

Do you mean at all to assume, that eight barrels would be the surplus of produce at the end of seven years on a hundred acres?—No; I think it is the very minimum. I think it is almost impossible a man should have so little as that. I think a man, at the end of seven years, would unquestionably have thirty acres of land under improvement. I apprehend he would undoubtedly have a pair of horses, with either a waggon or a cart, or some vehicle for carrying about his produce. I apprehend he would likewise have two or three cows, a yoke of oxen, a house to live in, and plenty of wholesome food for himself and family. I have no doubt that any person who is moderately industrious would be in that situation. I have known many persons in Upper Canada, who came there without a farthing, who, in the course of fifteen or twenty years, have become men of considerable property, and filling in that country the dignified situation that the gentlemen I address do here. I have known such persons to become members of the Colonial Legislature, and people of considerable importance in the colony, magistrates, and forming a part of the aristocracy of the country."

Two instances are brought forward of the thriving condition of settlers in New Brunswick. "Mr Nicholas Cunliffe, of Woodstock, commenced clearing his farm in May 1824. The work was done by contract, at the rate of from L.3, 10s. to L.4 per acre. He has now 107 acres of land cleared, excepting the stumps of the trees (74 acres were cleared since May last); and the crop raised from this land, last season, was 900 bushels of good clean wheat, weighing 63 pounds to the bushel, 400 bushels of Indian corn, nearly 100 bushels of potatoes, besides a quantity of beans and garden stuff, of which no particular account was kept. This crop alone will leave a profit of about L.100 over and above the expense of clearing the whole of the land.

"Mr Joseph Bedell commenced clearing his farm at Richmond, in the parish of Woodstock, about four miles from the River St John, in May 1821. Without any other assistance than that of three sons (the eldest of whom is now but sixteen, the next twelve years of age, and the other still younger), he had cleared fifty acres of land, from which he raised, last season, two hundred and forty bushels of wheat, two hundred and fifty bushels of oats, fifty bushels of buckwheat, six hundred bushels of potatoes, one hundred and fifty bushels of turnips, and a small quantity of Indian corn. He has paid L.110 since he went on the farm, is now clear of debt, and owns four cows, one pair of horses, eight head of young cattle, twelve sheep, and eight hundred acres of good land."

VARIOUS INFORMATION ON THE CANADAS.

The following scraps of information, selected from the excellent and popular works, entitled "Statistical Sketches of Upper Canada," by a Backwoodsman, and "The Advantages of Emigration to the Canadas," by Mr Cattermole, will be perused with advantage by intending emigrants:—

"Who then are to go to Canada? In the first place, all who cannot comfortably support themselves by their labour at home; because, let a man be ever so poor in this country, his wages as a labourer will more than support his family; and if he be prudent and sober, he may in a short time save money enough to purchase for himself a farm; and if he has a family, so much the better, as children are the best *stock* a farmer can possess, the labour of a child seven years old being considered worth his maintenance and education, and the wages of a boy of twelve or fourteen years of age being higher than those of a stout and skilful ploughman in most parts of Great Britain, generally from three to four dollars a month, with bed, board, and washing besides. At home they talk of "a poor man with a large family;" but such a phrase in Canada would be a contradiction of terms; for a man here who has a large family must, under ordinary circumstances, soon cease to be a poor man. Mechanics and artizans of almost all descriptions—millwrights, blacksmiths, carpenters, masons, bricklayers, tailors, shoemakers, tanners, millers—and all the ordinary trades that are required in an agricultural and partially shipowning and commercial country, will do well to come to Canada. Of these trades, the blacksmith, tailor, shoemaker, and tanner, are the best. If there were in nature (which is doubtful) such a being as a sober blacksmith, he might make a fortune.

Emigrants would find their account in bringing out small quantities of seeds, particularly those of the rarer grasses, as lucern, trefoil, &c.; for if they did not need such articles themselves, they would find plenty who would buy them at a high price. To these may be added some small parcels of potato oats, and of the large black oat of the south of Ireland, for seed, as that grain, if not renewed, degenerates into something little better than chaff in the course of time.

When a bear runs away with one of your pigs, there is no use in going after him, hallooing, without a gun. When once they have killed a pig, if you do not manage to kill the bear, you will never keep one hog; for they will come back till they have taken the last of them; they will even invade the secret precincts of the hog-stye. An Irishman in the Newcastle district once caught a bear *flagrante delicto*, dragging a hog over the walls of the pen. Pat, instead of assailing the bear, thought only of securing his property; so he jumped into the stye, and seized the pig by the tail. Bruin having hold of the ears, they had a dead pull for possession, till the whillilooing of Pat, joined to the plaintive notes of his *protégé*, brought a neighbour to his assistance, who decided the contest in Pat's favour, by knocking the assailant on the head.

The wild turkey takes the lead of our Upper Canadian feathered game. He is found in the London and western districts exclusively; though I have heard that, in New England, he is domiciliated much farther to the north. He is large, weighing from 25 to 35lbs., of a dark colour, which in some individuals is lighter, and in others, approaches to a leaden grey, and is very like the domestic turkey of the country, which, there is little doubt, must in many instances hold the same relation to him as the half Indian (or "*bois brulé*," as the French call them) does to the original proprietor of the soil. You can only distinguish him from his civilized cousin by a quick, firm, light infantry step in his gait, and his independent, watchful look. At certain periods of the year, he is any thing but shy. I have walked along the highway for half a mile at least, with a flock of fourteen of them marching in front of me, all the time within easy shot; some of them marching in the middle of the road, some hopping up on the rail fences and running along them, some jumping over into the neighbouring field, but none showing any unreasonable fear of me.

The stream is no less prolific in sport than the forest and field; and if a man thinks proper, in the words of Izaak Walton, "to be pleasant and eat a trout," he can gratify his taste to any extent in Upper Canada. Trout are only found in the small streams, not in the larger rivers; the large fish probably making the latter unsafe quarters for them. They, generally speaking, are small, like those of the moorland burns at home, but very delicately flavoured. When, however, mill-dams are erected on streams, they increase in size; and in the beautiful clear streams, fed from springs in the Long Point country, they are as large as I have seen them any where in England. The banks being overhung with trees, fly-fishing is rarely to be had, except you station yourself on a bridge or mill-dam; but the bait they take at all seasons, from the middle of winter, when you catch them through a hole in the ice, to summer, when you wash down the middle of the stream, with it floating before you. Not being acquainted with the ways of the world and the deceits of mankind, a piece of beef is as good a bait for a Canadian trout as any that can be found. Of other fish there is no lack; and many of them have no European name, but are very good fish for all that.

There are different kinds of houses in Canada, about which a few words may be useful to the settler. Most of the houses, more particularly those of recent settlers, are built of logs. When a man gets on a little in the world, he builds a frame house, weather-boarded outside, and lathed and plastered within; and, in travelling along the road, you can form a pretty accurate estimate of the time a man has been settled by the house he inhabits; indeed, in some instances you may read the whole history of his settlement in the buildings about his farm-yard.

The original shanty, or log-hovel, which sheltered the family when they first arrived on their wild lot, still remains, but has been degraded into a piggery; the more substantial log-house, which held out the weather during the first years of their sojourn, has, with the increase of their wealth, become a chapel of ease to the stable or cow-house; and the glaring and staring bright-red brick-house is brought forward close upon the road, that the frame dwelling, which at one time the proprietor looked upon as the very acmé of his ambition, may at once serve as a kitchen to, and be concealed by, its more aspiring and aristocratic successor; just like a man who, having acquired wealth from small beginnings, is anxious to conceal from the world the gradations by which he rose, and to exhibit only the result of his successful industry.

If you can afford to build a brick or stone house at first, by all means do so; but if you cannot, take my advice, and, like a good fellow, don't build a frame one. It is the most uncomfortable dwelling ever man lived in."—*Backwoodsman.*

"For the purpose of agriculture, the Upper Province is decidedly preferable, the climate being much milder. However, to go there with any reasonable prospect of success, some capital or a labouring or mechanical employment, connected with the every-day pursuits and necessities of life, is indispensably required.

In January the greatest fall of snow usually happens, when the winter trade with the interior commences; the snow sometimes, but not of late years, allows of two months good sleighing; last winter was mild, and it did not exceed five or six weeks; this is considered, in the present state of the roads, as a calamity, preventing the farmers who live far back in the country from getting to the different markets with their produce. In fact all, both Canadians and emigrants, after the first year, do not wish for mild winters, as they are less favourable to health and business than fine frosty weather, accompanied with plenty of snow.

In general we pay far greater attention to proper clothing than is done at home, wearing stout fearnoughts, &c.; this pervades all ranks; even the Indian observes it, and rarely appears, at least, to suffer from the most severe weather, which, it should be observed, is generally dry, seldom taking cold; if the feet and head are kept warm, all goes on well; fur caps are much worn in winter, being better adapted than hats, and may be had near 100 per cent. cheaper here than in Canada; 10 dollars is the usual price of a good cap. The air, though much colder than in this country, being dry and deprived of its moistness by congelation, has less effect on the human body than moister air, although many degrees warmer.

Deer abound in the woods; all persons capable and willing to hunt them do so, there being no game laws. Bears, wolves, and foxes, are not so numerous as to be troublesome; the flesh and skins of the first of these are valuable, and the reward paid for the scalps of the wolves, on producing them before a magistrate, which was raised last session, I believe from L.1 to L.2 per head, tends to keep them under.

Women servants can hardly be procured, and they generally receive 18s. or 21s. a month."—*Cattermole.*

CONCLUDING REMARKS.

We have now presented what we consider a correct account of the extent, character, and prospects of the British colonial possessions on the coast of North America. Although it is obvious that these territories do not offer the same wide field for the settlement of emigrants, or the same means of advantageous employment, as Upper Canada or the United States, it is a matter of certainty that they possess large and fertile tracts of good land, fit for the support of an abundant population, and that they afford a ready refuge and home for steady and industrious men and their families from this over-burdened country. However much these countries may suffer in comparison with the interior of the North American continent, it is, we think, clear that they are on the whole equal to Europe; and it is remarked by a native authority, "that of all the emigrants who come to the country, none return to their native land, notwithstanding the numerous opportunities from the different ports." In these provinces, as in other places, the description of emigrants who most promote their own interest and that of the colony, are farmers, or persons accustomed to rural occupations, who carry with them from L.200 to L.500; men who, instead of beginning a settlement themselves, can purchase one already commenced. The native is now expert with his axe, more used to the clearing of land, and better fitted for a pioneer in the woods. The European is generally his superior in all kinds of rural occupations: the one is at home with his axe, the other with his plough. The emigrant should therefore purchase a farm, which, besides suitable buildings, &c., should contain three or four hundred acres of land, forty or fifty of which should be cleared, and the native should recede to the woods, to contend again with new roads and new settlements, to which he has been accustomed. To the other class of emigrants who go to these provinces with small means, it may be proper to suggest, that experience has shown the necessity of their not being too eager to obtain lots of land. It is better for them to engage as workmen for a few years, until they become acquainted with the climate, mode of cultivation, habits and manners of the people, markets, relative value of land, and other useful information, after which there is a greater probability of their selection being judicious, and their efforts successful. We have heard it frequently remarked by a person of respectability in Nova Scotia, that, in very many instances, emigrants ruin their prospects at the outset, leaving themselves almost paupers, simply by not attaching themselves at once, on their landing, either to some occupation, or some select spot of land as their location. They go from place to place, seeking for the paradise they had anticipated, and spend all in the vain search. Let us try to impress upon the minds of intending emigrants of every class the absolute necessity of being persevering and steady in their habits. An idle man in any part of America is an anomaly, and one who falls into unsettled or dissipated habits is sure of being visited with ruin and contempt. Every man who departs for these vast western territories must resolve to work with his own hands; and if he use those obvious means which are pointed out, and which it requires no genius to understand, he cannot fail in placing himself and his family in a condition of respectability and permanent comfort. In speaking of the state of the labouring classes in Nova Scotia, Captain Moorsom makes the following striking observation:—"The cheapness of living, and, indeed, of every thing except clothing, is such, that the wages of most operative tradesmen enable them to be idle, if they are so inclined, three days out of the six. Instances are far too numerous in which this is a common practice, and most of the hours thus deducted from labour are passed in the various stages of intoxication." We would earnestly hope that those whom we are now addressing, who design emigrating to these provinces, will sedulously avoid such a pernicious habit of intemperance, which will bring disgrace not only to themselves, but be in some measure a reproach on the land which sent them forth.

There is one form of emigration which we would particularly recommend to intending emigrants, for we believe it will be found the most agreeable, if not the most economical; this is the removal, in a body, of a number of families known to each other, and who may all settle in a cluster, or in the neighbourhood of each other. This plan, if pursued discreetly, will neutralise many of the pains of emigration, and will originate a little society, in which there will be a similarity of sentiment and a sympathy not otherwise to be obtained. Such an advantageous species of removal has already been tried in a number of instances, particularly by Scottish families, and is productive of the most agreeable results. We would, therefore, advise those friendly to emigration, in any particular part of the country, and who intend to employ themselves in farming occupations, to proceed, if possible, in this manner, all going by the same vessel, and, on their arrival in America, selecting a district suitable to their wants.

It may here be appropriately remarked, that emigration, in recent times, has very much changed its character. The poor artizan, and the humble and hardy peasant, are not now the only class of persons who betake themselves to the countries beyond the Atlantic. Every day these extensive and fertile regions are coming more and more under the notice of capitalists, regularly bred farmers, active master tradesmen, in short, our middle class of society; and the wealth from this source alone, which will be speedily poured into North America, is incalculable, both as to its amount and its results on the surface of the country. It may be anticipated, that, in a few years, large tracts of country in these valuable colonial possessions will be as well settled, as well cultivated, as well regulated in their affairs, public and private, and, therefore, as civilized and refined, as many of the rural districts in Great Britain. Even as it is, many portions of North America have outstripped Great Britain in the career of general intelligence. Such being the capabilities and flattering prospects of these territories, it appears a species of infatuation for farmers to continue to peril thousands of pounds on land in this country, with the barest chance of success, enduring innumerable vexations, and at the mercy of landowners and law-agents, while they can obtain, for the matter of a few hundreds of pounds, lands, in the British colonies or the United States, of the most fertile description, and which, in a short time, by active exertion, will repay all that is expended upon them, and remain a permanent and valuable freehold for their family. Luckily, both for the benefit of the mother country and individuals, this kind of delusion is wearing off. A knowledge of the vast resources and general character of North America, such as that presented in this and other sheets, cannot but dispel the ignorance prevailing on the subject, and be useful in directing the views of a large proportion of the people towards a process of emigration highly beneficial to themselves and their descendants.

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EMIGRATION TO THE UNITED STATES.

The United States now occupy the largest portion of the North American continent, and offer a boundless field for the settlement of emigrants. Originally confined to the territory along the shore of the Atlantic, this great republic has extended its influence and power over nearly the whole of the regions spreading westward to the Pacific. This vast territory, surpassing in internal resources, and nearly in dimensions, any of the empires of the Old World, extends from the 25th to the 49th degree of north latitude, and from the 67th to the 124th degree of west longitude. It measures in extreme length, from the Pacific Ocean to the Atlantic, 2780 miles, and its greatest breadth is estimated at 1300 miles.

The United States consist of three great natural divisions—the slope from the range of the Alleghany mountains to the Atlantic, comprehending the oldest settlements; the valley of the Mississippi, now in the course of settlement; and the slope from the Rocky or Chippewau mountains towards the Pacific, which is still in a wilderness condition, and inhabited by Indians. The greatest wonder of this immense country is the valley of the Mississippi, which is considered the largest division of the globe, of which the waters pass into one estuary. The Atlantic slope contains 390,000 square miles, the Pacific slope about 300,000; but this great central valley contains at least 1,300,000 square miles, or four times as much land as the whole of England. The valley of the Mississippi, into which the flood of emigration to the states is chiefly directed, is divided into two portions, the upper and lower valley, distinguished by particular features, and separated by an imaginary intersecting line at the place where the Ohio pours its waters into the Mississippi. This large river has many tributaries of first-rate proportions besides the Ohio. The chief is the Missouri, which, indeed, is the main stream, for it is not only longer and larger, but drains a greater extent of country. Its length is computed at 1870 miles, and upon a particular course 3000 miles. In its appearance it is turbid, violent, and rapid, while the Mississippi, above its junction with the Missouri, is clear, with a gentle current. At St Charles, 20 miles from its entrance into the Mississippi, the Missouri measures from five to six hundred yards across, though its depth is only a few fathoms.

The Mississippi Proper takes its rise in Cedar Lake, in the 47th degree of north latitude. From this to the Falls of St Anthony, a distance of five hundred miles, it runs in a devious course, first south-east, than south-west, and, finally, south-east again; which last it continues, without much deviation, till it reaches the Missouri, the waters of which strike it at right angles, and throw the current of the Mississippi entirely upon the eastern side. The prominent branch of the Upper Mississippi is the St Peter's, which rises in the great prairies in the north-west, and enters the parent stream a little below the Falls of St Anthony. The Kaskaskia next joins it, after a course of 200 miles. In the 36th degree of north latitude, the Ohio (formed by the junction of the Alleghany and Monongahela) pours in its tribute, after pursuing a course of 750 miles, and draining about 200,000 square miles of country. A little below the 34th degree, the White River enters, after a course of more than 1000 miles. Thirty miles below that, the Arkansas, bringing in its tribute from the confines of Mexico, pours in its waters. Its last great tributary is Red River, a stream taking its rise in the Mexican dominions, and flowing a course of more than 2000 miles.

Hitherto the waters in the wide regions of the west have been congregating to one point. The "Father of Waters" is now upwards of a mile in width, and several fathoms deep. During its annual floods, it overflows its banks below the mouth of the Ohio, and sometimes extends thirty and forty miles into the interior, laying the prairies, bottoms, swamps, and other low grounds, under water for a season. After receiving Red River, this large stream is unable to continue in one channel; it parts into separate courses, and finds its way to the ocean or the Gulf of Mexico, at different and distant points below New Orleans.

The capabilities of the Mississippi for purposes of trade, are almost beyond calculation, and are hardly yet developed. For thousands of years this magnificent American river rolled its placid and undisturbed waters amidst widely-spreading forests, rich green prairies, and swelling mountain scenery, ornamented with the ever-varying tints of nature in its wildest mood, unnoticed save by the wandering savage of the west, or the animals which browse upon its banks. At length it came under the observation of civilized men, and now has begun to contribute to their wants and wishes. Every part of the vast region, irrigated by the main stream and its tributaries, can be penetrated by steam-boats and other water craft; nor is there a spot in all this wide territory, excepting a small district in the plains of Upper Missouri, that is more than one hundred miles from some navigable water. A boat may take in its lading on the banks of the Chetaque Lake, in the state of New York, within a short distance of the eastern shore of Lake Erie—another may receive its cargo in the interior of Virginia—a third may start from the Rice Lakes at the head of the Mississippi—and a fourth may come laden with furs from the Chippewau mountains, 2800 miles up the Missouri—and all meet at the mouth of the Ohio, and proceed in company to the ocean.

Those whom we are now addressing probably inhabit the island of Great Britain, where the traffic of every sea-port, every branch of inland navigation, has been pushed to its utmost limits, where every art is over-done, and where the heart of the ingenious almost sinks within them for want of scope for their enterprise. But here, on this wide-spread ramification of navigable streams, there is an endless, a boundless field for agricultural and mercantile adventure. Within the last twenty-four years, the Mississippi, with the Ohio, and its other large tributaries, have been covered with steam-boats and barges of every kind, and populous cities have sprung up on their banks. There are now *sea*-ports at the centre of the American continent—trading towns, each already doing more business than some half dozen celebrated ports in the Old World, with all the protection which restrictive enactments and traditional importance can confer upon them.

The valley of the Mississippi, one of the greatest natural wonders of the world, will one day possess and comfortably sustain a population nearly as great as that of all Europe. Let its inhabitants become equally dense with England, including Wales, which contains 207 to the square mile, and its numbers will amount to 179,400,000. But let it become equal to the Netherlands, which its fertility would warrant, and its surface will sustain a population of *two hundred millions.*

Such are the great natural divisions of the United States. Usually the country is divided into what are termed the Northern and Southern, or Free and Slave-holding States, in which the climate and habits of the people differ very considerably. It is chiefly, and almost entirely, to the northern or free states that the attention of emigrants should be directed, because such persons will there have at once a temperate climate, more agreeable to their constitutions, and a greater scope for their industry in agricultural and mechanical employments. The Southern or Slave States afford no place for any except those who have capital to purchase both land and slaves; and the soil and temperature, besides, are adapted chiefly to the culture of tobacco, cotton, indigo, rice, and other tropical productions, in raising and preparing which, the people of this country have no experience. We shall, therefore, advert but slightly to these states, in giving directions to emigrants, and make our information as full as possible on those which afford practicable and desirable settlements to people from this country. These latter are bounded on the south pretty nearly by the 40th degree of latitude, so that they lie in a climate corresponding to that of the south of France and the northern part of Spain, though, as yet, on the whole, they are less salubrious than these old cleared countries of Europe. When the climate of the northern states is placed in comparison with that of Great Britain, it may be described as more extreme in summer heats and winter colds; but from all we can learn, it appears that the Americans are exempted from that amount of *disagreeable* weather—that vexatious mixture of rawness, cold winds from the east, rains, sunshine, and frost, which constitutes the greatest drawback on this country, and which annually carries off a large proportion of the inhabitants.

The following is a list of the various States and Territories, with the names of the chief towns, amount of population, and extent in square miles:—

State.	Chief Town.	Population in 1830.	Area in Sq. Miles.
Maine	Portland	399,462	32,191
New Hampshire	Portsmouth	269,533	8,700
Vermont	Montpelier	280,679	9,330
Massachusetts	Boston	610,014	7,335
Rhode Island	Providence	97,210	1,200
Connecticut	Hartford	297,711	5,050
New York	New York	1,913,508	46,000
New Jersey	Trenton	320,779	7,870
Pennsylvania	Philadelphia	1,347,672	47,000
Delaware	Dover	76,739	2,100
Dist. of Columbia	Washington	39,858	100
Maryland	Baltimore	446,913	10,000
Virginia	Richmond	1,211,272	70,000
North Carolina	Raleigh	738,470	50,000
South Carolina	Charleston	581,458	33,000
Georgia	Milledgeville	506,567	61,000
Alabama	Tuscaloosa	415,803	51,770
Mississippi	New Orleans		51,000
Louisiana	New Orleans	215,575	48,220
Tenessee	Nashville	684,282	43,000
Kentucky	Frankfort	688,844	37,680
Ohio	Columbus	937,679	40,000
Indiana	Indianapolis	341,582	34,000
Illinois	Shawneetown	157,575	58,900
Missouri	St Louis	140,074	63,000
Michigan	Detroit	31,260	34,000
Arkansas	Little Rock	30,383	121,340
Florida	Tallahassee	34,729	54,000

LEAVING HOME.

Many persons shrink from the idea of emigrating, because it seems like a confession that they have been baffled at home, and that, where others have been successful, they have failed. From this weak feeling, they continue to linger on, struggling with discouragements, and wishing rather to gain the credit of patient well-doing and resignation to unavoidable troubles, than to encounter what they think the reproach of leaving the country. Such persons (who are often the worthiest of society) should recollect that the same perseverance and steadiness which in this country is only sufficient to keep their families out of distress, will, in a more favourable field of industry, place them in comfort and independence. In this country every man's exertions are met and thwarted by the competition of his neighbours; whereas, in the new lands, the increasing density of population and neighbourhood as yet only adds to a man's wealth, and to the profits of his industry. It used to be thought (and many still foolishly think so), that, to *leave the country*, was a man's last resource, and was only adopted by those who *could not do better*; but it is now discovered that America, instead of being only an asylum for the baffled and despairing, is, like an immense harvest-field, calling for reapers, who have skill and ability to labour, from all quarters. The abundance of unoccupied land in that country only requires the hand of man to convert it into the means of human subsistence, and every one who goes creates work for another to follow him.

The competition of one man against another in this country is so great, that young people, bred to laborious occupations, often seriously hurt their constitutions by working beyond their strength, merely to keep their places, or gain employment. There is hardly a man who has wrought as a farm-servant, a mason, a blacksmith, or such crafts as require the exertion of much strength, but can tell of some of his early acquaintances who *wrought themselves done*, in order to keep up with their neighbours, and this, because they were apprehensive of losing their situations. In America, the competition of one man against another is by no means so keen; good wages may be made by moderate exertion at all the ordinary useful trades; and men who have been accustomed to farm work will find a ready demand for their labour, with fair and even high wages, without the fear of losing employment when their youth and strength is exhausted. It requires a little firmness to determine on leaving one's country, and that is all. The resolution once taken, the chief difficulty is surmounted. The success and comfort of the numbers who have taken the step already, leave little room for perplexity or uneasiness with regard to others.

The difficulty which farmers have for this considerable time had in finding farms for their sons, and the very large capital which is required to stock a young man beginning life in that way, render it worthy of consideration whether parents would not do better to buy land for them in Canada or the United States, where one hundred pounds would make them proprietors of their farm, and stock them sufficiently with all that is necessary for thriving and becoming wealthy. A number of half-pay officers, who had served with credit in the late war, had the good sense and gallantry to begin establishments of this kind, in the woods at Lake Simcoe, and, by so doing, conferred a service on their country, much greater than if they had fallen in battle. The example of these brave men will doubtless have influence with many of their own rank in society, and may point out to thousands of anxious parents a way in which they may provide for their children, greatly superior to that of sending them into the army, or even to waste their constitutions in the enervating and destructive climates of India. They would have here healthy and thriving occupations; the labours of the farm, and the amusement of the rifle; the prospect of long life; and of becoming, as they advanced in years, the proprietor of a well improved estate, and the patriarch of a respected family. In going into the army, or to India, it is needless to say that all these prospects are much more uncertain. We make these observations principally, however, with reference to our own colonies in Canada, among whom the step we have mentioned would be the means of introducing a number of men of education, attached from principle to Britain, and exercising a powerful influence in securing the future attachment of the country of their adoption to that of their birth.

THE VOYAGE.

When the determination is once taken to emigrate, the next step is to make arrangements with a ship-owner, or captain, for the voyage. A passage may be taken either to Philadelphia, Baltimore, or New York, with almost equal advantage: Philadelphia or New York are perhaps preferable; but no passenger should go to Boston, except he has friends or business there. Take no furniture whatever, but plenty of good warm clothing, and bed-clothes. We need not repeat here the directions which have been already given; the steerage passengers generally lay in provisions for themselves, which consist of oatmeal, potatoes, some eggs, milk boiled with lump sugar, and some salt beef, or ham; these provisions should be calculated for fifty days; whatever remains after the passage, will be useful afterwards on the way to a settlement. A tin pot, or kettle, with a flat side and a hook, for *hanging upon the ribs of the fire*, will be very useful, because it is often impossible to pot every thing *on the fire* together at cooking times; and this pot can be boiled without occupying the room of others. It is particularly recommended to those who make the voyage, never to feel alarmed at appearances of stormy weather and what they may think danger; because there is really no danger: there are as few examples of ships sinking in the open sea, as of houses being burned on land. It is only when, by some mischance, they are driven upon lands and rocks, that danger occurs; and then it will be sufficiently evident to every body.

Men on board should pay the greatest attention to females, who are apt to be fluttered when they hear the noise of the waves, or of high winds, or the sailors trampling about in a bustle on the deck above. In such cases, passengers have only to keep themselves tranquil, and to recollect that the squall may cause hard work to the sailors, but no danger to any body, except there be land within sight, and the wind blowing them on it against their will. On coming into harbour, be in no hurry, or rather let your hurry put you in no confusion; get all your things ready, and have some lodgings fixed on to take your baggage to before moving.—Passage from Leith to New York, in the steerage, L.3, 10s. to L.4; children, from 7 to 14 years, one half; under 7, one third; under 12 months, no charge; passengers find their own provisions. The ship lays in water, firewood or coals, cooking apparatus, and fits up sleeping births. One-third of the freight to be paid before the passage be secured, and the remaining two-thirds on sailing. Cabin passage, L.14 to L.15; children, L.10.

LANDING IN AMERICA.

Supposing the emigrant landed at Philadelphia, New York, or Baltimore, his next step, if a tradesman, is to consider where he is most likely to find work. Except shipwrights, and one or two other trades, it is perhaps better to proceed to some of the considerable inland towns, where wages are generally higher, and the cost of living less. On this subject, the emigrant will find ready information from people of his own business in whatever city he may land; they are seldom unwilling to put strangers in the way of finding employment. There is an emigrant society in Philadelphia, which has done a great deal for this purpose.

If the emigrant wishes to purchase land, and has fixed on the district where he intends to settle, he ought to take his passage accordingly to the port which is nearest to his intended destination. If he means to purchase a farm in the settled districts of New York, such as those in the valley of the Hudson, or about the lakes of the River Mohawk, Genessee, &c., he should sail immediately for New York. The same port is the fittest for those who mean to proceed to Michigan, but these may also go by Montreal, whence the Rideau Canal, now opened, affords an easy passage to Kingston, instead of a disagreeable route by the rapids of the St Lawrence, formerly followed, and which made emigrants formerly prefer going, even to our own settlements, by New York, instead of Montreal. The passage by the canal now opened, from that place to Kingston, costs 9s. 4d., with one trunk; other luggage must be paid for. Supposing the emigrant at Kingston, he will find a direct passage to Michigan, by proceeding up Lake Ontario, and then through the Welland Canal, whence he will go up Lake Erie to Detroit. If he goes by New York, he proceeds up the River Hudson, thence along the Erie Canal to Buffalo, and next to Detroit by the Lake. By New York, the expense of the whole passage may be reckoned: passage to New York (in the steerage), L.3, 15s.; to Albany on the Hudson, 9s. 6d.; to Buffalo, L.2, 2s.; to Detroit, 9s.; the whole amounting to L.6, 15s. 6d. If there be considerable luggage, it will, of course, add to the expense, but L.7, 10s. will cover it in general. By Montreal, and the facility now afforded by the Rideau Canal, the expense will be somewhat less.

The above, we have said, is the cost of a passage to Michigan; that to the Ohio may be reckoned as a trifle more. We have not received intelligence of the completion and opening of the canal which is in progress from Lake Erie by Columbus and Chilicothe to Portsmouth in Indiana, so that it will be necessary for travellers, who think of proceeding to any of the western countries, to journey partly by road, and partly by canal, to Pittsburg, and thence down the Ohio. This they can do, either from Baltimore or Philadelphia.

Emigrants who intend to settle in the Highlands of Pennsylvania had better take passage immediately to Philadelphia, which will be cheapest; but if that be impossible, as ships are not always to be found for the desired port, the journey either from New York or Baltimore to that place is short, and not expensive. Readers may see it mentioned in our notice concerning the "Expenses of Travelling."

After landing, emigrants ought to make no delay in lingering about the sea-ports, either from curiosity or the persuasion of fellow-passengers. Let them immediately proceed to business. If in search of land in Ohio or Michigan, let them instantly set out thither; they will find a land-office in every principal town of the districts, where they may look at the surveys, learn what townships or lots remain unsold, and get such information as the surveyor possesses concerning their qualities. But in every case let the settler examine and search for himself; no one else can or will judge for him. The surveys are made out, delineating the lines of the most considerable rivers and hills; and they are covered over with a number of small squares, like checks, which represent the different townships of six miles square, sections of one mile, and quarter sections. There are some principal lines marking larger squares; these are the meridians and base lines, by which the positions of the smaller portions are fixed, according to their distance from each. No smaller quantity is sold than 80 acres; and the price of government land is every where the same, that is, one dollar and a quarter per acre, or 5s. 9d. —though emigrants cannot always reckon on getting a situation to fit them at that price; perhaps four to eight dollars may procure a choice.

If the settler wishes to have land in Pennsylvania or New York states, it is to be bought there from individuals, the government having no land for sale in these states. The price here varies according as the land is improved or not; and on this subject the reader will find information under the head "Prices of Land." If the emigrant should not, immediately on landing, find any one who has land to sell, an advertisement inserted in any of the papers will bring some of the owners or their agents to wait on him, and to direct him concerning purchases to be examined. His family should remain in New York or Philadelphia till he sees the land and fixes on a situation.

...igrants, on landing, are advised to lodge their money in some of the banks. If they have any considerable sum in gold, they can generally dispose of it to advantage to the brokers; but it is better, in the meanwhile, to place it in bank as a *special deposit*, taking a receipt from the cashier, bearing that he will return *the same* to you or your order. The proceeds, after exchanging your gold, may be left in the bank, from which you will receive a book giving you credit for your deposit; and you may then draw upon the bank as you need the money.

To those who wish full information on the subject of America, we would recommend the splendid work lately published by J. Howard Hinton, Esq., which contains every thing relating to the history, natural capabilities, and statistics of the country. The recent work of our countryman, Mr Stuart of Dunearn, has been quoted frequently in these pages, but not more often than its accuracy and impartiality deserve. The volume of Mr Fergusson of Woodhill is full of interest to agricultural emigrants. Other works may be perused with advantage—Flint's Letters from America, Duncan's Travels, &c.

DISTRICTS FOR EMIGRANTS.

Three districts are pointed out as highly worthy of consideration by emigrants. These are, 1st, The Highlands of Pennsylvania; 2d, The western countries lying on the Ohio; and, 3d, The district of Michigan, or the country lying around that lake.

The Highlands of Pennsylvania.

This is a fertile and healthy country, situated to the north-west between Philadelphia and Pittsburg. It lies in the middle of the settled districts, and has hitherto never been occupied by population, from the circumstance that there were no roads or channels of carriage open between it and the large towns and rivers; so that the settlers, whatever might be their produce, had no means of sending it to market. The mountainous nature of the ground rendered it long before lines of communications to the requisite extent could be carried through it; this has now, however, been effected; so that the whole resources of the district are at length laid open to cultivation and industry. Coals, lime, and iron ore, are here found abundantly, and canals or railroads have been formed to the mines. The lands in the vallies and sides of the lower ranges of hills are of great fertility, and, from the mildness of the climate, some of the mountains admit of cultivation to their very summits. The meadows are in the highest degree luxuriant, and the hills are covered with abundance of pasture for cattle, sheep, hogs, deer, and goats. The timber found on the lands in their wild state is different, according to their quality (a circumstance which the intending settler should observe carefully); that on the best lands being walnut and chestnut; the next best, maple, beech, oak, and hickory; the third quality, pine, spruce, and hemlock (a kind of fir-tree); and the poorest lands are encumbered with shrubs, brambles, and bushes. When the lands are brought under cultivation, their produce, in Indian corn, wheat, buckwheat, potatoes, &c., equals that of any of the eastern sections of the Union; and the soil, especially in the hilly parts of the north, is well adapted for grazing. Mr Flint mentions that produce in this district may be stated at from twenty to twenty-five bushels of wheat, and from twenty-five to thirty bushels Indian corn. These, he adds, are raised under slovenly management, and without much labour. A farmer expressed his contentment with the crop under existing circumstances. "A dollar a bushel for wheat," he said, "made a fair price, where he has neither rent nor taxes to pay. His own farm paid about four or five dollars a-year for the support of the state and county officers." The expense of taking cattle from these inland parts, where they are easily fed, to the market at Philadelphia (where they always command cash), is about 5s. 9d. a-head. The great roads from Philadelphia and New York, to Pittsburg, on the Ohio, pass through part of the district. There is also a canal between Philadelphia and Pittsburg, which intersects the southern parts of it, and affords means for transporting the produce of the country to markets on either side.

This country presents a climate more healthy, and less different from that of European countries, than most others in America. Its hilly surface, and clear rapid streams, seem more congenial to the habits of persons accustomed to the same scenes in this country, than the flat though rich carse lands of the western rivers. The price of land here, as in all other parts of the Union, varies according to the advantages commanded by the property; fertile land, well situated for roads, selling considerably higher than soil of an inferior quality, or more remote from markets. The medium price of unsettled land is from two to four dollars per acre, and the best situated about eight dollars; the amount of the purchase will always be taken in instalments of a dollar per acre, each year, till the whole be paid up. If the account be discharged in six years, little fault will be found. Many labourers, working at the canals in this district, of which there are several in progress, receive four dollars and a half per week; and as they can be boarded (with *meat* twice a-day) for about two dollars per week, they can save eight dollars at least every month, and, by the produce of their industry in this way, may be enabled, in three years, or a little more, to command as much money as will purchase 100 acres of land. As they are not required to pay for the land on entering this sum will enable them at once to settle on their property, though for such emigrants it is generally advisable not to purchase more land than they can quickly bring into cultivation, which is about fifty acres. Mr Cobbett mentions, that while in America, he was at an inn one night, where he met a Connecticut farmer on the road to Pennsylvania, with his daughter; the rest of his family had gone thither already. His reasons for migrating were these: He had five sons, the eldest nineteen years of age, and several daughters. Connecticut is thickly settled, and land dear. He had not means to buy farms for his sons there; he therefore goes and gets cheap land in Pennsylvania; his sons will assist him to clear it, and thus they will have a farm each. Mr Cobbett does not, however, think this an advisable plan, except for those who are accustomed to hard and steady labour.

There are numerous lots of land always on sale, and to be heard of in Philadelphia; but if the emigrant has any difficulty on this head, he has only to insert a notice, mentioning his wishes, in one of the public papers, when he will be waited on by one or other connected with the sales. Let him, however, by all means, see the land himself, before concluding a bargain; this caution cannot be too often repeated. It is not to be expected that every desirable object should be united on one property; but many inconveniences can be observed by a man's own eye, which no one will point out to him. It must in general be borne in mind, that the best carse lands, or the rich bottoms of vallies, are not the most healthy; and a situation near marshes, or pools of shallow water, is always to be avoided even in the healthiest districts. There are about twelve millions of good arable land on sale in this district.

The Countries on the Ohio and Mississippi.

The climate of this extensive region is not unsuited to European constitutions, though perhaps requiring greater caution on a first arrival than in the old states; because, being an inland country, the heat of summer and the cold of winter are not softened by those breezes from the ocean which moderate the temperature of islands and sea-coasts. In marshy situations, and close by the banks of rivers, especially if the woods in the neighbourhood have been left uncleared, agues and fevers are not uncommon during autumn, but these, with due caution, are seldom fatal, and are looked on by the inhabitants with little apprehension. None of the large towns have been set down in unhealthy situations; and the settlers, in selecting lands, can at present have their choice of fine upland grounds, which are not liable to any disease.

With this drawback, which it was necessary to state at the outset, the region we have now mentioned presents a scene of promise to the industrious settler, which is hardly to be equalled. The greater part of the land is a fine black mould; in some parts, particularly the river sides, where the grass continues rank all the year, it is covered with heavy timber; in others, where burning of the dry grass in summer prevented the growth of trees, it lies in fine meadows, called here *prairies*; and in the hilly, or rather *knolly* districts (for the land is generally flat), there is a growth of shrubs and underwood. The soil of the last portion is lighter than the others, but it is still excellent, and in that fine climate produces every kind of crop abundantly. These situations, too, are often the healthiest, in a degree which compensates for their inferiority in point of richness to the carse and meadow lands: it is even said that they are the best lands for growing wheat. The natural productions of the country are in the principal matters the same as those of the other states—Indian corn, wheat, oats, barley, buckwheat, potatoes, sweet potatoes, and rye. Of these, oats, barley, and buckwheat, are, we believe, hardly natural to the climate, and do not thrive so well; but, to make amends, there are tobacco, cotton, hemp, the grape vine, the papaw tree, the tomato, and other productions, which are not cultivated in the north of America or Britain. Wheat produces a good and sure crop of about 30 to 35 bushels of 60 lb. per acre: it is not uncommon to have it weighing 66 lb. Mr Flint mentions, as a proof of what can be done in this country by industry, that he met a settler who had that year raised nine hundred bushels Indian corn and wheat, by his own individual exertions. Mr Flint had previously heard of a negro, settled on the prairies near Vincennes, who had the same year raised one thousand bushels. The soil is well adapted for growing the European vegetables; as a proof of which, we find it mentioned, that cabbages grow to the size of 13 and 17½ feet in circumference: those of nine feet round in the head are common. Parsnips, carrots, and beets, are remarkable for their size and flavour; peas excellent, and very prolific; onions are raised with no other trouble than sowing the seed, and keeping the ground clear of weeds. The following extract from the memorandum of a naturalist in that country, will give an idea of the periods of the seasons:—April 1st, Peach trees in blossom. 2d, Asparagus in blossom. 3d, Peas, beans, and onions planted. 10th, Spring had completely opened, and the prairies were green. 18th, Lilac and strawberries in bloom. 27th, Lettuce and radishes fit for use. 30th, Roses and honeysuckles in full bloom.—It is mentioned, also, that turnips, sown on the 10th September, will grow to a very large size before winter. Besides its capability for rearing grain, &c., it is one of the best cattle-feeding countries in the world. "A farmer," it is said, "calls himself poor with a hundred head of horned cattle around him." Hogs, from the abundance of all kinds of vegetables, are reared and fattened in great numbers; and the demand at New Orleans affords a ready market for all. Nothing is more common than for an Illinois farmer to go among his stock, shoot down and dress a fine "beef" (as they call the ox), whenever fresh meat is wanted. This is often divided out among the neighbours, who in turn kill and share likewise. It is common at "camp meetings" (*tent preachings*) to kill a "beef" and three or four hogs, for the subsistence of friends from a distance. A three-year-old heifer is fed to about 421 lbs. (whole carcase), and sells for 5¼ dollars, or 24s. 6d. By the 1st of June or middle of May, the young cattle on the prairies are fit for the market. Common cows, if suffered to lose their milk in August, become fit for table use by October. Every farmer, besides his own land, has the range of the meadows around him, both for his cattle, hogs, turkeys, and poultry; so that they are reared in immense numbers, and at small expense. They are purchased readily, both, as mentioned formerly, for the New Orleans market, and by drovers, who take them to the east coast, Philadelphia, &c. This district affords, indeed, the chief supply of live stock for the Union. Altogether, the fertility of the country, and the abundance of its natural productions, are such, that the inhabitants are afraid of not being believed in mentioning them to the other Americans. "Our New England friends," says one of them, "must not put down every statement about this country as romance, because its vegetable productions so far exceed the scanty growth of the granite regions of the west. I am well aware," he adds, "that one hazards his reputation for veracity by narrating such things to a New Englander." All the favourable impressions, however, which had been made concerning this country, by the reports of former visitors, have been confirmed, in the most satisfactory manner, by one of the best-informed and most candid travellers of our day, Mr Stuart of Dunearn, who passed through the whole territory in 1832, and conversed with the most intelligent of its inhabitants and public men. His account agrees in every thing with what we had previously heard of the great fertility and growing importance of the country.

The influx of emigrants into Ohio, and the neighbouring states, has continued for these twenty years in multitudes, and without intermission. They can now travel by canal, and partly by railroad; but in the absence of these, the poorest emigrants still urge forward, over every difficulty, to the western land of promise. "It is truly interesting," says Mr Flint, "to see people of different countries, and of different dresses, coming forward in the mail-coach, on horseback, and on foot. At first view, this great migration leads to the conclusion, that oppression, and the fear of want, are in extensive operation somewhere to the eastward."—"On Sidelong hill," he says in another place, "we came up with a singular party of emigrants—a man, with his wife and ten children. They were removing from New Jersey to Pittsburg, a land journey of 340 miles. The eldest of the progeny had the youngest tied on his back, and the father pushed before him a wheelbarrow, containing the moveables of the family. Abrupt edges of rocks, higher than the wheel, occasionally interrupt the passage: their humble carriage must be lifted over these. A little farther onward, we passed a young woman carrying a sucking child in her arms, and leading a very little one by the hand. We could scarcely look, before or behind without seeing some emigrants travelling. No pilgrims were ever so diversified or interesting as these."

Mr Flint seems to have been surprised at the numbers whom he saw on the roads, all moving in one direction. His description reminds one of the multitudes seen streaming on in pilgrimage towards the Indian temple of Juggernaut; but the pilgrims of the Old World are generally going to seek a relief from their misery in superstitions or death; here they appear to have been led on by much more comfortable anticipations; at least if the next extract may be trusted.

"We arrived at a tavern. The bread was not prepared; but the people were obliging, and made it ready for us in a short time. The landlord was a farmer. He told us that Indian corn sells here at 13½d. per bushel, and that he could procure 20,000 bushels of it within three miles of his own house. Wheat sells at 3s. 4½d. per bushel."

The principal districts in the western country are Ohio, Indiana, and Illinois. There are considerable towns settled in each of these, the most advantageous situations, and those likely to become important in the commerce of the country, having been immediately pitched upon for that purpose. Some of these have hardly been longer in existence than fifteen years; few of them, except those on the river Ohio, longer than thirty; yet, from the influx of new settlers, and the facility these find in maintaining themselves and their families, such places are already populous and thriving. The country is generally flat, so that the towns do not, as in some of the western states, owe their origin to favourable situations for water-power. Manufactures, grist-mills, &c., if ever established here, must derive their power from steam; for which, indeed, the abundance of coal offers great facilities, while the smooth course of the numerous rivers makes the mines available over the whole district.

Cincinnati, a town situated on the Ohio, on the confines of the two states, Indiana and Ohio, is a place of great trade. In 1800, it contained only 750 people, and in 1805 only 960; it was then surrounded by a wild country, occupied by the Indians. The country around is now cultivated, and the number of inhabitants in the town is about 35,000, composed of people from all parts of Europe and the United States, who have been attracted by the advantages of the place. On the opposite side of the Ohio, in the state of Kentucky, there is another town, which is divided into two by the river Licking; these two parts are laid out on the same regular plan as Cincinnati, so that the whole appears one city. There are many great manufacturing works here: steam-mills, glass and iron-works, &c., and the bustle of the place gives the farmers an excellent market for their produce. This advantage is farther increased by the trade of the numerous large steam-boats which here take in cargoes of beef, pork, flour, &c., for their voyage down the Ohio and Mississippi to New Orleans. Formerly, they could not easily ascend the river, on account of rapids which occur farther down at Louisville; but these have been now overcome by a canal two miles in length, cut through the rock at that place. Louisville itself is situated in Kentucky, and is a place of considerable trade.

Other large towns in this tract of country are, Pittsburg, Wheeling, Steubenville, Marietta, Chillicothe. They afford a considerable market for agricultural produce; and the free navigation to New Orleans, as well as the facilities now afforded by a canal cut to intersect the country from the Ohio, at Portsmouth, to Cleveland, on Lake Erie, secure a constant and steady demand for grain, salted beef, pork at the mall, &c. The Americans look forward to this district, and the vast countries surrounding it, as the future pivot of their national grandeur.

Michigan.

The reader will observe on the map a tongue of land, situated between the two lakes, Huron and Michigan; this tract, with another which lies on the west, between Lake Michigan and the Mississippi, has been lately begun to be settled by emigrants from the old states of America. The two, together, possess great recommendations to agricultural emigrants. The capital is Detroit, a town situated on the river which connects Lake Huron with Lake Erie, and containing 2500 inhabitants. These lakes, with their rivers and canals, give the district access to the markets of New York, New Orleans, and Montreal.

The climate is temperate and healthy; winter sets in generally about the middle of November, and continues till about the middle of March. At Detroit, in 1818, the mean heat of January was 24°, and, in 1820, the mean heat of July was 69°, of December, 27°. The country is situated upon limestone rock, rather hilly, and possesses what the Americans call good water privileges—that is, numerous falls of water for mills, &c. It is better watered than any other in the United States, being finely diversified with lakes and brooks, rising in most parts from copious springs.

The soil is in general a good fertile loam, upon limestone; in some places a calcareous earth is turned up, mixed with the common soil; in others, the loam is mixed with a little sand; both are extremely productive. The country is, in some districts, under heavy timber, and in others, an open prairie, where the settler has nothing to do but start his plough. Horses cost here from L.16 to L.22, 10s.; oxen, from L.15 to L.18, a pair. The produce of the land runs from 25 to 50 bushels wheat, after one bushel of seed. The cotton plant, the grape vine, the sweet potato of Carolina, the tomato, and egg-plant, have all been successfully cultivated. Rye, barley, oats, peas, beans, and potatoes, as well as all kinds of vegetables usually cultivated in the same latitude, produce here in great abundance. Peaches and pears have been tried, and both produce delicious fruit; near towns, pears sell at from 2s. to 4s. per bushel; apples vary from 6d. to 2s. per bushel; currants, blackberries, raspberries, and strawberries, thrive exceedingly. Indian corn is less luxuriant than in the valley of the Ohio, the climate being somewhat colder. This country, on the whole, seems more congenial to European constitutions and habits than the other western settlements.

The richest, and, perhaps, most beautiful part of the territory, is generally thought to be that adjacent to the St Joseph's River, on which twelve new counties are formed. The soil is excellent, and there are numerous falls of water, for mills, &c.

At any of the government land-offices (which are established, wherever there is land to sell, in all the states), a settler may provide himself with a farm, at the usual rate of 5s. 7½d. per acre. No quantity smaller than 80 acres is sold by government. Should he chance to fancy one in some favoured spot (most of which are already secured along the great public road for 300 miles through the country), he will have little difficulty in procuring it for 12s. or 15s. an acre. An extensive tract of country upon the river and bay of Saganaw (on the west side of Lake Huron) is spoken of in terms of high admiration for the richness of the soil, and beauty of the natural scenery; and also, as presenting uncommon inducements to enterprising and industrious farmers and mechanics, from its central and advantageous position for business. The river Saganaw is navigable for boats, 20 miles from the head of the bay, and a road is made to Detroit. Fox River, on the west side of Lake Michigan, is also specially noticed as highly desirable for settlers, in regard to quality of soil, beauty, and local advantages: a canal is projected to connect this river and the lake with the Mississippi.

Mr Fergusson, to whom we are indebted for the above particulars, gives an estimate from the experience of persons acquainted with the district, of a purchase in Michigan, and of its returns:—

Price of 160 acres, at 1¼ dollar per acre	L.45	0	0
Seed, labour, and rail-fence, at 6 dollars, for, say, 150 acres	202	10	0
Harvesting, at 2 dollars	67	10	0
Dwelling-house, stables, &c.	180	0	0
	L.495	0	0
Returns.			
Produce of 150 acres, at 20 bushels per acre, at 1 dollar per bushel	L.675	0	0
Profit	L.180	0	0

No allowance is here made for maintenance; but it is to be recollected, that the wheat crop may be repeated for three or four years without manure, and in the succeeding years the charge for purchase disappears, so that the advantages of the latter are obvious. These are properly appreciated by the Americans, the number of emigrants flocking to Michigan being immense. Its population, in 1831, was estimated at 32,000.

Detroit, the capital of Michigan, is the embryo Constantinople of the inland seas of North America. It is situated on a narrow channel, which connects the two lower lakes, Ontario and Erie, with the three upper, Huron, Michigan, and Superior. Having access in every direction to countries of more fertile soil than those of Greece or Asia, and possessed of an equally favourable climate, it begins its career with political institutions far more propitious to human welfare than were possessed by the celebrated city we have mentioned; and it promises one day to be the abode of a more numerous, as well as happier population.

Other Districts.

The three districts we have mentioned are those in which the greatest quantities of land are yet unoccupied, and where it is to be had cheapest; but there are others in which settlers may *locate* themselves with advantage. Among these is the district of Genessee, in New York state; and, indeed, the whole valley of the River Hudson presents, at intervals, spots on which good land may be purchased, especially by those who would rather sit down on a place partially cultivated, and near markets, than in the heart of the forest.

DIFFERENT CLASSES OF EMIGRANTS.

Men with Capital.

There are three different classes of emigrants, each of whom will be guided by different motives in their choice of a situation. The first is composed of persons who are possessed of capital to some amount, and who have been accustomed to move among the wealthier classes of society in this country. If these individuals intend to devote themselves to agriculture in the country to which they are bound, every circumstance leads us to believe, that unless they are prepared to submit to very great sacrifices of personal comfort, and that for no inconsiderable time, they ought to purchase land partly improved, and as near some of the towns as they can find it. The hardships of a new settlement to persons who have not been accustomed to labour, are hardly such as can be anticipated by description; while the total change of habits—labouring in the woods, living in log-huts, and the want of regular food—often induces disease, of which such persons may feel the effects during the whole of their after lives. Abundance of half-improved properties may be found (as we have mentioned under the title "Purchasing of Land"), upon which moderate labour, and the exertion of some skill and attention, will secure excellent returns. These may be heard of at any of the large towns, but chiefly at New York, or at Albany, Genessee, Rochester, Geneva, &c., in that state. In Philadelphia also, in the state of Pennsylvania, most eligible purchases of this kind may be made; and at Pittsburg, a very busy manufacturing town in the same state, on the river Ohio, there are many properties on sale which must rise in value every day with the increasing commercial importance of the place. There are immense beds of coal, iron ore, and limestone, in the vicinity of the town, and the navigation of the Ohio is uninterrupted (though there are some inconsiderable rapids) the whole way to its junction with the Mississippi. Communications by canal and railroad are also opening, or now completed, to connect the Ohio at this place with Baltimore and Philadelphia; so that the town of Pittsburg is already of great wealth, and promises rapidly to increase. The land in the neighbourhood is of uncommon fertility, and may be obtained now at prices lower than can be expected in a few years, when a greater number of settlers shall have arrived to occupy it. Properties within twenty miles of the town already sell very high—say fifty dollars or more. Almost the same observations may be made with regard to Louisville, Cincinnati, and Jeffersonville, which are situated in the states of Ohio, Kentucky, and Indiana; these places already possess great trade, and from the abundance of minerals, coal, lime, iron, salt, and lead, which are found in the neighbourhood, they must continue to increase. Farms, therefore, purchased in their vicinity, are certain to rise in value, and, with attentive cultivation, will, in the meantime, pay the cultivator abundantly for his labour and capital. Cincinnati particularly is a place of great activity, and persons who settle in its neighbourhood will easily find society to their liking; it presents, indeed, though so remote from European cities, no difference nor any inferiority in this respect. It is right to mention, however, that the whole of the western country, and, indeed, of all the countries which are in progress of settlement, are overrun with a swarm of speculators in land, and in projected establishments, new cities, manufactories, &c., all whom the monied emigrant ought to avoid as a set of leeches. Americans may deal in those matters, and may perhaps profit by them; but emigrants never can do any thing but involve themselves in difficulties by such schemes. Let them look to *certainties exclusively*; the quality of the land, the healthiness of the site, the neighbourhood of a market already established; these are the only considerations that should weigh with them, and no other. In short, to those who have capital, we would say, without hesitation, choose your abode near some of the principal towns; it is almost indifferent which. The soil of the western countries on the Ohio is the richer, and its produce more varied and luxuriant, but the prices of agricultural produce are lower than in the old states, and labour dearer. This is the sole and essential difference; except, indeed, to those who wish to speculate in buying land, by adding to its improvements, and then selling it at a higher rate, when their own labour, and the increasing density of the busy population around them, shall have added to its value. To persons who wish to make money in this way, the vicinity of the rising towns in the western states is certainly a field of high promise, and many have already realized large sums there by proper management in that manner.

Mechanics, Farm-Servants, and Labourers.

Mechanics and labourers, in looking for a situation where they may settle, will be guided by very different views from those of persons possessed of capital. The latter, if they wish to buy land, will prefer to have it in a place where labour is cheap and farm produce sells dear. The man who lives by his wages, on the other hand, would have labour high, and all manner of provisions cheap. We have advised those possessed of capital to look for settlements as near the large towns as possible, where markets and labour are most easily procured. The other class we would refer to the lists we have already given concerning the rates of wages and the cost of living; they will find there all the information which is requisite, or can be given, for determining whether they should proceed to America or remain in this country, as well as for their settlements when there. It was impossible to obtain accounts of the wages of every description of tradesmen; but by comparing the rate at which those in any one business are paid there, with the wages which the same persons receive in Britain, a pretty safe conclusion may be gained with respect to the rest. In regard to the places to be chosen for settling by mechanics, farm labourers, and others who look for work, we believe, that to those who possess funds sufficient to carry them forward to the western or inland states, there can be no doubt but these afford the preferable field for them, both in respect to wages and cheapness of living. The towns on the Ohio are all gaining rapidly in population and importance, from the richness of the country with which they are surrounded; and the immense quantity of minerals found there, coals, &c. (as already remarked) make it probable, that if manufactures be ever established any where in America, it will be here. The carriage of foreign manufactured goods is very expensive to a country so remotely inland, and to which they have to be carried through so many canals, rivers, or railroads; and the district itself produces cotton, silk (if cultivated), iron, lead, coals, &c.; so that there is here a *bonus* for manufacturing on the spot which hardly any other country possesses. The consequence begins to be already felt; manufacturing establishments are begun, wages are high, and the price of living is withal exceeding low. To mechanics and labourers, therefore, who have money to defray the expenses of the journey, we cannot but say that the western states present by far the most favourable opportunities. The following extract of a letter is from Cincinnati, on the Ohio:—

"The improvements in Cincinnati are rapidly increasing: the communications opened by means of the canal and the new roads give an impetus to trade. Whatever number of artizans, mechanics, and labourers come out, they will find abundant occupation. The soil is excellent. Engineers are in great demand. Engravers, particularly those who will work in general work, as maps, names, &c.; card-manufacturers; tinmen and braziers; bell-hangers, with a knowledge of casting or directing in that department; baking, brewing, and malting; are good trades. Glovers, stocking weavers, first-rate plane-makers, turners in steel, iron, brass, and wood, are much wanted. Carpenters, joiners, builders, plasterers, bricklayers, stone-masons, plumbers, all who are good at their business, and labourers, can get plenty of work, at 3s. or 4s. per day. Gardeners and mechanics average 4s. 6d. to 9s. per day, curriers, 9s. per day, journeymen's wages. Tailors get 20s. for making a coat. Hatters do well."

Let it be recollected, that, with these wages, flour is at 9s. per 112 lbs.; mutton at 2d. per lb.; sugar, 4d. to 5d. per lb.; coals, 5d. per bushel.

It may now be asked, what additional expense will be required to take a mechanic to Cincinnati, after he has reached New York or Philadelphia? To this we find it answered, that the journey from New York to Wheeling (a town on the Ohio) costs 25 dollars, or L.5, 12s. 6d.; and from Wheeling to Cincinnati, by steam-boat on the Ohio, the fare is 10 dollars, or L.2, 5s. The whole expenses, therefore, from New York to Cincinnati, are L.7, 14s. 6d. The journey may now be made, by the canals and steam-boats, to Buffalo, on Lake Erie; thence to Cleveland; and from that place, by the canal, to Cincinnati. This will reduce the expense somewhat. The same letter from which we have quoted above, mentions, that a family of respectable persons had arrived at Cincinnati from England, and that the whole expense of their journey (with 2500 lb. luggage) was L.75. But there is no occasion for going even so far as Cincinnati; Wheeling itself, or Pittsburg, which, though still on the Ohio, is much nearer New York, present quite the same inducements to mechanics of all descriptions.

Labour is in the greatest demand every where. The people are not able to avail themselves of the riches of the country which they inhabit without assistance. Mr Flint, who travelled on foot, was stopped by the farmers asking him anxiously if he "*knew of any traveller who would rest himself, and thrash for a few days;*' and Mr Stuart of Dunearn, after telling one of the Ohio settlers the work usually done by farm-servants in Scotland, was charged, on departing, not to neglect sending some of them to America, if possible.

It is not in one or two districts of the Union that this demand for work-people exists, but every where. The towns immediately on the coast are generally better supplied with tradesmen, labourers, &c., than those inland, because emigrants first land there, and often apply for employment as soon as they go on shore: but in all that we have heard on the subject, we find no instance of a person who was willing to work, and who did not find employment.

Persons who wish to buy Small Lots of Land.

Besides emigrants possessed of good capitals, there are often men who are acquainted with farming business, and with that only, but who have not money to buy improved land, and who wish, therefore, to depend on their own industry for clearing ground for themselves. Many such men, after persevering for years, with their families, in unrequited labour in this country, have gone to America, and become proprietors of well-improved and rich farms. We could quote numerous examples of this kind: the following is taken from Mr Flint's interesting publication:—

"J. M., a man from the county of Edinburgh, arrived here (near Pittsburg), and had settled with his family, seven sons, two daughters, and a son-in-law, about ten months before I met him. He has purchased 480 acres of land; built two log-houses and a small stable; cleared and enclosed about 22 acres, which is nearly all under crop; deadened the timber of about 80 acres more; and planted an orchard. In addition to these improvements, his sons have wrought for a neighbour to the amount of a hundred days' work. He has a horse, a cow, a few hogs, and some poultry. I inquired if he felt himself happy in a strange land. He replied, that he would not return to Scotland, though the property of which he formerly rented a part were given him for nothing."

This instance—and hundreds of others might be quoted—will show that people from this country, with a stock of from L.50 to L.100, may establish themselves well in America. A smaller sum than these will hardly suffice to land with, if the settler intends to buy land immediately; because eighty acres of land (which is the least quantity sold by government) costs L.22, 10s.; and though something were done to raise a crop the first season, the other expenses of a log-house, &c. would absorb every thing. The price of government land is required to be paid immediately. We shall not dwell farther on the subject of settling on new land, clearing the ground, &c., but beg to refer our readers to what has been already said concerning it in the article on Canada, where the practice is the same as in America.

We shall only give the following quotation, describing the situation and life of cultivators in the woods:—

"The settlers in the woods appear to be the most contented and independent people, in their way, I ever met with: perhaps with only a log-house unplastered, containing two rooms, one above and one below, sometimes only one below, with a large open fire-place and a log-fire. The chimney back and hearth built of stone, picked up about the farm; a boarded floor unplaned, perhaps hewed only, if too far from a saw-mill; one or two small glass sash windows, and sometimes at first none; doors and gates with wooden hooks and hinges. A few articles of common household use; two spinning-wheels, one for flax and one for wool, with reaves of spun-yarn hung round the inside of the house on wooden pegs driven into the logs; an upright churn; a rifle-gun; a dog or two; an oven out of doors, at a little distance from the house, built sometimes of clay, sometimes of brick or stones, often placed on the stump of a tree near the house, and with a shed covered with tree bark to keep it dry; a yoke of oxen, some young steers, 2 or 3 cows, 8 or 10 sheep; perhaps a horse, or a span (yoke); a sleigh waggon, a plough and barrow, the last perhaps with wooden teeth; these form all their riches except their land, and on this they often raise 100 or 200 bushels of wheat, 80 or 100 of Indian corn, some oats, peas, and perhaps buckwheat and a patch of flax; and fatten three or four hogs and a cow, or a yoke of oxen, in a season, besides seven or eight more store pigs, and a sow or two. Those who brought a little money with them, or were fortunate in having a family of industrious sons, get perhaps a good frame-house, or, at all events, a good frame-barn, 80 or 100 acres of land cleared; grow 400 or 600 bushels of wheat; other things in proportion; with 2 or 3 yoke of oxen, 12 to 30 fat hogs, 2 to 5 horses, &c., half of them or more brood mares."

The following is a ruder picture of industry:—

"In Maquapin county (Illinois), one of our frontier men settled himself on government land three or four years since, with 4 or 5 sows for breeders, worth as many dollars. In 1829, he drove 42 fat hogs to market, which he sold for 135 dollars (L.30, 7s. 6d.) The amount of corn given to the whole before he drove them did not exceed one bushel. They lived on the *range*, and grew fat on *mast*, that is, beech-nuts, walnuts, acorns, &c.; had they been fed on corn, they would have sold higher. Of the proceeds, 100 dollars (L.22, 10s.) were applied to pay for 80 acres of land on which he had settled; the remainder served to pay some small debts, and to purchase his salt, iron, and groceries for the year. This is not an extraordinary occurrence, but one common in that country."

PURCHASING LANDS.

Lands are sold by the British and American governments in much the same manner, and at nearly the same prices. In our colonial possessions there are public sales of land at upset prices, and at these they may afterwards be obtained, if necessary, by paying instalments. In the United States there are public land-offices in the chief towns, at which maps of the sold and unsold lands are kept for inspection. Lands are first offered for sale by public auction, and are put up at from a dollar and a quarter to two dollars per acre. If no one offers these prices, they are exhibited on the land-office map, and may be obtained at any subsequent period. On the maps, sections of a square mile, and quarter sections of 160 acres, are laid down; six miles square constitute a township. The sixteenth section of each township is reserved for the support of a school. The lands when bought are payable one-fourth part of the price at the time of purchase, one-fourth at the expiry of two years, one-fourth at three years, and the remaining fourth at four years. For money paid in advance at the land-office a discount of eight per cent. per annum is allowed, till instalments to the amount of the payment become due. For failures in the payment of instalments, interest at six per cent. is taken till paid.* There is thus little difference in the mode of disposal of public lands in Canada and the United States. The deed which confers the right of property in the states is very simple. It is printed on a piece of parchment of the quarto size; the date, the locality of the purchase, and the purchaser's name, being inserted in writing, and the instrument subscribed by the President of the United States, and the agent of the general land-office. It is delivered to the buyer free of all expense, and may be transferred by him to another person without the intervention of stamped paper, law practitioners, or those absurd feudal usages which continue to disgrace the transfer of landed property in Great Britain. Emigrants in going into the woods to make a selection of lands, will do well to take with them an extract from the land-office map applying to the part of the country they intend to visit, and by this they will discover entered from unentered lands.

The public land is, of course, totally uncleared, and untouched by the plough; some of it is more heavily timbered than other portions, and it is of very various quality, that on the banks of rivers and alluvial grounds being exceedingly fertile, and other parts being either rocky or marshy, so as to be either too unhealthy, or too unprofitable to be cultivated. The settler, however, has his choice, and, by going out into the woods, he may fix upon a lot to his own mind. An enterprising cultivator, particularly if he be a stout man, with a family of sons, may do very well upon such lands, because the original price is small; and after clearing them to some extent, and erecting one or two log-houses and barns, he can either extend his cultivation (which is easy after crops are got for the first three seasons), or he may sell at a considerable advance as population begins to increase around him, and as settlers arrive, who are not inclined to make first beginnings in the woods for themselves.

When lots are advertised for sale, there are persons who make it their business to go out to survey the whole tract before any one else has examined it; and by remaining in the woods for months, sleeping often in the open fields, and undergoing great hardships, they get acquainted with all the natural advantages of the land, the spots where there are water-power, minerals (such as salt-springs, &c.), healthy, open, or fertile grounds, and select such of these as they choose, in order to sell them again at a profit. This practice raises the price of the best lands, and it is one which can only be followed by natives well acquainted with the face of the country; but it cannot be said to have much effect in retarding settlements, as the persons who follow it seldom have very large capitals, and are soon willing to dispose of their purchase at a reasonable advance to those who intend really to avail themselves of the natural advantages which the former have been at the trouble to search out.

A speech of Mr Clay, of Alabama, furnishes an account of the lands belonging to the general government which remained on sale in 1828. The whole quantity was 83,110,873 acres, of which, however, only about seven twelfth parts were of quality for cultivation. Of more than seven millions of acres in Ohio, only 200,000 were considered first-rate, and 666,000 unfit for cultivation. Of more than ten millions of acres in Indiana, less than one and a half millions were considered first-rate, and about two and a-half millions unfit for cultivation. Of more than thirteen millions of acres in Illinois, three millions were considered first-rate, and six millions unfit for cultivation. Of about thirteen and a half millions of acres in Missouri, 159,000 were considered first-rate, and 5,700,000 unfit for cultivation. Of about thirteen and a half millions of acres in Alabama, 687,000 were considered first-rate, and nearly 7,000,000 unfit for cultivation.—No account seems to have been given of the lands in Michigan, a large and very fertile district lying around the lake of that name, and on the west borders of the Huron. The greater part by far of this immense territory is still unappropriated, and remains for sale.

These are the public lands, but there are vast quantities of ground in the hands of individuals which have not yet been cleared, or only partially so; and the prices at which this is to be had vary according to the quality of the land, its situation with regard to roads and markets, or the work which has been already done upon it. Large quantities of this description of lands are to be had in the north-western districts of Pennsylvania, at from two to four dollars per acre; many portions of it are fertile, situated on healthy mountain sides, and in a climate more nearly resembling that of Britain, than is to be expected in the low, though rich vallies of the western states, where (except those of Michigan) the public lands are chiefly situated. In the other old settled states there is not so much of this kind of unoccupied land; though, certainly, when it comes to be in America as it is here, where every inch of ground is wanted for raising food, an immense quantity of what is now despised, will, by the operations of draining, trenching, and reclaiming, be brought into productive cultivation. In these states, particularly New York, there is, however, always abundance of properties in the market, parts of which have been long farmed, and which have houses and offices erected on them, for extending the cultivation of their remaining acres. These are offered at various prices, according to their advantages; and to gentlemen who have skill and enterprise to introduce better and more careful modes of farming, they offer admirable capabilities. The profit which has been hitherto realized in America, has been by merely breaking up the woods and prairies into corn land in the roughest and most unskilful manner; but a new field of enterprise and wealth remains to those who shall introduce, in the settled states, better breeds of cattle, and more scientific modes of agriculture. The Americans, as has been already stated, entirely neglect the use of manures; they often shovel the refuse of their stable-yard into the nearest river; and one farmer is mentioned, who, rather than remove a dunghill which had gathered in his court, chose to build a new set of barns.* The national habits lead them continually to think of breaking up new land, and they always choose to do this, rather than manure the old. They prefer, in short, taking their crop off a large field carelessly and unexpensively cultivated, to getting the same returns from a smaller piece of ground skilfully prepared. This is obviously a want of thrift as well as of science, and it is for this reason that we say that good farmers, with some capital, might take advantage of the half-improved lands which are on sale in the settled states,† and by buying them at the very moderate prices at which they are offered, enrich both themselves and the country, by the introduction of more business-like modes of farming. An attention to dairy produce, an improvement of the breeds of cattle, and the introduction of kinds which would produce fat of better quality, and with less expense or trouble than the kinds now known, would be of essential benefit.

The prices at which cultivated and half-reclaimed lands are offered in the district of Genessee (a very fertile one), are from twenty to forty dollars per acre. Mr Fergusson mentions several farms which he saw on sale: one near Geneva was of 250 acres, "consisting of good loam, and some indifferent clay, well watered, but without any mill power. The wheat and Indian corn were excellent; the hedges thriving and in good order, with a double rail-fence; the mansion-house and offices were very respectable. The price asked was 25 dollars per acre, or L.1406, 5s. for the whole farm."

* In an American publication, quoted by Fergusson, the following passage occurs relative to the Michigan territory:—"The emigrants to the territory are mostly enterprising, industrious farmers, who, from not being allowed to purchase the land on credit, thereby become immediately the real owners of the soil, and, being free from debt, bid fair to become wealthy citizens. The price of unsold wild land is fixed and uniform, being one dollar and a quarter (5s. 7½d.) per acre; the terms ready money." It is here apparent that instalments are not taken, at least, as regards Michigan; and this contingency should be borne in mind by intending emigrants. Most travellers concur in stating, that the plan of purchasing lands on credit, or by instalments, is mischievous, and should if possible be avoided.

* Flint's Letters from America.

† The experiments of Mr Cobbett, while residing on Long Island, are an illustration of this remark. His mode of cultivating and preserving *ruta-baga*, turnips, and other green crops; his less expensive method of feeding hogs; his sheltering of poultry during winter, to procure eggs and chickens early in the spring; are all examples which were much needed in America.

Mr Fergusson mentions the prices at which some other farms were offered; we subjoin an abstract of the notices:—

"1. Captain Davenport's farm, on the east bank of the Hudson. It contains 350 acres, 100 of which are in wood: the soil is partly clay, partly sandy loam, and a large portion is a rich holm on the river side, of the finest quality. The price demanded is L.7, 10s. per acre, and it was sold at somewhat more than that sum soon after. The return might reasonably be expected to reach L.112, 10s., *clear of expenses*, from the flat land; and L.70 from the profit on a sheep stock on the upper portion of the farm; in whole, L.182, 10s. The price given was L.2000, and L.1000 more was required for building, fences, and drains—in all, L.3000; for which there is a return of L.180. An industrious Scots farmer, in Mr Fergusson's opinion, would not fail to realize L.200, clear of all the expenses of subsistence, &c.

"2. Next to this farm was that of Mr Knickerbocker, containing 275 acres. There is a fine holm on this farm, and the upland seemed fully better than No. 1. It was let in shares last year, and the owner received L.63. The price asked was L.4 per acre, or L.1100; and L.200 more would be requisite for houses, fences, &c. There was no more timber than seemed requisite for the use of the estate.

"3. Mr Cherney's farm, 106 acres, with wood sufficient for the use of the property—about 40 acres of very fine holm, capable of yielding, I was assured, forty or fifty bushels of oats, or other grain in proportion. This farm could be had for L.530, and would certainly return L.45 or L.50 clear.

"4. Mr Valy's farm, 118 acres; 40 acres of most superior holm; the upland good; with a stream running through it. The houses appeared to be new. This farm could be had for L.400, and the return could not be less than from L.35 to L.40, clear of all charges.

"5. A farm of 300 acres, occupied by Colonel Grant, at a rent of 300 dollars (L.67, 10s.) The soil is good loam; nine parts of it are clay: a new dwelling-house, and good barn, with a valuable wood lot. It might be bought for L.1500.

"The whole of these properties were evidently susceptible of great improvement, though in foul and bad condition. The local situation is good, the Champlain canal passing within half a mile, though separated by the river. The roads are tolerable."

The account given of these properties by an intelligent observer and agriculturist, will serve to convey an idea of the prices of land, and the returns of the capital and industry employed in American agriculture. In all cases we believe it to have been well proved, that no person should buy more land, however cheaply offered, than he can immediately cultivate with advantage. The capital expended in buying superfluous ground is completely locked up from use; and that circumstance, in a country where every disposable dollar can be employed with certain profit, is a downright and pitiable loss. There are some persons, indeed, who, as has been already mentioned, speculate in land, buying large quantities in order to sell it again, as it becomes more valuable by the increase of population; but such adventurers require to have well studied the natural advantages of the district, and it is not a speculation for emigrants.

To conclude, then, on this subject: Land in new districts, chiefly in the western states, may be had for a dollar and a quarter per acre; in places partially settled, unreclaimed land fetches from two to four dollars; in very favourable situations, perhaps a little more. Ground partially opened, and cleared of trees, is offered at all manner of prices, according to the labour bestowed on it, from four dollars to forty.

RENTING LAND.

There is little of what is called renting land in any part of the states; but where there is, the produce is generally divided into certain proportions between the owner and tenant. Sometimes each receives an equal share; sometimes the owner gets a third, according to the improvements on the land, and its quality; sometimes tenants take land "*on shares*," with the landlord, on condition that he furnishes them with seed-corn and firewood; and then he receives one-half of the crop. In the western country of Illinois, &c., it is not uncommon for the owner to give a man "team, tools, and board, besides one-third of the crop," for labouring a farm. Mr Pickering mentions that, in the neighbourhood of Baltimore, he was asked a rent of 18s. per acre for a lot of fifty acres, only half cleared; for another lot of very rich land, the rent asked was twelve dollars, or L.2, 14s. per acre.*

These lands had the recommendation of being situated near the markets of Baltimore; and it must be recollected also, in explanation of the high sums demanded, that the rent of land in America by no means bears the same proportion to its price as it does in England. With us, it brings twenty-five years' purchase of the rent. In America, it is freely sold at sixteen and seventeen years' purchase. This must be owing to the many profitable ways in which ready money can be employed in that country.

CHOICE OF LAND FOR SETTLING, IN RESPECT OF HEALTH AND NEIGHBOURHOOD.

It is of the greatest consequence that the land which is selected be in a healthy situation, in whatever district it be chosen; and for ascertaining this, the emigrant must examine the spot himself. Let him trust the report of no other person: land dealers and others naturally commend tracts of ground which they have an interest to sell. The people of the neighbourhood are also to be distrusted, because they are all anxious to have settlers near them, from the additional value an increasing population gives to their property. There can, however, be little difficulty in making the choice. In the first place, the neighbourhood of all marshes is to be avoided, as well as of rivers, which, from their sluggish course and low banks, appear to overflow and stagnate in time of floods. Such situations are almost always liable to agues and fevers. The same may be said of low moist prairies (meadows), whose great fertility should never tempt any settler from this country to establish himself in them. An elevated spot, where the air circulates freely from all points of the compass, is most desirable. If circumstances should induce the settler to fix himself near any of the great rivers, it is asserted that a residence chosen as near as convenient to the margin of the stream will be more healthy than those situated a few hundred yards distance, in what is called the "Interior of the bottom." Along the Mississippi and Missouri, the banks are generally higher than the ground a little distance inward; and from the porous nature of the soil, this interior land absorbs moisture from the river, and remains always damp. So much is this the case with regard to the Missouri, that all the waters which it receives from its tributaries do not increase the stream, which is, therefore, as large 1000 miles from its mouth as it is where it falls into the Mississippi, after having received more than a hundred rivers in its course. This circumstance is attributed chiefly to the water being absorbed by the porous soil, whence it is partially evaporated in the surrounding air. This peculiarity renders the immediate vicinity of the rivers (except where they have a rocky channel) unfavourable to the health of persons lately arrived in the country, and whose constitutions have not been yet accustomed to the climate and atmosphere.

To emigrants from Britain, we would say, that the country of Michigan and the Highlands of Pennsylvania are likely to be least injurious to their constitutions, and that more caution is required in selecting a situation in Ohio, Indiana, and Illinois—the whole western country indeed—than in the former places. That country, from the number of years it has now been settled, however, has been thoroughly explored, and all its healthy and unhealthy situations ascertained; so that a settler will seldom be at a loss, in the neighbouring towns, to find some clue by which to guide himself.

In whatever place a settlement be chosen, it is of the utmost consequence that the *house* be on a dry and airy spot, and that it have a spring, or clear running stream, of good water, close by, for household purposes: some, to secure this object, pitch on the banks of a pool or small lake as an eligible situation, which is the worst place possible, both because the water is often stagnant and unwholesome, from the dead leaves and vegetables lying in it, and because the effluvia from such water is apt to generate disease in those who are constantly near it. The floor of the house should, if possible, be laid with some hard dry substance; and a little fire should be kept in the evenings, even when the weather hardly seems to require it, because this serves to maintain a wholesome circulation of air, and to dry more quickly the green logs of which settlers' houses are first constructed. With regard to clothing, it is of consequence that those who enter upon this new life should make themselves somewhat comfortable in this respect; and though they must for a time submit to hardships, by no means to imitate the savage affectation of many of their neighbours, who think that, as they are in the woods, they ought to take a pride in living like Indians. These people often neglect all cleanliness and comfort, both in their persons and dwellings, and are vain of telling how much they expose themselves to the weather, both in sun and dew, and how well they have stood it for years. Let none of these vain-glorious boastings have any influence with the new settler: he ought, in every point, to maintain habits as little removed from his former way of life as is consistent with his situation; keep his clothes and house as snug and comfortable as he finds it possible at the present time to make them; and expose himself neither to the weather nor fatigue, except where there is some useful purpose to be gained by it; never at least to do so for the mere sake of braggadocio, or to imitate the ostentatious hardiness of some of his neighbours. He will find the Scots proverb, "hooly and fairly gangs far," as true in the back woods of America as at home. Steady and continued perseverance in clearing his lands and securing his harvests, with patience and good humour under such privations as are unavoidable, are chiefly essential to the success of the emigrant.

As a farther advice to settlers entering into the woods or new lands, we would say, that if two or three can go together, it assists them materially: a family with several stout sons has a very great advantage in this respect. A few acquaintances joining together, and taking a piece of land to divide among them, can assist one another in clearing it, or in getting in their harvest; and if any accident happens in one of their families, the good offices of the rest serve greatly to relieve its inconveniences. It may happen, for instance, that some of them gets a hurt, or is laid by for a week with sickness; and if this were to occur during harvest, or in seed time, every thing would be lost without the assistance of the rest of the company. If such partnerships cannot be formed before leaving home (which, when the emigrants are not from the same neighbourhood, cannot be expected), they may be and often are arranged to much advantage during the passage; and intending settlers will often find it advisable to sacrifice some of their own views as to the district in which they mean to settle, in order to have the assistance of steady companions elsewhere. Should no prospect of this kind occur, and should the emigrant resolve to choose a spot and settle for himself, his next object ought by all means to be to study the dispositions and characters of his nearest neighbours, and accommodate himself to them with cheerfulness and good humour. In return, he will almost always find them obliging, and ready to afford him information and assistance. Both after he is settled, and while on the voyage, he ought to avoid all bargain-making people, many of whom he will find, who have continually something to sell or to exchange, of the very best kind, as they say. These insidious bustling characters ought to be specially marked, and emigrants ought never to buy any thing but what they have already determined on, or see to be absolutely necessary.

AGRICULTURE, SOIL, AND NATURAL PRODUCTIONS.

In North America, oats do not produce nearly so heavy a crop as in Scotland; and wheat, though of excellent quality, is not quite so productive as it is here. Part of these deficiencies may be attributable to the careless cultivation of the Americans, who seldom manure their lands; but part also is undoubtedly owing to the difference of climate.

The grains usually cultivated are wheat and Indian corn. The former, with such cultivation as the Americans bestow on it, produces about 30 bushels (or 7¼ bolls) per acre. The Indian corn yields 50 bushels (or 12½ bolls) per acre; this vegetable is cultivated in rows or drills, which are placed four feet apart, and hoed much in the same way as turnips are here; the stalk grows to a great height, and affords in the leaves a kind of grass, which cattle eat with greediness. The corn is used as food for man in a great variety of ways—as bread, as porridge (when it is called *mush*), and in puddings. When unripe, and in the green pod, it is not unlike green peas, and in that state is sold as a vegetable. Horses, cattle, and poultry are all fond of this grain, and thrive well on it.

Potatoes are also cultivated, and yield very profitable returns, good land producing 300 bushels per acre (60 bolls Scots). Wheat, however, is the most valuable crop; and though the produce is generally smaller than in Britain, the flour is of excellent quality. This crop usually succeeds maize, and is followed in succession by barley and oats, sown down with grass—although this rotation is as frequently inverted; and as maize is a culmiferous plant itself, it is not thought, by observers from this country, so useful in preparing the ground for wheat as our green crops are. With good management, oats yield from 40 to 50 bushels, and barley about one-fifth less. Rye and buckwheat are more generally cultivated than in Britain. Buckwheat cakes are one of the standing dainties of an American breakfast. The process of manuring is much neglected, both by the use of ordinary stable manure, and that of lime and gypsum. The Americans say that the labour required in the application of manure would be so expensive, from the high wages of all their servants, that the returns would not be profitable. But the truth seems to be, that they are more familiar with the process of breaking up new land, of which they have abundance generally within reach, and that they have never yet given manure and scientific agriculture a fair trial. Mr Stuart of Dunearn calculates, that, under their present system of management (the slovenliness of which is universally remarked), the average crops of all sorts of grain, maize excepted, are nearly a half less than in Britain. The climate is favourable for the making of hay, which yields a good return. Turnips, ruta-baga, pease, lucern, are all cultivated to advantage.

The following notice of the produce of some *well-cultivated* land, in the northern part of the state of New York, will give an idea of American agriculture:—

10 acres	of orchard ground produced		25	tons hay.
26	...	maize ...	1580	bushels.
4	...	wheat ...	140	...
1	...	flax ...	600	...
8	...	oats ...	560	...
1	...	barley ...	60	...
2	...	potatoes ...	1000	...
2	...	vegetables fattened 400 chickens.		

Much of the industry of the American farmers is exercised in rearing cattle, hogs, and poultry, for the market of the towns. The hogs are fed a good deal on Indian corn, and the plenty of that kind of grain often makes it be given to them, when they might be fattened on much cheaper stuff. The rearing and feeding of cattle is carried on very systematically, and to a great extent; there being drovers, as in this country, who purchase the beasts from the farmers, and often drive them as far as 600 miles to be sold. New York consumes about 700 oxen per week; these weigh on an average 55 stone of 14 lb., and the butcher

* The rents asked in America are certainly higher than might be expected from our ideas of the relative proportions of the price of land and its rents in this country. But as Mr Pickering, on whose authority we state the above facts, did not really take the land, and only inquired concerning it to gratify his curiosity, we are disposed to think a real bidder might have heard a lower price. In another place, Mr Pickering says he was asked three guineas per acre of rent—a sum quite incredible *to be paid*.

pays for them from L.12 to L.14 per head. Men employed as drovers receive 4s. 6d. a-day, with food for themselves and cattle. It is allowed that a great deal might be done in all the states to improve the breeds of fat cattle, who, though always in good condition, often take more care and more feeding to bring them into that state, than some of the profitable English kinds would do.

The horses of America are highly praised by good judges. Mr Fergusson of Woodhill says (speaking of those in New York state), that he seldom passed a farmer's door without noticing horses, which, for their action and figure, were worthy of being transferred to any gentleman's stud. They are, he adds, kindly treated, well fed, and *remarkably* docile. They are in general about 15 or 15½ hands high. Those of settlers in the less improved parts of the country are, of course, a smaller and inferior breed, but hardy, tractable, and easily fed and stabled.

The sheep of New York state are Saxon and Merino, and the wool brings 2s. 8½d. per lb. in good years; in others, only 2s. 1d. They raise fine crops of turnips (where this management is attended to), and rear many sheep, the prices fluctuating: ewe fetched in 1831, 9s.; the year before, only 4s. 6d. Some farmers brought a sheep-doctor from England, and gave him 27s. each 100 sheep for his attendance to this kind of stock only.

The prices at which farm produce sells vary exceedingly in different places, according to the demand and the distance from markets. In New York state, wheat brought 1 dollar to 1¼ dollar per bushel; maize, 2s. to 2s. 6d.; oats, 1s. 2d. to 1s. 6d.; barley, 2s. 11d.; potatoes, 1s. 3d. Good ordinary horses, L.20 to L.25. Oxen, per pair, with yoke and chain, L.20 to L.30. Cows, L.4, 10s. to L.6. Merino sheep, 9s. to 18s.; Saxony, 13s. 6d. to 45s.; common sheep, a sort of coarse small Leicesters, 4s. 6d. to 9s. after shearing. Brood sow, L.2, 5s. to L.3, 10s. Hogs, 1d. to 1½d. per lb. on live weight. Geese, 2s. 10d. a pair. Turkeys, 2s. 1d. each. Fowls, 6½d.—*Utensils* cost: Farm-waggon, L.13, 10s.; ox cart, L.10; ploughs, L.1, 10s. to L.1, 16s.; good double harness, L.18.

Dairy articles, from the labour and attention they require, are high in proportion to other things; and, from the same cause, they do not pay the farmer so well, nor are they so much attended to.

Orchards are a matter of considerable attention in America, and apples, peaches, and cherries, thrive in the greatest beauty and luxuriance. The orchard itself is a considerable ornament to a farm-house, and its fruit can be disposed of to advantage either fresh or preserved, if near a town; and if not, it yields a luxury to the farmer and his family, which their whole earnings could hardly purchase in this country. Little attention is paid to the appearance of gardens, which are in general ploughed; labour being too dear to admit of spade husbandry; the Americans, indeed, scarcely know how to handle that instrument.

Many parts of the Union are highly propitious for the growth of flax and hemp, the hemp of Kentucky being found not inferior to that of Riga. Hops thrive well in New England. The rearing of the silk-worm is a profitable occupation in Connecticut. Cotton, tobacco, rice, indigo, and sugar, may be said to form the staple products of the more southerly states. The vine, which seems to be indigenous to America, and is found in the forests, has within these few years been successfully cultivated in Indiana, and in many other parts of the western states, the first cultivators being a body of Swiss settlers. Of one of these vineyards, Mr Flint thus speaks—

"We have witnessed nothing in our country in the department of gardening and cultivation which can compare with the richness of this vineyard in the autumn, when the clusters are ripe. Words feebly paint such a spectacle. The horn of plenty seems to have been emptied in the production of this rich fruit. We principally remarked the blue or Cape grape, and the Madeira grape. The wine of the former has been preferred to the claret of Bourdeaux."

In the northern states, farmers make sugar from the maple tree; and as the produce is of excellent quality, and cheaply procured, this becomes a branch of industry well worth attending to, at least for domestic consumption. The tree flourishes best in hilly districts, where it rises to the height of sixty or seventy feet, with a thickness of one foot or more. The work of making sugar from its juice commences in February or March, when the frosts are most intense, and no other farm-work can be done. Holes are bored, ascending about half an inch obliquely into the tree, by means of an auger three quarters of an inch thick; into these, small pipes of the branches of the elder tree are inserted, and the sap flows through them into troughs placed below. After a quantity is collected, it is put into boilers holding eighteen or twenty gallons, and boiled to a syrup, which, after cooling, is strained through woollen cloths. It is then boiled repeatedly to a proper consistency, and afterwards put into moulds. The whole process is carried on in the woods, where small sheds or tents are erected for the boilers, and for sleeping. Three persons will attend 250 trees, from which they produce 1000 lbs. of sugar (20 lbs. to each tree), better than the brown sugar of the colonies, and, when refined, as beautiful as any that can be made in England. The West India sugar can be brought to market cheaper than the produce of the maple; but to those farmers who make it for themselves in the winter season, this American sugar may be said to be got for nothing.

There are some fruits cultivated in the United States which are not known in this country. Among these is the papaw-tree, which is not uncommon in the bottoms which stretch along the rivers of the middle states, but is most plentiful in Kentucky and the western parts of Tenessee. It attains the height of twenty feet, about four inches thick. The fruit resembles a cucumber, and, when ripe, is of a rich yellow: the pulp resembles egg custard in consistence and appearance; it has the same creamy feeling in the mouth, and unites the taste of eggs, cream, sugar, and spice. It is exceedingly nutritious, and in its native woods was a great resource for food to the Indians. So many tastes are compounded in it, that it is said no person at first eats it without being tempted to laugh at the unexpected and whimsical combination. The *persimon* is another fruit not known in this country, which grows to considerable perfection near New York: the ripe fruit is about as large as the thumb, of a reddish complexion, round, fleshy, and furnished with six or eight stones; but it requires to be mellowed by the first frost before it be eaten, when it becomes very palatable. The fruit is produced in amazing abundance, and is used either for eating from the tree, for making a kind of beer, or for distillation. The tree, however, is not, upon the whole, more advantageous than the apple and peach.

There are few persons established on farms in the states who have not access to some stream in their neighbourhood for fishing, if they are fond of that pursuit, either for amusement, or as a means of providing food for their families. Every one has the privilege to avail himself of all the treasures of the waters, without let or hindrance; and they are worth taking advantage of. The shad and the salmon, of excellent kinds, abound in the rivers of the eastern states, and beautiful trout are taken in those of the north. Among the fish of the western waters are noticed the perch, one of which, the buffalo-perch, is a fine fish for the table, weighing from ten to thirty pounds. The pike, the perch, and other fish of the Illinois, and the rivers connected with it, are represented as excellent; a line called a trot-line, drawn across the mouth of the Illinois, with hooks at regular distances, took five hundred pounds in one night. The whole of the fish of the Mississippi are not, however, of equal quality for eating; the kinds which are chiefly admired are the trout, the small yellow catfish, the pike, the bar-fish, and the perch.

In recounting the privileges of the farmer, it would be improper to pass over the game, which is abundant in the American woods, and which may sometimes afford amusement, sometimes an agreeable variety of food. The mallard, or common wild-duck, is found in every fresh-water lake and river of the United States. The canvass-back duck is an American species, altogether unknown in Europe; they are found in the rivers Hudson and Delaware, but principally frequent the waters of the Chesapeake, where they feed on the roots of a certain grass-like plant abundant in these streams; they float about in shoals, but are exceedingly shy, and difficult to be shot. The delicacy of their flesh, and the high price they bring in towns, render them an object of lucrative pursuit to numbers. In general, however, with regard to game of all kinds, though plentiful and excellent, it is no object with the chiefly colonist, who does not care to waste his time in following it. Mr Fergusson of Woodhill met in Canada with a young Scotsman who had been a poacher in Scotland, but was now settled and thriving well on a farm of one hundred acres in his new country. Mr Fergusson said to him, "You will need neither certificate nor qualification here: what do you principally shoot?" "Indeed, sir," said he, "if you'll believe me, I scarce ever think about it, for there's naebody here seeks to hinder us." A herd of deer only two days before had wandered past him while at the plough, yet Walter felt no inclination to run for his rifle, though it stood loaded in the house.

WAGES OF LABOUR, AND COST OF LIVING.

The price of articles varies in different places, so that no general average can be stated either of wages or of the cost of living: both are different in different circumstances. But we have selected, from the best authorities, such lists, for several of the chief towns and districts, as will enable the reader to judge for himself.

Albany.

For Albany, on the river Hudson, we have, from good authority, the following statement:—

Wages.—Men for general farm work—Summer, L.2, 5s. per month; winter, L.1, 7s. per month. Harvest work, cradling wheat, 4s. 6d. per day. A cradle scythe is said to cut four acres a-day, and requires one man to bind to each cradler. Hay cutting, 2s. 7d. per day. Board found besides to all these. A steady active farm overseer or bailiff has about L.45 money wages, a capital house, a cow, and some other advantages. A man gets 8 guineas (or 21 dollars) for three weeks' work drying hops. Good cooks, 18s. to 27s. per month; chambermaids, 13s. 6d. to 18s. per month; washerwomen, 4s. per day; servant girls, 18s. to 24s. per month.

Provisions.—Wheat, 6s. 6d. per bushel; beef, per quarter, 18s. to 23s.; per lb., 2d. to 4d.; mutton, 1½d. to 2d.; veal, the same; pork, 22s. to 27s. per cwt.; butter, 5d. per lb.; cheese, 2d. to 4d. per lb.; eggs, 4d. to 5d. per dozen. Brandy (French), 4s. 6d. per gallon; gin, 3s. per ditto; whisky, 1s. to 1s. 1d. per ditto; excellent table beer, 4s. 6d. per barrel of 32 gallons. Firewood, 13s. 6d., country price; 22s. to 27s., town price, per cord of 128 cubic feet, delivered four feet long, and cost 2s. per cord to cut to lengths required for use.

"The American farmers," says Mr Fergusson, "live comfortably, and at a very moderate expense. Candles and soap are generally manufactured from kitchen refuse. A good housewife assured me that the butcher-meat for her family, 15 in number, did not exceed, in *whole*, one shilling per day (three meals), except when she allowed them turkeys and other poultry, when she reckoned the expense at 2s. 6d. The flour consumed did not exceed 4s. 6d. per week. They have fruit, both fresh and preserved, in the utmost profusion; and the cider barrel is always ready broached. A good many articles of clothing are spun and woven at home; and the geese are subjected to periodical contributions, towards the bedding of the household, or the feathers are sold at a good price."

Baltimore.

Mr Pickering, who went to this town to look for a situation as overseer of a farm, mentions the following prices as current there:—

His own lodgings and board, at a respectable ship-carpenter's (including washing and mending), 13s. 6d. per week.* In the markets, beef, 2d. to 3½d. per lb., the best cuts, 4½d.; pork from 2d. to 3½d. per lb., and sometimes lower; veal and mutton, by the quarter, 1s. 2d. to 2s. 3d.; good lamb, 4d. per lb. Turkeys, 1s. 2d. to 2s. 3d. each; fowls, 6½d. to 9d. each. Cabbages (drumheads), 1d. to 2d. each; potatoes and turnips, 10d. to 14d. per bushel. Wild-ducks, 3½d. to 5d. each; the canvass-back duck, a large bird, and esteemed a great delicacy, 13d. to 18d. each.; partridges, 4d. to 7d. each; quails, 1d. to 2½d. each; hares and rabbits (small), from 6d. to 1s. each; shad (a fine fish like a herring, but ten times the weight), 13d. to 18d. a pair. Apples, very fine, 13d. to 2s. 3d. per bushel; green peas, 1s. to 1s. 8d. a peck.

Ship-carpenters' wages from 7s. to 8s. per day, which was higher than the usual rate, on account of a great demand for hands at the time. A young man, bound apprentice to a shipwright, had 13s. 6d. per week, wages for first year, and 22s. 6d. per week second year, to board himself.

Philadelphia.

In the "Price Current" of Philadelphia we find the following rates given on wholesale articles:—Mess beef, per barrel of 196 lbs., 45s. to 47s. 2d.; butter, per lb., 4½d. to 5d. (best quality); biscuit, best, per lb., 2d.; mould candles, per lb., 5½d.; dipped candles, 4½d; cheese in casks, 3d. to 4d.; coffee, 5½d. Brown shirting, 3d. to 4½d. per yard. Flour, superfine, per barrel of 196 lbs., 20s. 1d.; Indian corn meal, per 196 lbs., 13s. 1d.; hams, 5d. to 5½d. per lb.; honey, per gallon, 2s. 1d.; loaf sugar, per lb., 6½d. to 8d.; brown sugar, 3½d. per lb.; brandy, per gallon, 7s. 2d.; Virginia tobacco, 1½d. per lb.; Cuba tobacco, 5½d. per lb.; wine, Madeira, per gallon, 5s. 2d. to 13s. 6d.; Port wine, per gallon, 4s. 6d. to 5s. 9d.

These are the wholesale prices; articles of provision are furnished in the markets as follows:—The best beef from 3½d. to 6¾d. per lb., according to what part of the animal is selected; fat mutton, of excellent quality, 3d; chickens about 2s. 1d. a pair; turkeys from 3s. 6d. to 7s. a pair. Butter varies, according to the time of the year, from 6½d. to 18¾d. per lb., averaging about 12½d. Superfine wheat-flour, 10s. 8d. per barrel of 196 lbs.; kidney beans, 1s. 1½d. per peck; cherries (good), 2½d. per lb.; good rye whisky, 1s. to 1s. 2d. per gallon; corn do., less.

As to the prices of labour in Philadelphia, and the surrounding country, we find it stated, that a labouring man gets from 3s. 2d. to 4s. 6d. per day, in the cities; and at farm-work, in the country, he receives from L.1, 10s. to L.2, 14s. per month, besides board and lodging. An attentive handy servant girl is readily engaged at 4s. 6d. per week (besides her board, of course).

New York.

The provision market here seems to be cheaper than that of Philadelphia, as we find the best beef quoted at 2d. per lb. Journeymen mechanics are hired at 6s. per day, and some that work by the piece earn 8s. per day. House-carpenters, bricklayers, and brick-makers, find ready employment (except in the dead of winter), at 4s. 6d. to 7s. or 8s. per day; and shoemakers, tailors, and persons well acquainted with any common or useful trade, easily find work, according to these rates. It must be remarked, that tradesmen in America work long hours, that is, from sunrise to sunset. Mr Stuart of Dunearn says of this circumstance, that he does not think the employer gets any additional work done by it, the people being much more disposed to loiter than when the hours are shorter. It may be remarked, also, that the long summer day at New York is about an hour and a half shorter than that of London.

With regard to prices generally, it deserves to be mentioned, that those of imported articles, such as

* The living was, a roast turkey once or twice a-week, fowls, beefsteaks, ham, sausages, and a kind of pudding; pies, soup, fish, &c. A variety of the above was placed on the table at every meal, and generally three kinds of vegetables, with coffee or tea at breakfast and supper.

tea, sugar, coffee, &c., are higher in places at a distance from the sea and the great towns, and that articles of home provision are cheaper there. This arises from the expense of carriage in both cases, what is produced and sold at home having always less charges on it than what is brought from a distance. Clothing is rather dear in the states, especially woollen; worsted stockings and worsted mits, for instance, are considerably higher than in England.

These notices will serve to convey an idea of the cost of living and of wages in most parts of the eastern states, where emigrants first land. They will be found to vary, as we have already mentioned, in different places, and according to circumstances; but it appears generally that there is full employment for labour, with wages according to the kind of business, from 3s. 6d. per day, with board, to 9s. per day without board, the most laborious or most ingenious trades receiving the highest remuneration. The cost of living may be inferred from the prices of beef and wheat, the former varying from 2½d. to 4d. per lb., according to the quality or the demand, the latter generally about 4s. 6d. per bushel, or 18s. per boll.

Wages and Living in the Western States.

We find the following list given for the prices at Cincinnati, on the Ohio, which may be reckoned the capital of the west, and is the point to which emigrants first direct their steps in that quarter.

Flour, 9s. per cwt. of 112 lbs.; Indian corn, from 6½d. to 8d. per bushel; mutton, 2d. per lb.; cider, 4s. 6d. per barrel; bacon, 2d. and 2½d. per lb.; shoulders, 1½d. per lb.; hams, 2½d. per lb.; freesold butter, 2½d. and 3d. per lb.; mould candles, 5½d. and 6d. per lb.; dip candles, 4½d.; coals, 4d. and 4½d. per bushel afloat, 5d. and 6d. in the yard; coffee, 6d. and 9d. per lb.; teas, 1s. 6d. to 2s. per lb.; sugar, 4d. to 5d. per lb.; copper sheeting, 18d. per lb.; old copper, 9d. per lb.; cigars, 20s. per 1000.

We have mentioned these prices for the sake of comparison; but as the western states form a country in some measure different, and almost foreign to the Americans themselves (those of the old settled districts), we shall give an account of them separately, to which we refer our readers in another page.

EXPENSES OF TRAVELLING.

Mr Pickering, to whom we have formerly referred, travelled in search of a situation as land steward, and has been particular in noticing the expenses of his journey. The following are some of his notes:—From Brunswick in New Jersey, to New York, partly by steam-boat, and partly by coach, 196 miles, 11s. 3d., luggage included; dinner on board, 3s. 4½d.—the fare, fish, flesh, fowl, puddings, pies, tarts, brandy, &c. On landing at New York, he got lodgings, after some search, at a tavern, where he paid for lodging 6½d. per night, and 13½d. for each meal; five beds in the room he slept in. Went on board the steam tug-boat for Albany; the fare 4s. 6d., one trunk included, and paying 1s. 1d. for the other. In the steam-boat the fare is higher; the distance is 145 miles; he took provisions with him for 24 hours, as did the rest of the passengers. From Albany he took passage in the canal to Lockport, near Lake Erie, distance 300 miles—fare, a little more than one penny per mile for himself and one trunk, paying 3s. 4½d. for the other, which weighed 75 lb. Passed over a ferry on the Niagara river, to Canada—charge, 13½d. This was in the year 1826.

Mr Fergusson of Woodhill travelled the same route from New York to Albany, some years later (1831). The charges of freight were then considerably lower; he went in the cabin of the North America, a magnificent steam-boat, and paid only 9s. fare for the whole 145 miles, with a very moderate charge for meals—being 2s. 3d. for dinner, including brandy, whisky, and Hollands, placed on the tables at the discretion of the passengers. He returned from Canada by the Erie Canal to Rochester: the fare from Buffalo to Rochester, 94 miles, 15s. 9d., three capital meals included—the boats good, the cabins amply supplied with books and pamphlets, and the tables with good cheer. Travelled by hired coach from Geneva to Albany, 170 miles, L.1, 11s. 6d. No extra charges given to coachmen or other persons.

Mr Fergusson afterwards went from New York to Washington, and found the charges as follows:—From New York to Philadelphia, by Bordentown (where Joseph Bonaparte lived), by steam, with 30 miles of land-carriage, 18s., including breakfast and dinner; went in the William Penn steam-boat from Philadelphia to Baltimore, 120 miles (going through the Delaware and Chesapeake Canal, 14 miles), fare 18s.—breakfast and dinner, both excellent, were charged 2s. 3d. each. From Baltimore to Washington in the stage-coach, 38 miles, fare 13s. 6d.; got a neat light coach, a pair of sleek well-fed horses, and a black driver to go to Mount Vernon (the former residence of General Washington), a distance of about 12 miles, fare 13s. 6d.

In the account of travelling expenses, it must be noticed, that passengers may always carry their own provisions when in steam-boats, or canal boats, and, by that means, reduce the amount very considerably.

MANNERS OF THE PEOPLE, AND THEIR CONDUCT TOWARDS STRANGERS.

We have now presented a fair and impartial view of the United States of America, as regards their suitability for the purposes of intending emigrants; leaving for another sheet a historic account of the country, and a variety of details relative to its commercial character and resources, but not of such immediate interest to settlers. As the preceding information has been very carefully drawn from every accessible source, and rendered as complete as possible, nothing remains to be mentioned which can concern the interest of emigrants, unless it be a few observations on the manners of the people they have an intention of residing amongst.

Few persons know or care about those little peculiarities of speech or manner in which the people of one county or district differ from those of another; as, for instance, in what the dialect of the natives of Yorkshire differs from those of London, or that of the people of the south of England from the same class in the north of Scotland. These matters are of very slight importance to the comfort of a stranger going to reside among them; but it is of some consequence for him to know if the new people with whom he is going to pass his life are kind and hospitable to those who come among them, or if they are jealous and intolerant in this manner, and disposed to repel the advances of strangers. There are many such people look on all new comers as intruders, and take every means to make them feel that the country they have come to belongs to others. Is this the case with regard to America? may be naturally asked by emigrants who think of proceeding thither. On this subject we might appeal to the many invitations which are daily circulated by the Americans and their friends, calling on all who are destitute of employment and subsistence in Europe, to come freely to that country, where they are assured of cordial welcome and abundance. But the following extracts from the journal of Mr Fergusson may show how our wealthy travellers are received there; and we shall by and bye subjoin a similar specimen of what the poor are to expect.

"I could say much," says Mr Fergusson, "were it proper, of the hospitality of New York, and of the unostentatious kindness with which my letters of introduction were received. The style of living is elegant and comfortable, and the domestic circles which I had the pleasure of joining seemed truly unaffected and happy. The quiet, modest, and amiable tone of female society particularly pleased me."

We give a second extract from the same traveller.

"I learned also, from a Scotsman in Mr Thorburn's employment, whose family had suffered heavily from sickness last winter, that flowers and parties by no means engross the sole attention of the ladies of New York. He assured me, that, within his own observation, it was quite wonderful what they continued to do, in visiting, clothing, and attending to the poor. This man left Glasgow in great destitution about a year ago. He is now in comfortable circumstances, and his family provided for; but the first fortnight which honest Saunders Lee spent in New York, a total stranger, without money or engagement, he described with a shudder, as '*perfectly awful*.'"

Mr Pickering, who arrived a total stranger, and without employment, lodged at the house of a ship carpenter, where he says he was treated with great kindness. Speaking of Christmas day, he says—

"The moment I arose this morning, I was presented with a glass of 'egg-mogg,' as they called it—a compound of rum, eggs, milk, and sugar; also with ginger-cake, and a cake with raisins in it, which is their 'Christmas cake'—all for merry-making and parties. I was pressed to one in the evening with the carpenter and his wife; a number of fine females and young men present; quite a sociable party; the females easy and unaffected; broke up early, by request of our host, next day being Sunday."

It must be recollected that the person who was thus kindly entertained was a total stranger to the whole party—an Englishman—without friends, and with very little money.

The following extract is from the letter of a female emigrant, whose husband had fallen sick on his arrival. The letter is dated

"*Brooklyn, Long Island, near New York*, 18[illegible].

"We hired a room, and my husband bought a saw, and went sawing wood, and doing any thing; and we thought we should get through the winter pretty well; but after about three weeks, he was taken ill, and it proved to be a typhus fever. We had no parish to apply to for relief; but you would be astonished at the friends we have found; for people that were quite strangers have called to know *if the sick Englishman lived here*; one kind gentleman sent for a doctor, and another good old Methodist gave me leave to go to the grocers for any thing in his name; and others were equally kind. I never thought I should meet with such friends among strangers. Husband is now mending fast."

Mr Flint says—

"To-day a vessel from Dumfries arrived; and a few minutes after she was moored, one of the brothers Messrs Ronaldson went aboard, making inquiries after the views and circumstances of the poorer classes of emigrants. He employed one of them, pointed out where several others would find work, and gave advice to the rest. This is not a new or rare instance of benevolence on the part of these gentlemen."—"Every day numbers of European emigrants are to be seen in the streets (of Philadelphia); I have never heard of another feeling than good wishes to them."

It is frequently mentioned that difference of rank or of wealth is not so much thought of in America as in this country, and that the industrious labouring man stands more nearly on an equality with his employer than with us. The following extracts relate to this subject.

Extract of a letter from a labourer:—

"A person must not think of coming here without working; and they despise drunkards; but if a person keeps steady, he is respected much more than in England; he is admitted at table with the farmer."

The following extract is illustrative of American manners in various respects. It is from Mr Stuart:—

"When they meet us walking, they, whether acquainted with us or not, frequently stop their vehicles, and very civilly offer us a ride with them, and will hardly believe us to be serious when we decline to avail ourselves of their kindly meant invitations, and tell them we prefer to walk. There are few more striking points of difference between this country and Britain, than in the numbers of people who ride and walk on the public roads. It absolutely seems disgraceful to be seen walking. The circumstance, no doubt, proves the easy circumstances of the mass of the people, as well as the value of time to a mechanic, whose wages may be from one to two dollars a-day, and who can better afford to pay for a conveyance and spend less time, than to walk and spend more."—"We have not hitherto," he adds, in another place, "seen any thing like a poor man's house, or a beggar, or any one who did not seem well-clothed and well-fed."

Such are some of the traits of character of the inhabitants of North America, who, although speaking the English language, and living under institutions strictly English in their character, differ, as may be supposed, in several respects in their manners from the people of this country. They do not lay claim to that artificiality and polish which distinguish what is called "good society" in Great Britain; they are more downright and frank in their behaviour, less ceremonious, and are in every way a more independent people in their thoughts and actions than the generality of English and Scotch. From all that we can understand of their character, they seem to possess less of the quality which produces "cringing" than any people on the surface of the earth. It may be conceived, from the extraordinary mixture of classes of persons from most European countries, and the wide field offered for adventure and enterprise, that the Americans have little of that staidness of disposition and subdued tone of mind which are characteristic of the British nation. Society, in the partially settled districts, is, therefore, still in a loose condition; and emigrants will require to be more alert in regard to their interests, and much more on their guard against deception, than in this old established country. It is deeply to be regretted, that, for a number of years, there has been a class of writers in Great Britain—we would particularly instance those of the *Quarterly Review*—and a few travellers, whose deeply-rooted object it has been to vilify the American nation in the gross, and to hold up not only their institutions and usages, but all that belongs to the country, whether in nature or art, as fit subjects of ridicule and contempt. The unworthy calumnies which have been industriously circulated by these splenetic writers, need not in the smallest degree produce hesitation among emigrants in reference to settling in the United States. The citizens of the North American Union are essentially British in their origin and character. Their other peculiarities have naturally arisen from the fortunate circumstances under which they are placed; and in which peculiarities we would equally partake, had we fewer public burdens, fewer causes to be careworn, as well as a greater scope for the profitable exercise of our industry. In comparing Canada with the states, every intelligent traveller allows, that the citizens of the Union are infinitely more active than the subjects of Great Britain. Within the colonial territories, all public works, and most of the settlements, proceed slowly, the system seeming to be rather inert; while on the states' side of the boundary, every species of work proceeds with the most astonishing rapidity—canals being cut, railways formed, and towns built, in an inconceivably brief space of time. As Upper Canada has nearly the same natural advantages as the states, and as the people, it may be presumed, are as well educated and as generally intelligent, it would seem that the true cause of the difference we specify is in the mode of conducting public affairs. It may be conceded, that the provinces are as well managed as they could possibly be; but it must also be allowed, that it is not in the nature of things that a country, with its seat of government three thousand miles distant, can be so advantageously conducted as another country, where the government is not only on the spot, but consists of the people themselves. It is not, however, our object here to draw any comparison betwixt the political condition of the colonies and states. Both have free institutions, and both possess those capabilities which can yield comfort to settlers. The honest, the industrious, and the enterprising, will do well in either, and will command respect and ascendency wherever they may fix their place of settlement.

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ACCOUNT OF THE GLOBE.

The above Engraving represents some of the more remarkable Phenomena of Nature, which will be found described in full in the body of this article.—On the right is a view of Fingal's Cave, one of the most remarkable specimens of Basaltic Columns.—On the extreme left, a Submarine Volcano is seen belching forth its red-hot melted rocks from the bosom of the deep.—In the distance is a Volcanic Mountain, and to the right of it, Granitic Rocks.

ASTRONOMICAL DESCRIPTION.

The Earth, or Globe, which we inhabit, and which for many ages was supposed to be the centre and principal part of the universe, is only one of eleven primary planets, or similar globes, which revolve round the sun at various distances, and the whole of which together, including the sun, form but one of innumerable similar systems, which are disposed in the immensity of space.

The Earth is the third of the planets in point of distance from the sun (that distance being ninety-five millions of miles); in point of size, it is one of the smallest—Jupiter, for instance, being many hundred times larger. Its thickness from pole to pole is 7898 miles; in the other direction, it measures 7924. The difference of 26 miles causes an imperceptible departure from the spherical, into what is called the *spheroidal* shape; and it is assumed, as a proof of the originally fluid state of the earth, that this is exactly the form which a melted or liquid globe naturally takes in revolving in space. The revolution of our globe round the sun occupies 365 days, 5 hours, 49 minutes, and 57 seconds, which, as every one knows, constitutes a year of time. It has another revolution round its own axis, which is performed in 24 hours: this again, as every one knows, constitutes a day. The former revolution produces the seasons; the latter, day and night.

SURFACE OF THE EARTH.

The greater part of the surface of the globe is covered by sea, and the land appears insulated in larger or smaller masses within that envelope. A mass of the larger kind is called a continent; of the smaller, an island.

Of continents there are properly two. The larger and first known overspreads a great part of what is called the eastern hemisphere or half of the globe, and is divided into Europe, Asia, and Africa. Another continent of less extent exists in the western hemisphere, and is divided into North and South America.

Of islands there is a great multitude, the largest being New Holland, in the Southern Ocean, while the most important is that of Great Britain, on the north-western confines of Europe.

The mass of the earth is composed of the various substances which we are accustomed to call land, and the sea is only a covering of greater or less depth. The vast ocean called the Pacific, which in some parts interposes thousands of miles between America and Asia, is supposed to be only four miles deep at an average, and the Atlantic, which separates Europe from America, is supposed to be only three. In order that such a large mass of waters might be preserved from putrifaction, it is replete with salt, of which the Southern and Mediterranean Seas are said to contain a somewhat larger proportion than others. The other substances found in the sea are sulphates of soda, magnesia and lime, and carbonate of lime and magnesia, which, collectively with salt, exist in the proportion of three to four per cent.

The surface of the land, from being very uneven, is in many places indented by large sheets of water, which have obtained the name of inland seas; such are the Mediterranean, Baltic, and Red Seas. If the extent of such seas be less, and the openings larger, they are called gulfs or bays. The still smaller portions of sea, surrounded to a considerable extent by land, and which afford a shelter for ships, are called ports, creeks, or roads. Those masses of salt water which are enclosed by the land on all sides, and have no communication with the main ocean, are termed Caspians, from the Caspian Sea, which is the largest of them. The saltness of these bodies of water has been variously accounted for, some supposing that they have been cut off from the ocean by a change in the relative level of land and water; and others, that the saltness arises from their occurring in countries impregnated with that matter. In support of the latter theory, it may be stated that salt springs are numerous where the Caspian, and the Lakes Aral, Baikal, &c., are situated.

LATITUDE AND LONGITUDE.

In order to describe accurately the position of any place, geographers have divided the circumference of the globe into 360 degrees or parts, each of which contains 69½ English miles. A quarter, or 90 degrees, of this circumference, lies between the equator or girth-line of the earth, and its poles, in all directions. A half, or 180 degrees, lies between any one point on the equator, and the spot exactly opposite. Thus, when it is desired to indicate the position of any place, the geographer first mentions how many degrees and parts of degrees it is either to the north or south of the equator—which is called *latitude*; and then points out how many degrees and parts of degrees it is from an imaginary line cutting the equator, of which almost every nation has established one for itself; and this is called longitude. In Britain, the great Astronomical Observatory at Greenwich is held to be the starting point for measuring longitude.

There are other circles on the face of the earth, all established for astronomical and geographical purposes.

MOUNTAINS AND PLAINS.

The surface of the land is composed of slopes of every degree of inclination, extensive and nearly level plains, grooves, depressions and cavities, ridges and eminences of all kinds; the highest of which bear so insignificant a proportion to the earth's diameter, that the globe, if reduced to the size of an orange, would not present asperities so palpable as those on the surface of that fruit. The bottom of the sea presents inequalities similar to those exhibited on the surface of the land.

The most remarkable elevations are those series or *chains* of mountains, which stretch through large tracts of country—such as the Himalayas of Asia, the Andes of America, the Alps, the Appenines, and the Pyrenees, in Europe. The Himalayas are the highest hills of which the height has yet been ascertained, being 25,000 feet and upwards above the level of the sea. These chains are intersected by vallies, which slope towards the surrounding countries, and afford the sources of the numberless streams which carry off the rain waters to deposit them in the ocean. The tops of hills are sometimes like sharp cones, sometimes are round and swelling, and occasionally present extensive plains, or what are called table-lands. In obedience to the laws of nature, such waters as rise out of the ground, or fall from the heavens in elevated districts, glide into the hollows, or vallies, and there form rivers, which, in proportion to the extent of country drained by them, are either large or small. The longest and largest river in the old continent is the Danube, which runs through Germany and Turkey. In America, however, there are streams of much greater magnitude—such as the Mississippi, which runs 4300 miles, or a fifth part of the circumference of the globe, and the Amazon, which is only 300 miles shorter. In some instances, water rests in large basins or hollows, and forms what are called lakes: the largest of these is Lake Superior, in North America, which measures 381 miles in length, and 161 in breadth. Sometimes lakes occur on the tops of mountains: one, called the Lake of Mica, on the platform of Antisana, in America, is 13,123 feet above the level of the sea.

The land is in many places nearly level for a considerable space, and thus forms what are called plains. In general, there are levels of more or less extent along the banks of all rivers, being formed by matter brought down and left there by torrents, and which, therefore, is called alluvial deposit. In other instances, but seldomer in Europe than in the other parts of the globe, there are vast plains unconnected with rivers. The Pampas of South America stretch from the base of the Andes to Buenos Ayres, over a space of 900 miles; and in Africa are vast expanses of nearly level ground, where the traveller, day after day, sees the horizon preserving the same distance as he proceeds, and bounding an ocean of arid sand. Large plains also occur at great elevations above the sea, such as those of Tartary, Thibet, and Mexico. In North America there are similar expanses, called prairies (*i. e.* meadows), which present a thick covering of natural grass. Among other remarkable indentations or hollows of the earth, may be mentioned the two great Scottish vallies, called Glenmore-nan-Albin, and Strathmore: in both of these instances, a straight line is observed for nearly a hundred miles, and the hollow is not in either case filled regularly by natural water, though the former has become the bed of a canal.

ALTERATIONS OF THE SURFACE.

All these substances, which, by the action of the atmosphere, and other causes, separate from the more solid parts of the earth's surface, are carried to a lower level by the agency of water in the shape of rains, rivers, &c. The effects thus produced are very remarkable. The hardest rocks, such as granite, are liable to decomposition, which has been attributed, and justly so, to the chemical as well as mechanical influence of the atmosphere. This destruction of the surface is common to almost all countries; it goes by the name of weathering. In some parts of England, the rubbish thus accumulated in the bottoms of vallies is thirty feet thick.

The fall of rocks is common in mountains whose lofty ridges are exposed to the alternations of frost and thaw. Water is the grand agent of destruction in this case. In filtering through porous rocks, it sometimes meets with clays, which do not admit of its passage. The clays become moistened; and if a large mass of rock repose upon them, it is loosened, and descends, like an avalanche, upon the plains below. Many falls of this kind occur; one which took place in Switzerland, in 1806, covered a beautiful valley with stones and slime, crushed one village with masses of rocks, overwhelmed another with mud, and destroyed above [illegible] individuals.

Rivers.—An immense quantity of mud, sand, and other substances, is carried down by rivers, and these accumulating at their mouths, are called deltas. During a flood, the transporting power of rivers is augmented, and sometimes trees and animals are hurried along, and entombed in the bottom of the sea. Lakes collect immense quantities of this matter: the Lake of Como, for instance, is nearly filled with it at the higher part.

The subject of deltas is a very interesting one. During a succession of ages, the Nile has transported an enormous quantity of mud and other rubbish into the Mediterranean, which at the mouth has accumulated into a constantly increasing delta. It has been calculated that the Nile has raised the surface of Upper Egypt about six feet four inches since the commencement of the Christian era. The delta of the Po advances at a rapid rate, in consequence of the shallowness and placid character of the Adriatic Sea, into which it flows. Adria was, in the time of Augustus, situated on the shores of the Adriatic: it is now twenty Italian miles inland, from the filling up of the sea by the Po, and other rivers. The Rhone, Rhine, Danube, Ganges, Congo, Mississippi, and all other rivers, accumulate immense quantities of mud, &c. at their mouths.

Action of the Sea on Coasts.—Many coasts bear ample evidence of the destructive effects of the sea upon them. In the eastern part of our own island, the sea has made very considerable encroachments within the lapse of a few centuries. The breakers, however, sometimes throw up a barrier against their own ravages, in the shape of shingle and sandy beaches. The former frequently become an excellent protection to the land, but the latter sometimes prove very destructive to it. When the sand is forced forward by the breakers, and accumulates into hills known by the name of *dunes*, it is often drifted inland by the winds, forming a sandy desert, and large tracts of country are thus overwhelmed by it. The progress of these dunes, according to Cuvier, is irresistible, forcing even lakes before them, and covering forests, houses, and cultivated lands. Many villages have been entombed by them; and in one department of France, ten are at this moment threatened with destruction.

In Africa, there are immense deserts of moving sand, which have made a desolating progress over vast tracts of territory. To the westward of the Nile, between the temple of Jupiter Ammon and Nubia, innumerable cities lie buried beneath them. Whole caravans are said to have been overwhelmed by the Lybian sands; and Burckhardt, the traveller, informs us, that after passing the Akaba, near the head of the Red Sea, the bones of dead camels are the only guides of the pilgrim through the wastes of sand.

Tides and Currents.—Tides are caused by the attraction of the sun and moon, and currents principally by the winds: the motion of the earth, however, has also some effect upon them. They are of importance in geology, as they may be the means of distributing the matter brought from the land by rivers over the bottom of the ocean. The stream caused by tides has a velocity of one mile and a half per hour, when there is nothing to oppose it. The transporting power of tides is very small, except in shallow seas. This is proved by the fact, that the bottom of various parts of the ocean, though consisting of sand and mud, has, according to the soundings of navigators, remained the same for a long period of time. Currents, like tides, have little transporting power in deep water, and it is only on coasts, and seas of small depth, that their effects can be traced.

Volcanos.—Those conical masses, through whose orifices various gases, cinders, ashes, stones, and rivers of red-hot melted rocks, are projected, have obtained the name of volcanos. The changes which these produce upon the surface of many parts of the earth, have been very great in all ages. Taken as a whole, they are always more or less in a state of activity over the globe, acting like safety-valves for the escape of that combustible matter, whose confinement would otherwise rend it asunder. The eruptions of volcanos are sometimes tremendous, scattering utter desolation for miles around, and converting a flourishing tract of country into a black and barren desert. One of the most terrible on record is that of Vesuvius, which happened in the year 79: besides laying waste the luxuriant vegetation that clothed the sides of the mountain, it overwhelmed the cities of Pompeii and Herculaneum, which are at present in the course of being redeemed from the subterranean darkness that has enveloped them for seventeen centuries. Volcanos abound in all quarters of the globe, and in some parts fill up the bed of the sea with ashes and other matter, for an extent of several miles. It is not uncommon for volcanic islands to emerge from the bottom of the sea: Monte Nuovo, near Naples, was thrown up in a day and a night, in 1538; its height is 440 feet above the sea, and its circumference about a mile and a half. Islands thus ejected sometimes disappear again, as was the case with Graham Island, which rose in 1831, off Sicily, and went down again early in 1832. Iceland may be considered as one vast volcanic mass, and the eruptions from its various craters have been frequent: that of 1783 is the most terrible recorded in the modern annals of the island; it destroyed twenty villages, inundated others with water; and immense quantities of cattle, together with nine thousand human beings, perished. The melted matter flowed in two directions, nearly opposite to each other: the one was forty, and the other fifty miles in length. It is unnecessary to multiply instances of the violence of volcanic eruptions, and their power in obliterating the beauty and changing the surface of the globe. We shall only mention the remarkable disappearance of a volcanic mountain, which took place in Java, in the year 1772. The largest volcano in the island, for two successive nights, was enveloped by a luminous cloud; the inhabitants betook themselves to flight, but before they had all escaped, the mountain fell in, accompanied by a sound resembling the discharge of artillery; vast quantities of volcanic matter were ejected, and scattered over a circumference of many miles: the extent of ground swallowed up was estimated at fifteen miles by six. Forty villages were engulfed or entombed in the substances thrown out, and nearly three thousand individuals perished.

Earthquakes.—The connection between earthquakes and volcanic eruptions is now almost universally admitted. They frequently occur simultaneously, and seem to be the effects of some cause as yet unknown to us. Every theory which has hitherto been offered as explanatory of the phenomena, is liable to serious objection in one respect or another. Earthquakes produce a motion of the ground, sometimes tremulous, and at other times undulatory; the latter is by far the most dangerous, and frequently spreads devastation far and wide. Instances of the destructive effects of earthquakes must be familiar to our readers, and scarcely require to be mentioned here The shock of an earthquake is sometimes felt over an immense circumference. That of Lisbon, in 1755, sent its undulations over nearly the whole of Europe, and even as far as the West Indies and the continent of America. Vast tracts of country have occasionally been elevated by earthquakes. The coast of Chili, in South America, to the extent of one hundred miles in length, was raised three or four feet in consequence of the earthquake which took place in 1822. In Mr Lyell's able work on geology, there is a great mass of evidence which goes to prove that earthquakes have produced such elevations in other places, and that depressions have likewise taken place. The following instance of such an occurrence will be read with interest:—In the year 1692, the Island of Jamaica was visited by a violent earthquake; the ground swelled and heaved like a rolling sea, and broke into rents, in which many people were engulfed, and some of them were vomited forth again, along with great quantities of water. Three quarters of Port Royal, then the capital, sunk down, with their inhabitants, entirely under water; and after the earthquake had ceased, the chimney-tops of houses were seen just projecting above the waves. A tract of land round the town, about a thousand acres in extent, sunk down in less than a minute, during the first shock, and the sea immediately closed over it.

Hurricanes.—The terrible violence of these visitations is well known. The velocity with which they travel, and the deluges of rain with which they are accompanied, effect considerable changes on the surface of a country. Whole towns are sometimes scattered in that confusion which the playthings of a child present, when, in a fit of anger, it strews them about, and tramples upon them. Not only buildings and animal life are destroyed, but whole forests are swept to the deep. A large amount of terrestrial animals and vegetables, along with the land-detritus, must, upon these occasions, be hurried into the ocean, and there deposited. Hurricanes are sometimes accompanied with submarine earthquakes. In Jamaica, in 1780, during a storm, a great wave burst upon Savanna la Mar, and swept the whole town away in a moment, leaving "not a wreck behind."

Springs.—Springs are generally impregnated with various kinds of matter, which they deposit in abundance. Many springs have the power of changing vegetable matter into a fossil, or stone. This process of petrifaction, as it is called, is carried on to a great extent in the hot springs of Furnas, of which Dr Webster gives the following account:—He found "branches of the ferns which now flourish in the island completely petrified, preserving the same appearance as when vegetating, except the colour, which is now ash-grey. Fragments of wood occur, more or less changed; and one entire bed, from three to five feet in depth, is composed of the reeds so common in the island, completely mineralised, the centre of each joint being filled with delicate crystals of sulphur." Travertino is a substance somewhat of the same description, and is to be found deposited from springs in layers of immense thickness. Those of Tivoli present an extraordinary accumulation of horizontal beds, from four to five hundred feet thick. The Bakie Loch, in Forfarshire, produces a marl used in the agriculture of the country. Mr Lyell is of opinion that it was immediately due to the shell-fish of the lake, which derive the lime either from the water or the food which they live upon, and that dying, their remains accumulated into heaps of shell marl. This was converted into rock by the action of the water, which was impregnated with an acid. Certain springs deposit a pitchy substance, called asphaltum; and others are covered with a combustible fluid, called naphta, which floats upon the top. Those of Rangoon, in a province of the Burman empire, are said to produce 92,781 tons a-year.

Coral Reefs and Islands.—These are the works of myriads of small insects, called corals. They occur in various parts of the world, but are most numerous in the Pacific Ocean and Indian seas. Their extent is sometimes almost incredible. On the coast of New Holland, there is a coral reef which stretches out to a thousand miles in length. The Pacific Ocean is studded with coral islands, some of which are of considerable magnitude. Corals do not commence their laborious operations at a great depth below water; from 60 to 100 feet is considered the utmost extent to which the islands extend downwards. They are generally of a circular or oval shape; and Mr Lyell is of opinion that corals build upon the rims and in the craters of submarine volcanos. The outer wall of the building emerges first above the waves, enclosing a pool of tranquil water. The seeds of vegetables are either brought there by sea-birds, or wafted by the ocean, and the islands soon become clothed with a mantle of green. The substance of which these islands and reefs are composed, is lime, which the corals extract from the sea-water, and cement together with a glutinous matter contained in their bodies. Mr Lyell, while surveying the Isthmus of Panama, detached a quantity of these animals, and placed them on some rocks in a shallow pool of water. On returning to remove them a few days afterwards, he found they had secreted stony matter, and had firmly glued themselves to the bottom.

Submarine Forests.—This name has been applied to those accumulations of wood and plants which are laid bare at the retreat of the tide, and are covered at high water. There are several both in England and Scotland. One occurs in the Firth of Tay, another in the Firth of Forth, at Largo Bay, and in the islands they are numerous. On the west coast of the mainland of Orkney, one was discovered, which has been thus described:—"Stems of small fir trees, ten feet long and five or six inches in diameter, are found partly imbedded in, and partly resting on, the surface of an accumulation of vegetable matter, principally composed of leaves. The stems were still attached to the roots, and the whole was greatly decayed, so as to be easily cut by the spade." At Mount's Bay, in Cornwall, there is a submarine forest. The vegetable bed consists of a brown mass, composed of the bark, twigs, and leaves of trees, which would appear to be almost entirely hazel. Intermixed with this are numerous branches and trunks of trees. At a foot beneath the surface of this bed, the chief part of the mass consists of leaves, amongst which are an abundance of hazel nuts. In this layer, there are also filaments of mosses, and portions of the stems and seed-vessels of small plants. Fragments of insects of the beetle tribe were also dug up, which at first displayed the most beautiful shining colours, but these small objects crumbled to dust on being exposed to the air.

Taking these facts in connection with the raised beaches and masses of shells, which are not unfrequent, it would appear that the relative position of land and water has been changed at some remote period by earthquakes, as we have seen was the case in Chili. It is impossible that trees and vegetables could have grown where they are now found, with the sea breaking over them. Besides their occurrence in other places, there are at Plymouth the remains of a beach, over which the sea has, without doubt, formerly flowed; it is now, however, at an average, thirty-three feet above it, clearly indicating that some internal convulsion has either raised the land, or sunk the bed of the ocean. In the Isle of Jura, in the Hebrides, there are six or seven terraces, or lines of beach, which appear to have been successively upheaved above the present level of the sea.

OF PEAT, AND THE VARIOUS REMAINS FOUND IN IT.

Peat bogs are formed in those situations which admit of vegetables decomposing without putrifying. A vast extent of surface in Europe is covered with these mosses, and in Ireland they are said to extend over one-tenth of the whole island. One of them, which borders on the Shannon, is fifty miles in length, and from two to three in breadth. Many of the peat bogs in the north of Europe occupy the place of immense forests of pine and oak, which have many of them disappeared within the historical era. "Such changes," observes Mr Lyell, in his able work on geology, "are brought about by the fall of trees and the stagnation of water, caused by their trunks and branches obstructing the free drainage of the atmospheric waters, and giving rise to a marsh. In a warm climate, such decayed timber would immediately be removed by insects, or by putrifaction; but in the cold temperature now prevailing in our latitudes, many examples are recorded of marshes originating in this source." A species of moss constitutes a considerable part of the peat found in marshes; and reeds, rushes, and other aquatic plants, can be traced. It would appear that many of the peat bogs are not more ancient than the age of Julius Cæsar. A great number of Roman coins, axes, arms, and other utensils, have been found in British and French mosses: and several of their famous roads (for even in road-making the Romans built "not for a day, but for all time") are now covered with peat several feet in thickness.

Peat possesses the remarkable quality of preserving animal substances for, it would appear, any length of time. In June 1747, the body of a female was discovered in a peat moor in the Isle of Axholm, in Lincolnshire. Her feet were furnished with antique sandals, and it has been supposed that she was an ancient Briton. Her nails, hair, and skin, are described as having shown scarcely any symptoms of decay. In Ireland, a human body was dug up which was completely clothed with garments made of hair. The clothing of the inhabitants was manufactured from this material before the introduction of wool; but many ages have transpired since this took place, so that the body must have lain an immense time, yet it was perfectly fresh and unimpaired. Amongst a number of cases of this description which might be brought forward, we shall quote the following, as particularly interesting:—"At the battle of Solway, in the time of Henry the Eighth (1542), when the Scotch army, commanded by Oliver Sinclair, was routed, an unfortunate troop of horse, driven by their fears, plunged into this morass (the Solway moss), which instantly closed upon them. The tale was traditional, but it is now authenticated, a man and horse in complete armour having been found by peat-diggers in the place where it was always supposed the affair had happened. The skeleton of each was well preserved, and the different parts of the armour easily distinguished."

Besides the human body, there have been found in peat bogs bones of the stag, ox, hog, horse, sheep, and other animals that feed on herbs, and in Ireland and the Isle of Man, skeletons of a gigantic elk. There are no remains, however, of animals such as the elephant and rhinoceros, which are only now to be found in warm countries, though, as we shall shortly see, they are quite common in mud and other rubbish. Upon this Mr Lyell remarks, "that they had ceased to live before the atmosphere of this part of the world acquired that cold and humid character which favours the growth of peat." This reasoning appears perfectly conclusive.

With regard to the question whence peat derives its antiseptic property, it has been conjectured by some, that the carbonic and gallic acids which issue from decayed wood, and also charred wood, which occurs in the lower parts of many peat mosses, may account for it. Vegetable gums and resins will also have an effect. Dr Macculloch states, in his work on geology, that the occurrence of tannin in peat is too casual, and its quantity too small, to produce effects of any importance. The power of tannin to prevent decay is well known, and its presence in almost all trees, but particularly, and in considerable quantities, in the oak, is also well known. Now, as has been already observed, many peat beds occupy the sites of forests, especially those of *oak* and *pine*; so that tannin, in these at least, must have been present in great quantities. It may have entered into various combinations, but that it really is to be found in such peat bogs, and to a considerable extent, either in a simple or compound state, appears to us beyond a doubt.*

DENSITY AND TEMPERATURE OF THE EARTH.

Various opinions have been entertained on the density of the earth;† but its attraction is such, that it is now no longer disputed that the density must continue to increase, in a somewhat regular manner, from the surface downwards. The mean density of the earth is about five times greater than that of water.

Whether the temperature of our planet be entirely owing to solar heat or not—for philosophers still differ upon this point—there can be no doubt of its being very materially influenced thereby. We have only to recollect, that the difference of seasons and climates depends upon the more or less vertical descent of the sun's rays. Local circumstances, such as the proximity and size of mountains and seas, have certainly a very considerable influence in varying the temperature; but the principle seems incontestible, that, under equal circumstances, the temperature decreases from the tropics to the poles.

That the temperature of the earth is not the same at present as it was formerly, but has considerably decreased, is proved by the organic remains of vegetables and animals having been found in situations of latitude, where, from a want of congenial temperature, they could not now exist. Plants and animals, now peculiar to a tropical climate, have been discovered imbedded in various rocky formations in Scotland, England, and other places even farther north. These interesting relics of a former world, as they may be called, will be described when we come to treat of the internal structure of the earth. Various causes, but none completely satisfactory, have been assigned for this change of temperature. By one party it is insisted upon, that the axis of the earth was by some cause or other shifted, and, consequently, that the poles were differently situated formerly from what they are at present. Sir J. F. W. Herschel supposes that a diminution of temperature might have been effected by a change in the ellipticity of the earth's orbit, which, though slowly, becomes gradually more circular. The theory of an internal heat has also been had recourse to for the explanation of this point. From the earliest periods, philosophers have entertained the opinion that a central heat exists; but it was only at a comparatively recent period that direct experiments were made, in order to put the hypothesis to the test. The temperature of mines has particularly attracted attention; and, notwithstanding that the experiments made on them are liable to error from various causes, they would seem to indicate an increase of temperature from the surface downwards.

The temperature of springs has also been appealed to in support of this theory. Many of these, rising from considerable depths, have a heat independent of solar influence, which heat varies from the boiling point of water downwards. They occur in all situations, and sometimes far removed from volcanos. In many parts of the Himalaya range they have been found, and Bakewell discovered them amongst the Alps. A great burst of thermal or hot springs takes place near the base of the Ozark mountains, in North America, and at a short distance from the Washita, from which they derive their names. They are about seventy in number, and occur in a ravine between two slate hills. The hot springs of Iceland are well known; those called the Geysers are the most remarkable. Sir J. Mackenzie witnessed an eruption of the great Geyser, which commenced with a noise resembling the distant discharge of a piece of ordnance. "The sound," says he, "was repeated irregularly and rapidly; and I had just given the alarm to my companions, who were at a little distance, when the water, after heaving several times, suddenly rose in a large column, accompanied by clouds of steam, from the middle of the basin to the height of ten or twelve feet. The column seemed as if it burst, and, sinking down, it produced a wave, which caused the water to overflow the basin in considerable quantity. After the first propulsion, the water was thrown up again to the height of about fifteen feet. There was now a succession of jets to the number of eighteen, none of which appeared to me to exceed fifty feet in height; they lasted about five minutes. Though the wind blew strongly, yet the clouds of vapour were so dense, that, after the first two jets, I could only see the highest part of the spray, and some of it that was occasionally thrown out sideways." The water at last sunk into the pipe in the centre of the basin to the depth of ten feet. It rose again, gradually however, and was found to have a temperature of 209°, only three degrees below the boiling point. There can be no doubt that heat is communicated to these springs at some distance from the surface of the earth, but whether or not from the supposed great fountain of central heat, is yet uncertain.

It has also been attempted to account for the superior temperature of the earth in remote ages of its history, by supposing that volcanic influence was formerly more active, and that, consequently, a more copious communication of internal heat to the surface would take place. But we have no proof that an activity in volcanos, sufficient to account for the phenomena, did ever really exist.

Mr Lyell has examined the subject with his usual philosophical acuteness, and his opinion is, that such a change in temperature may be accounted for according to the present order of nature. The degradation of old, and the elevation of new continents, is a demonstrated fact; and the influence of such a change in the relative position of land and water upon climate, is unquestionable, from what we know of it by actual observation.

If we compare the two continents of Europe and North America, we shall find that places situated in the same latitudes differ very considerably in temperature, sometimes to the amount of seventeen degrees of Fahrenheit's thermometer. The principal cause of the difference observed in corresponding latitudes of North America and Europe, is, in the first place, the connection of the former country with the polar circle, by a tract of land of considerable height; and, in the second place, in the separation of Europe from the arctic circle by an ocean. All large bodies of water have a tendency to preserve an equilibrium of temperature, which is communicated to the contiguous land; and hence the climate of islands and coasts differs very materially from that of the interior of continents. Mountains which rise into the colder regions attract and congeal vapour, which communicates its cold to the adjoining country. Greenland, which forms part of a continent stretching northward to the 82d degree of latitude, experiences under the 60th parallel a more rigorous climate than Lapland under the 72d parallel.

Upon this subject Mr Lyell observes—"If, for example, all other circumstances being the same, the land is at one time more divided into islands than at another, a greater uniformity of climate might be produced, the mean temperature remaining unaltered; or if, at another era, there were mountains higher than the Himalaya, these, when placed in high latitudes, would cause a greater excess of cold. So, if we suppose that at certain periods no chain of hills in the world rose beyond the height of 10,000 feet, a greater heat might then have prevailed than is compatible with the existence of mountains thrice that elevation."

THE INTERNAL STRUCTURE OF THE GLOBE.

Taking a superficial view of the continents and islands we have just been considering, they awaken no further idea than that they are a mass of rocks, sands, clays, and other substances, confusedly mingled together without order or arrangement. More careful inquiry, however, soon shows this conclusion to be erroneous. Phenomena of a very singular and unexpected character display themselves when we take a survey of the side of a mountain which has been laid bare, or look into the interior of a coal mine or a quarry. Instead of the miscellaneous accumulation of heterogeneous substances anticipated, we find a remarkable degree of order and arrangement. Successive layers of rocks appear regularly disposed, one above another, like so many volumes of books piled horizontally. Further inquiry shows that this is not an accidental and rare occurrence, which is confined to particular and far separated localities; for such an order is found to prevail universally over the whole surface of the globe; and even where it would appear to fail, the exception proves the rule, as there will always be discovered, in such cases, ample evidence that violence from beneath has been exercised in breaking the continuous and horizontal lines of rocks, thereby introducing anarchy and confusion; and we need not travel far for an explanation of all this: no one can be ignorant of the fact, that at the present moment, volcanos are at work in belching forth rivers of liquid fire through the solid floors of the earth, and not only destroying its internal organisation, but changing its external appearance.

This, however, is not all. When we come minutely to inspect what sort of substances compose the various rocks, we find that many of them are as thickly studded with the remains of animal and vegetable life, as is the midnight sky with stars. The strata thus cease to be, but accumulations of particular kinds of matter, interesting only in so far as their own origin and deposition is concerned: and we recognise them as tablets, wherein are inscribed in hieroglyphics, which are universally understood, and can neither become obsolete nor perish, the records of nature's history. The decay of man is hereditary in his works; and when these become dust, like the hands which

* We have been informed by Mr Stevens, an experienced land-drainer, that in Sweden, where he has drained an immense quantity of soil, the peat bogs almost invariably occur above prostrate forests, and that the trees for the most part consist of oak.

† Density is a term employed in science to express the comparative closeness or compactness of the particles of which bodies are composed.

fashioned them, it is once and for ever. They are destitute of the elements of renovation which we see in nature's, whereby they are made to reappear again, "another and the same;" or of that perpetuity of being which sets the lapse of indefinite periods of time at defiance, and to which, emphatically, a thousand years are as one day. The grapes of Zeuxis, and all the splendid pictorial achievements of antiquity, have long since been gathered up with the other spoils of time. But the myriads of animals imbedded in the bosom of the cold rock, uncounted ages before the creation of man himself, still exist, completely entire—all but alive—and reveal to us not only the minutest parts of their organic structure, and sometimes also their various shades of colour, but their habits and modes of life, where they lived, and what they fed upon. Such is the state of perfection in which the process of embalming is carried on in the grand museum of nature. We shall now proceed to give a more particular account of the

STRATIFICATION AND OTHER GENERAL CHARACTERISTICS OF ROCKS.

Rocks are said to be stratified when they occur in layers parallel to or above each other. When they are found, as granite is in a mass, without any such form or order, they are called unstratified. Strata differ in being more or less distinct, regular or irregular, straight or undulating: they are seldom found perfectly horizontal, and are of very unequal thickness.

Rocks, taken in the mass, are very nearly related to each other, nineteen-twentieths of the whole mineral contents of the earth being composed of five substances, namely, silex, alumine, lime, magnesia, and iron—(for a description of which, see below).—There are other minerals found in the solid parts of the globe, but they occur usually in veins, and are more especial objects of attention to the mineralogist.

To those unacquainted with the subject, many of the terms which we must necessarily employ will appear as unintelligible as Egyptian hieroglyphics, and to obviate this difficulty, the following alphabetical list of them, with explanations, is prefixed:—

Acids are compound substances, which have a sour taste, and, amongst other properties, they dissolve alkalies, earths, metals, &c.

Alumine is one of the earths, and enters most largely into the composition of rocks, clays, and loams, of which it is the plastic principle. When washed and thoroughly dried, it is of a white colour, and destitute of taste or smell. It is the base of alum, and hence its name.

Arenaceous, formed of sand.

Argillaceous, formed of clay.

Bitumen is an inflammable mineral substance, which burns with flame in the open air. There are numerous varieties of this substance which have obtained distinct names, such as naphtha, which resembles common tar, and asphaltum, similar in consistency to common pitch. All the varieties of pit-coal contain more or less of this substance.

Calcareous, formed of lime. Calx is the Latin name for that substance.

Carbonate, Carboniferous.—Carbon, or charcoal, is a simple body, of which the purest and most valuable specimen is the diamond. Combined with oxygen, one of the gases composing the atmosphere, it forms carbonic acid, an air which is fatal to animal life when inhaled: a carbonate of any thing—for instance, of lime—is carbonic acid in combination with lime. A carboniferous body is one in which carbon prevails.

Chemical action differs from mechanical action thus: —When a river washes away and carries any portion of the earth to the sea, the waste thus borne down is only mixed in the water, not intimately united with it by any chemical affinity: when, however, oxygen or an acid combines with any of the substances composing rocks, and forms a body different from either of the former two, then this is a case of chemical action. In the first instance, the integral particles were only separated from each other; in the second, they are both separated and united again with the solvents. In the one, a sediment is deposited; in the other, a precipitate.

Conglomerate is a mass of rounded pebbles cemented together.

Cretaceous, having the properties of chalk.

Crystalline.—When fluid bodies are allowed to cool with adequate slowness, their particles are arranged in regular figures, which are called crystals:—Ice, for instance, is a crystal.

Decompose, to separate into more simple parts; to decay.

Detritus, or *Debris*, the waste of rocks and other substances.

Fissure, a cleft, or chasm, where a breach has been made.

Formation, a certain series of rocks, supposed to have been produced under certain general circumstances, and at about the same epoch.

Fossils, organic remains.

Igneous origin, and *aqueous* origin; the first results from the agency of fire, and the second, from that of water.

Lime, a well-known earth, which exists in great abundance, and under various forms in nature. It is a metallic oxide, that is, a metal in combination with oxygen. Common limestone is a carbonate of lime; gypsum is a sulphate of lime, that is, sulphuric acid, or vitriol, in union with lime. The carbonate is widely distributed in nature, and frequently occurs in beds of immense extent. There are a great number of other calcareous minerals, such as oolite or roestone, which will be described as they occur. Chalk is a very common species of calcareous earth.

Magnesia is another earth, which has also a metallic base. It exists in nature under various states of combination, with acids, water, and other earths, and is found in various mineral springs, and the water of the ocean, united with sulphuric and muriatic acids.

Marl is essentially composed of carbonate of lime and clay, in various proportions. Marl frequently contains sand and other foreign ingredients, and some of them are more or less hardened, while others are friable and earthy.

Organic, having the structure peculiar to living bodies. Organic remains are living bodies converted into earth, stone, bitumen, &c., but preserving the appearance of their original forms.

Oxides are metals and other substances, combined with oxygen. They differ from acids, in having less oxygen.

Oxygen gas forms about a fifth part of the atmosphere, and water contains about eight-ninths of it. It is more amply diffused in nature than any other material body, its attractions being very numerous and powerful.

Shale is slate clay and bituminous slate clay.

Silex, or silica, is an earth: it is a crystalline substance, and presents itself in nearly a pure state in the varieties of flint, agate, &c.

Strata [singular, *stratum*], layers of substances placed above or beneath each other, as slates, &c.

Supracretaceous (*supra*, over or above, *cretaceous* chalk), above chalk.

Travertine, one of the varieties of lime.

Vertebræ, back-bone.

CLASSIFICATION OF ROCKS.

To facilitate the acquisition of knowledge regarding rocks and their organic contents, they have been classified by various philosophers. No classification that we have seen, after consulting a great number of authors, seems to be either so free from theory, or to come so closely up to the present state of the science, as the following, which has been employed by De la Beche in his recent valuable work on geology. This author, in his classification of rocks, has divided them into groups. For the accommodation of those who may prefer what is termed the improved Wernerian classification, it is also given, in the second column.

1 Modern Group.	Alluvial.
2 Erratic Block ditto.	Diluvial.
3 Supracretaceous ditto.	Tertiary.
4 Cretaceous ditto.	Secondary.
5 Oolitic ditto.	
6 Red Sandstone ditto.	
7 Carboniferous ditto.	
8 Grauwacke ditto.	Transition.
9 Lowest Fossiliferous ditto.	
Inferior stratified, or non-fossiliferous.	Primitive.

Unstratified Rocks.—These in the improved Wernerian are arranged among the stratified rocks, according to the order in which they are supposed to occur.

1. MODERN GROUP.

This name distinguishes the detritus, or waste of various kinds produced by existing causes, such as have already been described under the head "Alterations of the Surface." It likewise includes the coral reefs, submarine forests, and peat bogs, which have also been noticed.

The organic remains of this group, of course, for the most part consist of existing animals, and are hence not of so interesting a character. Those, however, which are most important, belonging either to extinct animals, or those which are at present found on the globe, will be noticed in the next group.

2. ERRATIC OR TRANSPORTED BLOCK GROUP.

This group, says De la Beche, is merely one of convenience, formed for the purpose of presenting certain phenomena to the reader's attention, which, in the present state of science, could not so easily be done under any other head. It comprises all those gravels, sands, blocks of rocks, and other mineral substances which have been scattered over hills, plains, and on the bottoms of vallies, and which, though often referred to one epoch, may belong to several.

In various parts of Britain, and also of the Continent, great quantities of rocks, sometimes of considerable size, are to be found strewed upon the sides of mountains, and in hollows, which, as far as can be at present ascertained, must have been conveyed there by the influence of "moving waters." The fact of their having been transported from a great distance, is proved by their differing from any rocks in the neighbourhood, and their identity with others of the same formation far seperated from them. Between the rivers Thames and Tweed there have been pebbles, and even blocks of rock, found, which, according to their mineralogical character, must have been transported from Norway. From these, and various other circumstances which might be mentioned, it seems probable that a body of water has proceeded from north to south over the British Isles, and that by this means these fragments of mountains have been conveyed across seas. Whether this current may correspond with the Mosaic deluge or not, is still a matter of great uncertainty. Indeed, the facts are not sufficiently numerous to justify us in drawing any conclusion on this difficult point. It is very dangerous to impress the Bible into the service of philosophy; it was not given for any such a purpose, and religion has almost invariably suffered by the connection. Many cases in proof of this might be enumerated, but that of "the starry Galileo" stands conspicuous. He maintained that the earth revolved round the sun, and for this the holy see of Rome imprisoned him, because it was in opposition to certain expressions in Scripture, which they had an over-scrupulous desire to preserve intact. The fact is so well authenticated now, that, were any clerical personage to maintain the contrary before the same see, it would consider him as hopelessly unqualified for a mitre.

The remains of animals discovered in the gravels, sands, clays, and other rubbish, referable to a passage of water over the land, and hence called in scientific works, *diluvial*, are very numerous and interesting. They consist not only of animals which at present exist either in the same country where they were found, or in tropical climates, but also of those which differ altogether from any living thing that moves upon the face of the earth at present. A description of them all cannot be expected here: indeed, a full account of those which were found in the Kirkdale cavern in Yorkshire, would alone more than occupy the whole of this journal. This cavern was discovered by cutting back a quarry in 1821, and was shortly afterwards visited by Professor Buckland, to whom the world is indebted for a minute and able description of it. Its greatest length is about 245 feet, and its height so inconsiderable, that only in a few places will it permit of a man standing upright. The following are the animal remains found in it: Elephant, rhinoceros, hippopotamus, hyæna, tiger, bear, horse, wolf, fox, weasel, ox, three species of deer, hare, rabbit, water-rat, and mouse. Of birds, there were the raven, pigeon, lark, a small species of duck, and a bird about the size of a thrush. It is the opinion of Professor Buckland, from the manner in which the remains were strewed about the cavern, and the great proportion of hyæna teeth over those of other animals, as well as the way in which they were gnawed and fractured, that this was the den of hyænas for a long succession of years. It may be inferred from appearances, that they brought in as prey those animals whose remains are now intermixed with their own, and that this state of things was put a stop to by an eruption of muddy water into the cave; for the latter is covered with a stratum of mud, and in it the bones were found.

At other places in England, various interesting remains have been dug up, such as those of the mammoth and bison. Amongst the numerous animals found, which differ in some part of their structure from any living thing that now exists, there are several of immense size. The mammoth, or fossil elephant, demands particular attention, as the entire body of one was discovered in an iceberg, near the embouchure of the river Lena, in Siberia. It was a good deal mutilated by bears; but from what remained of its flesh and hair, and from its physiological structure, philosophers were enabled to determine that the animal had belonged to a race of elephants inhabiting cold regions, but which is now extinct. The remains of great numbers of the same species have been found in the same country, and in other northern regions. Its height appears to have been from ten to twelve feet, and its length from sixteen to twenty. Its tusks are larger than those of the common elephant; one was discovered which measured fourteen feet in length. In every respect the extinct species appears to have been stronger, larger, and clumsier, than any which is now to be met with on the globe.

The megatherium is another gigantic remnant of the past. It is found in few places; but four nearly complete skeletons have been collected. In height it would appear to have been about seven feet, and in length about seventeen. In structure it is between the ant-eater and the sloth; hence it has been termed the gigantic sloth. Its bones are of great size and strength; and, from some parts of its conformation, it would appear to have been a climbing animal. Its neck is long, and Cuvier is of opinion that it had a trunk. It is furnished with that which no other quadruped has—a chin. There are other animals of nearly similar dimensions, such as the mastodon and megalonix, as well as great numbers of smaller size, but our limits will not permit of us describing them.

Besides the Kirkdale cavern, above noticed, many others of a similar description have been discovered; and the ascertaining the relative ages of these accumulations of animal remains, is at present occupying the attention of geologists. This is a question of vast moment; for should the remains of man be discovered in them—which has never yet occurred—and if the mouths of these caverns be closed with detritus and fragments of rock brought from a distance, such transport not being due to actual causes, and there being no other communication between the outside and the place where the bestial and human bones are entombed, there would appear to be no doubt that man was a contemporary with the extinct species of elephants, rhinoceroses, hyænas, and bears. Upon this interesting subject, Mr de la Beche has the following remarks:—

"If the co-existence of man and these extinct animals should ever be satisfactorily proved, it would become a curious question whether his so found remains are those of an extinct species; or undistinguishable, like the bones of the horse, from those which now exist. It is a singular circumstance, and one which demands attention, notwithstanding the ingenious remarks that have been made on the subject, that the remains of the monkey tribe should not yet have been discovered among the undisturbed bones and other substances in caves, or in the old transported gravel, or *diluvium* of Professor Buckland. It has been objected, to a remark that man and the monkey tribe were created about the same period, and were of comparatively modern appearance on the earth's surface, that the countries have not been geologically well examined where the monkey race now exists. This is perfectly true. But is there any reason why monkeys should not have lived in climates and in situations where elephants, rhinoceroses, tigers, and hyænas were common? for the climates and regions in which existing elephants, rhinoceroses, tigers, and hyænas' abound, are precisely those where monkeys are now found. To the objection, that if they did then exist, their bones would not be discovered, as their activity would secure them from falling a prey to hyænas and other predaceous animals, it may be opposed, that they must have died like other animals, and that their dead carcasses must have fallen to the ground, and that they were quite as likely to have become the food of less nimble creatures, as the birds found in the cavern of Kirkdale."

3. SUPRACRETACEOUS OR GROUP ABOVE CHALK.

This group is identical with the tertiary rocks of most English authors. It consists of a number of substances, such as sands, marls, plastic clays, &c., in which there is a great abundance of organic remains. In France, MM. Cuvier and Brongniart first pointed out the importance of these rocks, and, during their observations on the beds around Paris, they discovered that the organic remains were not all marine, but that a number of fresh-water shells, and terrestrial animals of a description now unknown, were by no means uncommon. They also found that these remains were deposited in beds, each holding a certain place in a certain series. In England, Mr William Smith was employed upon more ancient rocks, and was in the habit of identifying certain formations by the organic remains embedded in them. These facts instantly led to a generalization; and it was a theory received for a long time, that particular formations or beds contained the same organic remains which were not to be found in the rocks either above or beneath. The opinion, however, gave way before after observations; and it is now generally admitted, that certain shells are not peculiar to certain strata, but that they are, nevertheless, to be found in far greater abundance there than in any other place. It would also appear to follow, as a necessary consequence, that the older the series, the more, and the newer the series, the less, the uniformity. However, this is merely a conjecture, and the truth of it can only be determined by an accurate examination of rocks in distant parts of the world.*

The varieties of the supracretaceous group, and the theories which have been advanced to account for their formation, it will be impossible to give here. A description of the Paris rocks, and also some of those in England, with the organic remains peculiar to them, will suffice to convey a pretty accurate idea of this part of our subject. The rocks of the Paris basin have indeed long been considered the most perfect specimen of the kind to be found; and the following is their classification, according to the illustrious philosophers, whose labours have been so essential to the advancement of the science, MM. Cuvier and Brongniart—(order ascending):—

1. Fresh-water formation,	Plastic clay. Lignite. First sandstone.
2. First marine formation,	Calcaire grossier.
3. Second fresh-water formation	Siliceous limestone Gypsum, with bones of animals. Fresh-water marls.
4. Second marine formation,	Gypseous marine marls. Upper marine sands and sandstones. Upper marine marls and limestone.
5. Third fresh-water formation,	Millstone without shells. Shelly millstone. Upper fresh-water marls.

Plastic Clay.—This substance has been so named from its easily receiving and preserving the forms given to it, and, from possessing this property, it is used in the potteries. It rests upon a surface of chalk, which is very irregular, and furrowed out so as to present an alternation of hills and vallies. This clay is of various colours; and above it, and separated by a layer of sand, there frequently occurs another bed of clay, which scarcely can be called plastic. It is black, sandy, and sometimes contains organic remains. In this deposit, considered as a mass, it is stated that organic remains do not occur in the lower parts. In the central portion, fresh-water animals commonly occur, and in the upper part there is a mixture, sometimes an alternation, of marine and fresh-water remains.

Calcaire Grossier, as its name implies, is composed of a coarse limestone, which is employed for architectural purposes. It is frequently separated from the plastic clay beneath by a bed of sand, and it alternates with argillaceous or clayey beds. The animal and vegetable remains enclosed in it are numerous, and generally the same in corresponding beds, presenting considerable differences when the beds are not identical.

Siliceous Limestone is sometimes white and soft, sometimes grey and compact, and penetrated by silex. It is often full of cells, which are occasionally large, and communicate with each other in all directions.

Gypsum and Marls.—Gypsum is a crystalline substance composed of lime, in union with sulphuric acid and water. Its colours are grey, white, and yellow; but different varieties of it have different hues. It was used in ancient times for window glass. The gypseous rocks consist of an alternation of gypsum and limey and clayey marls; these marls are also found in thick beds above this alternation. Abundant remains are there found, and palms of considerable size are discovered prostrate. The gypseous strata contain the remarkable remains of several extinct animals which suckled their young. These beds are considered as having been deposited in fresh water, and above them are others, which, from their organic remains, are believed to have been deposited in the sea. Amongst other marine animals, the remains of oysters, sometimes of a large size, have been found, and they have evidently lived in the places where they are now entombed. Besides fishes, birds and reptiles have also been discovered in the gypseous beds.

Upper Marine Sands and Sandstones.—These consist of irregular beds of siliceous sandstone and sand. The animal remains in the lower portion of these beds are broken, and very rare. In some situations, however, millions of small bodies have been found. These beds are occasionally covered with a species of rock which is filled with marine shells.

Upper Fresh-Water Formation.—This rock sometimes consists of white calcareous marls, at others of different siliceous compounds; from one of these, millstones of a celebrated kind are formed. They are sometimes charged with shells and petrified wood.

The Paris basin, as the space in which the above group of rocks is found, affords one of the most remarkable instances to be met with of the various vicissitudes to which the surface of the earth has been formerly subjected. There are three fresh-water and two marine deposits, which alternate with each other; the former composing the first and the last of the series. A glance at the foregoing table of the classification of rocks will place the fact in a clear point of view. As an explanation of this phenomenon, we may suppose, that, at the period when these rocks were deposited, large inland lakes had become numerous; and that this basin was a gulf of the sea into which a large river emptied its contents. There is no evidence, however, of a violent rush of waters, the organic remains having apparently been quietly deposited.

The supracretaceous rocks of England are commonly known by the names of plastic clay, London clay, Bagshot sands, the fresh-water formations of the Isle of Wight, and the crag of Norfolk. We can only afford a short account of some of these.

Plastic Clay.—This deposit, though it occasionally contains an abundance of clay, employed for various useful purposes, is also mixed with beds of pebble, irregularly alternating with sands and clay. It thus differs from that of Paris, but it agrees with it so far as it reposes upon an uneven surface of chalk. The organic remains are principally marine, but those of fresh-water and terrestrial animals are intermingled with them.

London Clay.—The great argillaceous deposit which underlies the London district, has obtained this name. It is of a bluish or blackish colour, and contains a portion of calcareous matter; beds of sandstone are also said to be occasionally present in it. This clay varies considerably in thickness, sometimes from seventy-seven to seven hundred feet. Besides the remains of a great variety of shell-fish, those of a crocodile and turtle have been found; masses of wood have also occurred in this stratum.

Bagshot Sands.—These rest upon the London clay, and consist of layers of various kinds of sands and marls containing fossil shells.

The Isle of Wight and London formations, although differing considerably in the nature of their deposits from those of Paris, present such an analogy in the organic remains of some parts of the group, that we are justified in referring the deposit to the same epoch, local circumstances and accidents having determined their characters.

It is the opinion of many philosophers, that at the deposition of the supracretaceous group, the world was passing from a state in which animals were somewhat different from those which exist at present. The lower part of the Appenine mountains, in Italy, has been appealed to as a good example of the truth of this hypothesis, for among the shells discovered in them, there are some which bear a resemblance to those now existing in the Mediterranean; while there are others whose analogies are only to be found in warmer latitudes, and many are wholly unknown. We do not see that this theory will stand the test of facts; for we have already seen, that many animals which are now only to be found in warm climates, and also those now extinct, have been discovered in cold regions; and may we not with equal plausibility generalize upon these facts, and say, that they indicate a transition of the earth from an ancient to a modern state of things; perhaps both may be correct, and we may therefore conclude, that the earth has passed through a variety of changes, and has gradually been fitted for the habitation of those numerous animals that now people its surface. This will be more clearly shown as we proceed in our examination of the more ancient rocks which constitute the crust of the earth.

It may be observed, that volcanic agency has been very active during the formation of this group. Etna, it would appear, has for a long series of ages given forth its igneous products, and a considerable portion of these rest upon supracretaceous rocks. In Central France, where extinct volcanoes are numerous, this is still more evident; a volcanic mass, called the Plomb du Cantal, appears to have burst through, and fractured the fresh-water limestones of the Cantal, which, according to Mr Lyell, are equivalent to the fresh-water deposits of Paris, and some of those in England.

4. CRETACEOUS OR CHALKY GROUP.

This group, and the three which follow, belong to the secondary rocks of the improved Wernerian classification. Throughout a large portion of Western Europe, the cretaceous group occurs in the well-known form of chalk. Chalk is a carbonate of lime. It is very plentiful in England; and at Dover and other places, it runs along the coast in cliffs and mountains of considerable size. It is well known that nodules or masses of flint are abundant in chalk, and it is extremely difficult to account for their presence there. These nodules often contain the remains of shells and animals. In the lower parts of the English chalk deposits, the flints disappear, becoming gradually more rare in the passage downwards. From this circumstance, the group has been sometimes divided into upper, or chalk with flints, and lower, or chalk without flints. But this characteristic does not universally prevail. Beneath the chalk, there is a rock called greensand, which in Normandy is used as a building stone. An argillaceous deposit called gault also occurs; it is of a bluish-grey colour, and is frequently composed of clay in the upper, and marls in the lower part.

The cretaceous group, taken as a mass, may in England, and over a considerable portion of France and Germany, be considered as cretaceous in its upper part, and sandy and clayey in its lower part. The group is extensively distributed over Europe; and Mr de la Beche makes the following observations upon its mineralogical character in general: "Throughout the British islands, a large part of France, many parts of Germany, in Poland, Sweden, and in various parts of Russia, there would appear to have been certain causes in operation, at a given period, which produced nearly or very nearly the same effects. The variation in the lower portion of the deposit seems merely to consist in the absence or presence of a greater or less abundance of clays or sands, substances which we may consider as produced by the destruction of previously existing land, and as deposited from waters which held such detritus in mechanical suspension. The unequal deposit of the two kinds of matter in different situations would be in accordance with such a supposition. But when we turn to the higher part of the group, into which the lower portion graduates, the theory of mere transport appears opposed to the phenomena observed, which seem rather to have been produced by deposition from a chemical solution of carbonate of lime and silex, covering a considerable area." Mr de la Beche goes on to state, that no springs or set of springs could have produced the great deposits of chalk which cover immense surfaces. "But," says he, "although springs, in our acceptation of the term, could scarcely have caused the effects required, we may perhaps look to a greater exertion of the power which now produces thermal waters for a possible explanation of the observed phenomena." Mr Lyell states, that chalk must have originated in the sea, in the form of sediment, from tranquil water; and that, before the existence of the rocks above, it must have been raised in large portions above the water, and exposed to the destroying power of the elements.

An immense number of organic remains have been discovered in this group. In various parts of France and England, fish have been observed. Reptiles also have been found; one of them was of considerable size. Shell-fish, and great numbers and varieties of small animals, have been discovered; but the remains of mammalia (animals which bring forth their young alive, and feed them from their breasts or dugs) have not yet been detected. The fossil vegetables in this group are principally marine; and much of the fossil wood is pierced by a boring shell, as if it had been long drifted about in the sea.

A species of rocks called the Wealden rocks occur beneath the lower green sand of the English series, and are characterised by the presence of terrestrial and fresh-water remains in abundance. It would appear that these rocks underwent changes similar to the Paris basin already noticed. Near Weymouth, and in the Isle of Wight in particular, fresh-water and marine remains occur alternately. Amongst the animal remains found in these rocks are varieties of land and fresh-water tortoises, crocodiles, and a species of monstrous terrestrial reptiles.

5. OOLITIC GROUP.

This group is composed for the most part of alternating clays, sandstones, marls, and limestones, many of the latter being oolitic. Oolite stones are a carbonate of lime, intermixed with other ingredients. Those which are found at Bath, Portland, and Purbeck, are much esteemed in building. This group of rocks has been separated by various authors into a number of subdivisions, which, however, can only interest those who

* De la Beche's Geological Manual, p. 195.

have studied the subject minutely. As it occurs over a considerable part of western Europe, there is a general uniformity in its structure. In other parts of the world, however, it differs very considerably, especially in its mineralogical character; and when this is the case, in order to determine whether certain rocks belong to the group or not, recourse has been had to the organic remains contained in them. In some parts of Europe these are very abundant, and in other places the reverse. To account for this difference, it has been supposed that in those parts of western Europe where they are abundant, shallow seas existed; while in those places, such as Italy and Greece, where few remains are found in the formation, the waters were deep.

With respect to the deposition of the oolitic group, nothing very satisfactory can be said. Whence came the immense quantity of carbonate of lime, is a question not easily answered. To account for it by springs, similar in size and saline contents to those we now see, appears to be unphilosophical. Many limestones are nearly altogether composed of organic remains; and this has led to a theory, that these animals extracted lime from the water, leaving their shells, produced through millions of generations, to be gradually converted into limestone. Notwithstanding all that we can suppose was deposited from springs and organic bodies, "there remains," says De la Beche, "a mass of limestone to be accounted for, distributed generally over a very large surface, which requires a very general production, or rather deposit, of carbonate of lime contemperaneously, or nearly so, over a great area."

The organic remains in this group of rocks are very numerous, and several remarkable species of animals have been discovered. There has been one strange reptile, called Ichthyosaurus, found; it was of a very large size, as its jaws are occasionally eight feet in length. In shape it somewhat resembles the crocodile, and, from its form, appears to have been adapted for buffeting the waves. Another, named the Plesiosaurus, had a very long neck, and probably, from its appearance, fished in shallow creeks and bays. From the indigested remains of vertebræ and other bones found in them, we have become acquainted with the food upon which they lived. They not only devoured fish, but preyed upon each other, the larger devouring the smaller. Most voracious and singular inhabitants of our globe these animals certainly were. Cuvier informs us that the Ichthyosaurus has the snout of a dolphin, the teeth of a crocodile, the head and breastbone of a lizard, the extremities of cetacea (being, however, four in number), and the vertebræ of fish; and the Plesiosaurus has, with the same cetaceous extremities, the head of a lizard, and a neck resembling the body of a serpent. It is unnecessary to observe, that no living specimens of these monsters exist.

Mammalia have been found only in one place—Stonesfield. Crocodiles, tortoises, turtles, fish, great varieties of shell-fish, and many kinds of curious reptiles, are abundant. Millions of small animals called Ammonites have been discovered in this series. The shells are shaped something like a ram's horn, and they are furnished with various cells, which the animal appears to have had the power of filling with air or water, as it wished to rise or sink in the sea. Belemnites are another plentiful class of shell-fish to be met with. The destruction of these animals in certain places must have been exceedingly great, beds of rock of great size being almost wholly formed of them. From the vegetable remains discovered, it would appear that some parts of the globe were clothed with a vegetation widely different from that which we now see around us.

6. RED SANDSTONE GROUP.

This group, the next in order as we descend downwards, is sometimes of considerable thickness; the rocks composing it are as follows:—Variegated Marls, Muschelkalk, Red or Variegated Sandstones, Zechstein, and Red Conglomerate or Todliegendes.

Variegated Marls.—Those which lie immediately below the oolitic group, sometimes gradually pass into it. As their name implies, they are generally of different colours:—those of the Vosges, a chain of mountains in the east of France, are principally wine red, and greenish or bluish grey. In the central portion of these marls are beds of black clay, bluish-grey sandstone, and a species of greyish or yellowish limestone. The sandstone and clay contain vegetable impressions, and even coal. In Poland, the rocks which immediately succeed the oolitic formation are termed white sandstone, from their colour. The upper part of this alternates with thick beds of grey-blue marls, partly red, and more rarely variegated; beds of limestone, and a valuable one of iron ore, are found in it.

Muschelkalk is a limestone varying in texture, but most frequently grey and compact; it is sometimes so hard as to be employed as marble; it is unknown in England and the north of France, but, in the east and south of the latter country, and in some parts of Germany and Poland, it occurs. Amongst other organic remains found in it, are those of the Plesiosaurus and Ichthyosaurus, already described. Shell-fish are also abundant.

Red or Variegated Sandstone, or new Red Sandstone of English authors, varies in colour, being red, white, blue, and green; the former, however, predominating. In France and other countries, this rock is sometimes used for building. A bed of it runs from Nottinghamshire into Yorkshire, but it is generally coarse, and often incoherent. A variety of vegetable and animal remains have been found in this rock.

Zechstein, or Magnesian Limestone.—This rock has been variously divided in Germany and England. In the latter country, Professor Sedgwick has separated it into, 1. Marls, slate, and compact limestone, or compact and shelly limestone, and variegated marls. 2. Yellow magnesian limestone. 3. Red marl, and gypsum. 4. Thin-bedded limestone. Like the rest of the group, it is plentifully supplied with organic remains.

Red Conglomerate.—This rock is sometimes called new red conglomerate, and Exeter red conglomerate. As its name implies, it is composed of various substances, a detail of which would be but of little interest here: it occupies the lowest position of the group, and seems, for the most part, to have been formed from the partial destruction of those rocks upon which it reposes.

These five various kinds of rock are not always all present at the same time in the group, sometimes more than one being wanting. Taken as a mass, the group may be considered as a deposit of conglomerate sandstone and marl, in which limestones are occasionally to be found. The conglomerate commonly occupies the lower, the sandstones form the central, and the marls the higher part. "When we look for the causes which have produced this mass," says De la Beche, "we may perhaps in some measure approach them, by observing the state of the rocks on which it rests. These are found, in the greater number of instances, highly inclined, contorted, or fractured, evidences of disturbance which the inferior and older rocks have suffered previous to the deposit of the red sandstone group upon them. These appearances are not confined to particular districts, but are more or less general in western Europe. From an examination of the lower beds, no doubt can exist that the fragments of rocks contained in them have, for the greater part, been broken off from the older rocks of the more immediate neighbourhood.

It therefore does not appear unphilosophical to conclude, that, as far at least as regards these lower conglomerate beds, we have approached to something like cause and effect—the cause being the disruption of the strata, the effect being the dispersion of fragments consequent on this violence over greater or less space, by means of water, probably thrown into agitation by the disturbing forces. That these forces have, in some places at least, not been small, is attested by the large size of the fragments driven off, and the rounded condition of some of them, as may be well seen in the vicinity of Bristol, where the rolled masses of carboniferous limestone are sometimes considerable. Of the evidence of the great force employed, I know of no better or more easily observed example, than that at the cliff named Petit Tor, in Babbacombe Bay, Devon, whence so large a portion of Devonshire marble is obtained."

"This group," says the same author, "would seem to constitute the base of a great system of rocks, which, when not deranged by local accidents, has filled numerous hollows and inequalities of land of considerable parts of Europe. Such a hollow is well seen in our own island, where the central counties are occupied by the red sandstone series, apparently filling up a previously existing depression in that situation, but is here without that great capping of the oolitic group, which, for the most part, rests so conformably upon it; so that, taken as a whole, and abstraction being made of minor derangements, they would both seem to fill up great depressions in Europe; sometimes, as is the case in Normandy, the oolitic rocks overlapping and coming in contact with strata older than the red sandstone group, upon which latter they nevertheless rest so conformably, that the one seems a tranquil deposit on the other. We must of course consider that numerous local disturbances would produce a marked difference in the deposits, even amounting to a perfectly unconformable position; yet the conformable nature of the two groups, taken in the mass, is somewhat striking. During their deposit, great and remarkable changes were effected in animal and perhaps vegetable life; and it seems somewhat necessary to admit, that considerable differences in the relative levels of sea and land were produced at various times, causing changes in the character of the inhabitants of the sea, from variations of pressure, and other circumstances, while no small difference might be effected from the filling up and rise of the bottom."

7. COAL OR CARBONIFEROUS GROUP.

There are three kinds of rocks comprehended in this group, namely, Coal Measures, Mountain or Carboniferous Limestone, and Old Red Sandstone.

Coal measures are composed of various beds of sandstone, coal, and shale. Coal is certainly the most valuable mineral product of the globe. To Britain, it has been, and still is, of inestimable importance, inasmuch as the commercial prosperity of the country in a great measure depends upon it. Our coal is not only the best in the world, but the quantity seems to be almost inexhaustible. It has been ascertained that the coal mines in South Wales alone, which are yet nearly unwrought, would supply the present demand for the article for 2000 years to come. Coal measures abound in vegetable remains, and their origin is now universally ascribed to an immense accumulation of plants and other vegetable matter at some remote epoch. They were distributed upon a previously deposited surface of sand or mud, but principally the latter, which is now compressed into shale. Sands and mud were again accumulated upon the vegetables, and this process went on irregularly for a considerable time, during which successive tribes of the vegetable world sprung up upon the detritus which covered plants formerly entombed, thus giving rise to those irregularly interstratified beds of coal, sandstone, shale, &c., of which this group is composed. At Newcastle, there is a mine containing forty successive coal beds, all separated from each other by layers of sandstone and other rocks. The length of time required for such accumulations must have been immense. The transporting power which deposited these vegetables appears to have been moderate, and the distinct intervals of vegetable growth would require considerable time; for coal beds, now only six or ten feet thick, must, before pressure was applied to them, have occupied a much greater depth. The terrestrial vegetable remains so abundantly preserved in the coal strata, are for the most part laid flat. But there are cases where they occur in a more upright position, and some of them are found vertical, with their roots downwards. This is precisely the manner in which submarine forests are found; and if several of such forests were discovered above each other, we would thus have a series of deposits similar to the coal strata, in so far as vegetable remains were concerned. From the state of preservation in which some of the delicate leaves of plants are found, there is some difficulty in reconciling their deposition with the supposition that strong currents of water bore them down, and distributed them over the extensive areas where we now find them. Such rough transport must greatly have injured the leaves; and how are we to account for vegetables occurring with their roots downwards? On the other hand, De la Beche remarks, "If we are to consider parts of the coal measures as in any way resulting from a series of similar deposits" (to those of submarine forests), "we are certainly called upon to admit a very remarkable series of changes in the relative surface-levels of land and water." There is no doubt of this, but how are we otherwise to account for phenomena? The deposits of the Paris basin already adverted to are quite as remarkable, and they both in a general sense seem to have resulted from similar causes.

The vegetable remains found in coal measures are sometimes of considerable size. Stems of plants fifty or sixty feet long are not uncommon, and in Craigleith quarry one was discovered forty-seven feet in length, the bark of which was converted into coal. With respect to the character of the vegetation in the coal group, botanists inform us that it is insular, and not continental; and that many plants unequivocally indicate an extremely hot climate, even greater than that of the torrid zone. This is another indisputable proof that the temperature of the earth has decreased. The remains of both terrestrial and marine animals have been found, and amongst them were some palates of fish—a very remarkable circumstance.

The coal strata are frequently twisted and shattered, and these dislocations, in the technical language of the miner, are called faults. The occurrence of these, although they may interrupt mining for a time, are highly advantageous. Fractured strata are often bounded by faults, which prevent the passage of water from one mass into another, and thus prevent an overflow of water, which would otherwise paralyze the operations.

Mountain Limestone.—This is a very prevalent rock, and many picturesque mountains of Britain, and other parts of the world, are composed of it. It is frequently traversed by beautiful veins of calcareous spar, at times appearing to be principally composed of organic remains, while at others not a trace of these can be detected. This rock is of various colours, but mostly grey, varying in intensity of shade. In some situations it affords good marble, which is susceptible of a considerable degree of polish. From its durable nature, it is likewise used in building. That stupendous work, the Breakwater at Plymouth, is composed of it. Many valuable mines of lead ore occur in this rock. Shell-fish, and other organic remains of the lower class of animals, are plentiful.

Old Red Sandstone.—This rock consists of grains of sand, or fragments of older rocks, cemented together, and rendered compact; hence it is termed a conglomerate. It derives its red colour from the oxide of iron which it contains. It is of very variable thickness, sometimes very thin, and at others swelling to the depth of several thousand feet. A specimen of it may be seen at Hawthornden, where it frequently occurs under coal strata. Few organic remains have been discovered in this rock.

The line of separation between the three members of the carboniferous group is generally well marked; in some parts of Scotland, however, we can scarcely say that this is the case. Considerable difficulty is felt in making distinctions in this country, which is increased by the presence of rocks belonging to another group altogether. This is otherwise in the northern districts of England, where the red sandstone rocks have evidently been deposited upon the limestone and coal after the latter had suffered violent dislocations. A considerable portion of the surface of Ireland is covered by this group, the limestones being very abundant. With respect to the deposition of the series, great changes in the power by which it was affected must have taken place at various times. In some parts it is evidently a mechanical formation, and in others, for instance the limestone, in which myriads of small animals are found where they have apparently lived and died, there is evidence of a slow, or perhaps a chemical formation. But the subject is still involved in considerable obscurity, and an investigation of it cannot be entered into here.

8. GRAUWACKE GROUP

This group, and the one which follows, are the Transition Rocks of the Wernerian classification:—Grauwacke is a very prevalent rock, and consists chiefly of argillaceous matter, for the most part of a slatey texture, in which numerous fragments of other rocks and stones are imbedded. Viewed as a whole, the grauwacke series consists of a large stratified mass of arinaceous and slatey rocks, intermingled with patches of limestone, which frequently extend to considerable distances. Roofing slate is not unfrequently met with amongst the grauwacke rocks. The group occurs in Norway, Sweden, and Russia. A portion of southern Scotland is formed of it, from whence it proceeds down western England into Normandy and Brittany. It appears abundant in Ireland, and patches of it are found in other parts of the globe. There is in North America a large deposit, closely agreeing with it in many respects, "so that," says a writer upon the subject, "there is evidence to show that some general causes were in operation over a large portion of the northern hemisphere, and that the result was the production of a thick and extensive deposit, enveloping animals of similar organic structure, over a considerable surface." From the character of the substances composing the grauwacke group, it would seem to have been slowly deposited. The origin of the limestones has afforded matter for much speculation. We cannot, as we formerly did for the previous limestone rocks, suppose them to have resulted from the exuviæ of marine animals, because we would be thus called upon to consider that carbonate of lime was once more abundantly present in the sea than we now find it, and that it has been gradually deprived of it. This supposition would naturally lead us to expect that the sea, having been deprived of a considerable portion of its carbonate of lime, the rocks composed of it would become less and less abundant as we rose from the older to the more modern formations. But this is the very reverse of the case: it has been supposed that the carbonate of lime has been derived from the interior of the earth; and as it is not unfrequent in volcanic regions, great disruptions of the strata may have produced circumstances more favourable for its deposition at one time than at another. "Be this as it may," says an eminent writer upon the subject, "the limestones in the grauwacke series most frequently run in lines parallel to the general direction of the beds; and although the calcareous matter may not be altogether continuous, there has evidently been some cause in operation at the same time, within a given district, more favourable to the production of limestone, than at another. It is also worthy of attention, that when the limestones occur, then also do the organic remains become more abundant, appearing as if the calcareous rocks and the organic remains were connected with each other." That animals, by secreting lime from the medium in which they lived, may have contributed considerably to the mass, is evident from their remains occurring in abundance; but that it may all be attributed to their operations, appears impossible, for in certain districts not a trace of animal exuviæ is to be found.

In the organic remains of the grauwacke group, there is a mixture of existing and extinct animals, which is remarkable, considering the antiquity of the rocks. A family of small animals, called Trilobites, appear to have been the first living creatures who inhabited our earth. Their forms vary considerably; and in some which we have examined, the head and mouth extended over the whole diameter of the body. They seem now to have entirely disappeared from among existing animals. Several families, such as the genus called *Spirifer*, survived the deposition of this series of rocks, as they occur in after formations; but in these they must have been finally entombed, since no living trace of them is now to be found: others again have weathered the various vicissitudes and revolutions of the globe, and are continued up to the present day; amongst these are several species of corals.

With respect to the vegetation existing at this early period of the earth's history, from the remains found, it would appear to have been similar to that which is so abundantly preserved in the preceding series of rocks. Indeed, the formation of several coal mines has been referred to this epoch—an important fact, as it proves the existence of dry land, with vegetables upon it, contemporaneously, or nearly so, with the dawn of animal life. What other creatures may have existed at this period besides fish, and the other organised beings already mentioned, it is impossible to say; but there is no presumption in supposing, that, since vegetation clothed the dry land to some extent, terrestrial animals, suited to the circumstances of the time, were not wanting, for this is only in accordance with the general harmony we at present observe in nature.

9. LOWEST FOSSILIFEROUS GROUP.

Although this group is little more than one of convenience, being but the lower part of the preceding series, it is the opinion of some geologists that it may be separated from the grauwacke mass. The study of this part of our subject is very difficult, and presents few attractions to any class of readers but those who have paid some attention to the science. The rocks composing this group are intermixed with those of igneous origin, so that the most deceptive appearances prevail, thus rendering a fine distinction between them and the group below obviously impossible. We have thus, in a descending order, arrived at a period when there was a combination of those causes which produced fossiliferous and non-fossiliferous strata—when there was, as it were, a conflict between the powers of fire and water, until "nature reclaimed her order," and the latter prevailed. "That there should be a transition or passage," says De la Beche, "even effected by the alternate operation of particular causes from that condition of the world's surface, when chemical action prevailed, to that when mechanical action became more abundant, is what we should expect, since it is in accordance with our knowledge of rock deposits generally; for we observe, however suddenly certain changes may have been produced in particular situations, that, viewed on the large scale, a general change of circumstances attending rock formations has been more or less gradual."

The remains of organic life discovered in this formation are few, and similar to those in the group above; but we are not to infer from this that animal life was scarce. We have said, that trilobites were probably the first creatures that inhabited the globe, but this is only inferred from their being the lowest specimens of organic life hitherto found. There may have existed previous to them myriads of fleshy and gelatinous animals which perished without leaving one solitary trace behind that they had ever lived, and moved, and had their being in the waters. Indeed, Dr Turner has suggested, that, if we suppose these animals to have been abundant at an early period, we may thus account for the bituminous nature of some of the earlier limestones, especially those which do not contain a trace of organic remains.

INFERIOR STRATIFIED OR NON-FOSSILIFEROUS ROCKS.

Hitherto the hardest and most compact substances that we have met with have been characterised by the presence of organic remains, but we now enter upon the examination of a class of rocks which were formed at a period when, as far as our knowledge extends, neither animal nor vegetable life existed on the globe—a period antecedent to that when the Divine Spirit, which Milton so sublimely invokes,

> "With mighty wings outspread,
> Dove-like sat brooding on the vast abyss,
> And made it pregnant."

This group, and that which follows, have long gone under the name of primitive or primary rocks, because, from their occurring lowest in the series of rocks, and also from their containing no organic remains, they are supposed to have been first in the order of formation. Before describing them, it will be necessary to give an account of four substances which enter largely into their composition, namely, Quartz, Felspar, Mica, and Hornblende.

Quartz, or silica, is a crystalline substance of various colours, but generally in appearance something like white glass. It scratches glass, strikes fire with steel, and is sometimes nearly transparent. It presents itself almost pure in the form of rock crystal, in the varieties of flint, agate, chalcedony, and siliceous sand. It is a metallic oxide, its base is called silicium. The scientific world is indebted to Sir Humphry Davy for its decomposition. Quartz is very extensively used in the arts. When combined with soda, it forms glass, and, with alumina, porcelain and pottery ware.

Felspar is another crystalline stone, which displays various colours, and refracts the light. It principally consists of a mixture of sandy and clayey matter. Lime and potash are also present, and oxide of iron occasionally colours it of a reddish hue. Its colours are usually white, red, and grey. It is softer than quartz, but harder than glass, and therefore scratches it. Felspar is used in pottery, that of Cornwall, from its fine quality, to a considerable extent. Some beautiful varieties of it are employed in jewellery. It is one of the most abundant minerals in nature, and enters largely into the composition of a number of rocks, as we shall shortly see.

Mica is very common, and easily recognised. It also consists principally of flint and clay, with a little magnesia and oxide of iron. It is of a lamellar or leafy texture, and easily splits into thin layers or plates, which are transparent, and highly elastic. Before the invention of glass, it was employed as a substitute for that useful article. Indeed, in some parts of the world it is still used in place of glass. It is soft, and may be scratched with the nail. Its usual colours are brown and light grey, but sometimes it is black. Those shining specks and small thin plates observed in sand and various other substances are mica. It is sometimes, but very rarely, found crystallized.

Hornblende is another plentiful mineral. It is crystalline, and of a dark green colour, approaching to black. Its constituents are alumina, silex, magnesia, and a considerable proportion of the black oxide of iron, from which it derives its dark colour. Whipstone is composed of this mineral and felspar.

The individual rocks of the inferior stratified series are not so easily distinguished as those which lie above them, they are so confusedly mixed up with each other. The strata very seldom exhibit one species of rock extending over a large tract of country, except, perhaps, the clay slate.

Clay Slate contains a considerable portion of argillaceous matter. It is disposed in layers, which are easily split into thin slabs. In colour it varies from a greyish white to a deep blue or black. Extensive beds of it occur in Scotland and Cornwall, as well as in other parts of the globe. It is used to a great extent as a roofing for houses. The best slates for this purpose found in Scotland are those of Easdale, and some neighbouring islands off the coast of Lorn, in Argyle, and in Ballachulish, in Appin. The finest kinds of clay slate are used for writing on, and the pencils employed are a softer species of the same rock. Those little metallic masses which we discover in this and other slates, are iron pyrites. Pyrites are native compounds of metals and sulphur. These slates are often so very like those of the grauwacke series as to be undistinguishable from them, which renders their origin very ambiguous. *Chlorite Slate* is chiefly composed of a substance called chlorite, resembling mica, but softer, and of a green colour. It is sometimes mixed with quartz, felspar, mica, and hornblende, in various proportions. *Talcose Slate* is a rock into which clay slate graduates, and not unfrequently it passes itself into mica slate. Talc is a substance similar to mica, or is rather a species of mica.

Quartz Rock.—Quartz we have already described. The rocks composed of it vary in texture, sometimes apparently of a chemical, and at others of a mechanical origin. It is pretty abundant in Scotland; and in South America, Humboldt takes notice of a mass more than 9500 feet in thickness.—*Hornblende Rock and Slate.* Under this head are included all those compounds, evidently contemporaneous with the rocks amongst which they occur, of which hornblende constitutes the principal ingredient.—*Mica Slate* is essentially composed of mica and quartz, and forms extensive tracts of country, as well as thin beds, included amongst other rocks.—*Eurite* is principally, and in many cases entirely, composed of the substance called compact felspar. It is generally subordinate to gneiss or mica slate, and does not appear to constitute any extensive tracts of country.

Primitive Limestone.—This is an important rock, and is easily known from other limestone, by containing no organic remains. To it belong those various kinds of statuary marble so valuable in the fine arts. An account of the varieties of marble is incompatible with our limits. It is found in several parts of Scotland; but the finest is the Parian marble, of which the famous statue, the Venus de Medici, is formed. It is almost incapable of decay. A question here arises, under what circumstances could marble have been produced? It is a carbonate of lime, and must have been, from its compact texture, subjected to great heat. Now, carbonate, when heated, gives out its acid, but the acid is still present in the marble. Sir J. Hall has thrown considerable light upon this obscure subject. He subjected common carbonate of lime to heat, under a high pressure, which prevented the escape of the acid. The consequence was, that the lime was fused, and a substance obtained which in every respect was identical with the finest marble. We are therefore justified in inferring, that, under a high pressure in the bowels of the earth, nature formed her extensive beds of statuary marble.

Gneiss is composed of quartz, felspar, mica, and hornblende, with an occasional mixture of other minerals. It occupies very considerable tracts of country, and we are informed by Professor Jameson, that all the useful metals, except mercury, occur in this rock. *Protogine* may be arranged with gneiss, as they are very nearly similar, and both are closely allied to granite. These are the most remarkable of the inferior stratified rocks, but they are far from being the whole of them, for the varieties and transitions of the one into the other are endless, and set classification at defiance.

We cannot enumerate the various situations where these rocks are to be found. They occupy a large portion of the earth's surface, and they always occur with constant general characters, so that we may suppose them all to have resulted from common causes, and those of a chemical nature, since the prevalent mineralogical characteristic of the mass is confusedly crystalline.

UNSTRATIFIED ROCKS.

This group, which is widely diffused over every part of the globe, comprises those rocks usually called Volcanic, Trappean, Serpentinous, and Granitic. They are found mixed with almost all the stratified formations, and bear every mark of having been thrown up from beneath. For the most part, they either occur as "protruded masses, as overlapping masses which have resulted from the spread of matter after ejection, or as veinstones filling up fissures, apparently consequent on some violence to which the strata have been subjected." The substances principally entering into the composition of these rocks are quartz, felspar, hornblende, and mica, which have been already described individually. The compounds which they form either when they are all present, or when two or more constitute the elements, are exceedingly various in their aspect and texture.

Granite.—The most prevalent and important rock of this class is a confusedly crystalline body, composed of the four substances above named; but these are not always all present; sometimes only two of them are found in a mass, which obtains the name of granite. This rock was long considered the fundemental one on which all the others were accumulated; but this opinion was abandoned when examples occurred of its resting upon stratified and fossiliferous rocks of comparatively recent origin. Granite is common in Scotland, forming a great proportion of the Grampian mountains which intersect the country; it is also found in England, but not so abundantly. It forms a beautiful stone for building, and though used for that purpose, it is not so to an extent commensurate with its value. "In general," says Mr Brande, in his Outlines of Geology, "granite is the most durable of nature's productions, and long resists the destroying hand of time; and though, in common cases, its extreme hardness is against its employment, its use should be enjoined for public edifices." There is assuredly no danger of exhausting the material. Mr Williams, in his Natural History of the Mineral Kingdom, informs us, that there is as much granite in the mountain of Ben Nevis alone, and that "perhaps the best and most beautiful in the world," as were adequate "to serve all the kingdoms of the earth, though they were as fond of granite as the ancient Egyptians." Some idea of its durability may be formed from the excellent state of preservation in which the grand head of Memnon is found, and that of the celebrated column vulgarly called Pompey's Pillar, which still stands entire, amid the mouldering ruins of the ancient city of Alexandria. The obelisk in the Palace of St Jean de Lateran, at Rome, which was quarried at Syene, in the reign of Zetus, King of Thebes, thirteen hundred years before the Christian era; and that in the Place of St Pierre, also at Rome, which a son of Sesostris consecrated to the sun, has, for three thousand years, survived the vicissitudes of nature and of time.

The most common granitic compound is that which has quartz, felspar, and mica, for its constituents; when hornblende is present, instead of mica, it is called Syenite, from its abounding in the island of Syene. When quartz and felspar occur alone, and the crystallization is such that the former appears disseminated in the latter, it is termed graphic granite, from its bearing a supposed resemblance to antique graphic characters. Granite is sometimes porphyritic, large crystals of felspar being disseminated through the mass. The porphyry of Ben Nevis is a beautiful stone, in which the pale rose and colours of a yellowish white are finely blended and shaded. The porphyry of the ancients was chiefly of a red colour, and from this quality it derived its name.

Serpentine.—A rock of this class has been so called from its resembling the skin of a serpent, in the delightful admixture of various colours which it exhibits. Several fine specimens of this stone are found in Britain, particularly at Portsoy, in Banffshire. A curious substance called asbestos occurs in this rock. There are five varieties of it, and all are more or less fibrous and flexible. From one of these the ancients made *cloth*, which was incombustible. When these habiliments required cleaning, it was only necessary to throw them into the fire, whence they came forth completely purified, and as uninjured as the three Jewish youths who went through the ordeal of the furnace. The Esquimaux use it as a substitute for wick in their lamps. Mountain cork, another kind of asbestos, floats on water. *Soapstone*, or *Steatite*, is also found in serpentine rocks. It derives its name from having a soft feel, somewhat resembling that of soap. Humboldt assures us, that some of the North American savages use it for food, although there is not a particle of nourishment in it. It writes on glass, the characters remaining invisible until breathed upon; far from being fugitive, they can only be destroyed with the glass itself.

Trap Rocks.—Certain rocks have obtained this name from their presenting very often the appearance of steps and stairs. Arthur's Seat and the Calton Hill, and the principal mountains surrounding Edinburgh, are composed of them. Trap rocks consist of basalt, clinkstone, greenstone, amygdaloid, &c.

Basalt.—This rock very frequently presents the most remarkable appearances; the most wonderful of which are Fingal's Cave, in the Island of Staffa, and the Giant's Causeway, in Ireland. The entrance to the former resembles a Gothic arch, and is about seventy feet high; the length of the cave is 227 feet, and the breadth from forty to fifty; the sides are composed of masses of basalt arranged in columns, with considerable regularity throughout. This magnificent temple of nature has been frequently described by scientific and other travellers, but all description would seem to fall short of the reality. The following are the impressions which it made upon the mind of a great poet:—

> "Where as to shame the temples deck'd,
> By skill of earthly architect;
> Nature herself, it seemed, would raise
> A minster to her Maker's praise!
> Not for a meaner use ascend
> Her columns, or her arches bend;
> Nor for a theme less solemn tells,
> That mighty surge that ebbs and swells."
>
> *Lord of the Isles.*

The Giant's Causeway consists of three piers of columns, which extend several hundred feet into the sea, and are walled round by towering rocks, some hundred feet high, in which are clusters of columns of various forms and inclinations. Basalt frequently shoots upward in abrupt masses, without displaying any columnar appearance. The rocks upon which the Castles of Edinburgh, Stirling, and Dumbarton, rest, are examples of this kind. Clinkstone, another species of trap rock, derives its name from emitting a ringing sound when struck. Greenstone is of a pale green colour, and composed of felspar and hornblende. Whinstone is a rock of the same kind. Amygdaloid is so called from small nodules of an almond shape occuring in it.

Walls or dykes, that is, long ledges or walls of greenstone intersecting a different description of rock, are very prevalent in this formation. These appearances may be seen on the western side of Salisbury Crags, and in several positions on the Calton Hill, in the neighbourhood of Edinburgh. In the coal strata these dykes also occur. The trappean rocks are so common in nature, that any further notice of their "local habitation" is superfluous. They are found mingled with stratified rocks in every possible way; and for a more minute account of them, and also of all the rocks in this group, we may refer the reader to Macculloch's Western Islands. Mr Gregory Watt has made several most interesting experiments to ascertain the causes which have produced the columnar and globular structure of these rocks. He fused a considerable quantity of basalt, and allowed it to cool very gradually; by this means spheroids were formed in the mass, which explains the phenomena of globular basaltic rocks. His remarks were also extended to the columnar structure, and the theory of their origin, hence deduced, is exceedingly plausible, but an explanation of it would carry us far beyond our limits. We can, therefore, only refer the inquirer to the Philosophical Transactions for 1804.

We have now passed in review before the reader the various stratified and unstratified rocks of which the crust of the earth is composed. A more minute account of the almost endless diversity of substances, and their intimate and complex relations to each other, it was impossible to give within our necessarily circumscribed limits. But we hope enough has been done to satisfy the minds of that numerous class of individuals who wish a comprehensive view of a subject presented to them without being fatigued with minute details, or entertained with barren speculation; while in other minds there may have probably been awakened a desire to prosecute the study by reference to more laborious and amplified compilations devoted to the subject, or to that most perfect and sublime of all works—Nature herself.

From the foregoing detail of unquestionable facts, we may with perfect safety infer, First, That all solid bodies have formerly been in a soft or fluid state, that they were either fused by fire or held in suspension by water; for how otherwise can we account for the presence of organic bodies in them? Secondly, That some terrible convulsion, or a series of convulsions, has rent the solid pavement of the earth, and upheaved the bed of the sea, in many instances beyond the regions of perpetual snow; for how otherwise can we conceive of marine remains being imbedded in elevated mountain rocks? Not assuredly by means of the deluge; yet such an explanation of the phenomena has been given, with all due gravity, in works published so late as the year 1832. The theory of Voltaire, in one of his numerous and very absurd essays on geology, was even more plausible than this. That singular man hated the Christian religion so much, that he hated every thing which was brought forward to support it. When it was stated that the shells found upon the Alps afforded a proof of the deluge, he replied, with admirable tact, that they were eastern species, which had fallen from the hats of the Syrian pilgrims. On another occasion, he observed, "that the bones of a rein-deer and hippopotamus, discovered near Etampes, did not prove, as some would have it, that Lapland and the Nile were once on a tour from Paris to Orleans, but merely that a lover of curiosities once preserved them in his cabinet." Thus he threw doubt indiscriminately on all geological subjects. Thirdly, That the globe has existed many (it is impossible to calculate how many) thousands of years previous to the creation of nature's "chief ornament," man. Amongst other facts which support this conclusion, the absence of his remains, and those of his works, in strata where vegetables and the lower animals occur in infinite number and variety, is one which cannot be explained away, and appears to be decisive of the point. Let not the Christian reader be startled at this statement, and sarcastically exclaim with the pious Cowper—

> "Some drill and bore
> The solid earth, and from the strata there
> Extract a register, by which we learn,
> That he who made it, and revealed its date
> To Moses, was mistaken in its age."

It goes directly to corroborate the Mosaic account of the time which has elapsed since the human race first appeared upon the globe. This is now agreed upon by all philosophers whose opinions are worthy of notice. With regard to the creation of the earth itself, the language of Scripture, particularly with regard to *time*, is metaphorical; so that to found any argument upon it would be quite unphilosophical.

THEORIES OF THE EARTH.

There is nothing so important to science as a correct generalization of facts, which go to prove that nature has adhered to a certain number of fixed principles, from which she never deviates, in developing particular parts of the mighty scheme of creation, unless, perhaps, it be the collection of the facts themselves; and yet there has nothing retarded its progress more than the hasty deductions from too limited observation. The truth of this is more strikingly exemplified in the history of geology than in that of any other science. The theories and conjectures as to the manner in which the substances composing the globe were first amassed, and the vicissitudes to which rocks and strata have been subjected, so as to account for their present positions, and the alternation of hill and valley, are various and conflicting. Two, however, stand conspicuously forward—those of Werner and Hutton. The Wernerian or Neptunian theory, as it is called, supposes that the whole materials of the earth were held in solution by water, and that they were gradually deposited in layers or strata, the granite falling down first, and the other formations following in succession, according to the order of superposition. The Huttonian or Plutonic theory supposes a continual decay and reproduction to be taking place on the earth's surface. Mountains and rocks are worn down by the agents already noticed at the beginning of this article, and, being arranged in strata at the bottom of the ocean, are acted upon by the agency of fire, and thrown up again in the shape of mountains, &c. The characteristic feature of Hutton's theory is the exclusion of all causes but those which belong to the present order of nature. Its great defect is the undue influence ascribed to subterranean heat, supposed necessary for consolidating submarine deposits. It was the opinion of the Scotch geologist that there were alternate periods of disturbance and repose; that, when the ruins of former continents had furnished sufficient materials for new ones, they were heaved upwards by violent and paroxysmal convulsions. These two theories for several years kept the scientific world in a ferment. Each had its partisans, and the virulence and rancour with which the belligerents carried on the warfare is without a parallel in the history of philosophy. Religious zeal added a fearful contribution to the amount of abuse and contumely heaped upon the heads of the heretical volcanists. "In the economy of the world, I can see no traces of a beginning, no prospect of an end," said Hutton. He threw the creation of the globe many ages farther back than what was then deemed the orthodox period of cosmogony. He may be said to have exhausted time, according to all previous notions, of the extent of its duration, and to have borrowed largely from eternity; and yet there are now comparatively few who will be disposed to doubt the truth of what Hutton advanced. How should there be any traces of a beginning or of an end? The works of the great Creator are not like those of man, which have inherent in them the elements of their own destruction. "He has not permitted in his works," says the gifted Playfair, "any symptom of infancy or of old age, or any sign by which we may estimate either their future or their past duration. *He may put an end, as he no doubt gave a beginning*, to the present system at some determinate period of time; but we may rest assured, that this great catastrophe will not be brought about by the laws now existing, and that it is not indicated by any thing which we perceive."

The lamentable exhibition of human frailty displayed in this philosophical crusade, for a time retarded the progress of just views with regard to geology, but in course, a third party took its rise, and rapidly gained ground. The members composing it observed a strict neutrality, and were zealous in collecting facts, not for the purpose of supporting speculative doctrines, but of ascertaining truth.

It is now pretty generally admitted, that, after all, neither of the two theories answers the various conditions of the problem to be solved. A third theory is at present gaining ground, and it appears to be a very rational one. It is reared upon, and partly constructed of, the ruins of the Huttonian. Discarding the idea of paroxysmal convulsions at particular epochs, and an extraordinary influence of subterranean heat for the consolidation of submarine deposits, it explains the former changes of the earth's surface, by reference to causes now in operation. Professor Lyell has published an admirable work in support of this opinion. It would be doing injustice to the author were we to attempt to give an abstract of his various arguments, deduced from an unusual mass of evidence, which goes to support the doctrine. We take pleasure, however, in referring the reader to the work; and if he be not convinced of the correctness of the fundamental view there entertained, he cannot fail to admire the ability and eloquence with which it has been advocated.

With respect to Mr Lyell's theory, we have, in conclusion, one observation to make:—Since it is now pretty generally admitted, that the temperature of the earth was a good deal higher formerly than what it now is, would not the causes at present in operation, under such circumstances, act with a greater degree of intensity, and produce more extensive results?

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THE COTTON, SILK, WOOLLEN, AND LINEN MANUFACTURE.

THE COTTON MANUFACTURE.

The Cotton Manufacture of Great Britain is, altogether, one of the most wonderful triumphs of mechanical invention. To it are we mainly indebted for the commanding position which Great Britain at present holds amongst civilised nations. It has alike proved our "prime sinew" in the struggle of warfare, and (next to agriculture) our main prop in the time of peace. It has at once called forth the resources of British genius, and furnished a boundless field for active industry, and the employment of capital. Perhaps the surest way of commanding the attention of our readers to the subject, and impressing upon them its immense national importance, is simply to state, that the cessation of our cotton manufacture at this moment, were such a contingency possible, would at once throw idle, and expose to all the miseries of poverty and privation, nearly a *million and a half* of our countrymen, and dry up a source of national produce of the annual value of nearly *forty millions sterling*, whereof *twenty millions' worth are consumed by foreign countries!* But even these facts, startling as they may seem, are not the most remarkable features of this branch of art. That so large a field for industry, and the employment of capital, should have been opened up within the short space of little more than half a century; that, after travelling five thousand miles for the raw material, returning with it to our shores, incurring all the outlay of dressing, manufacturing, &c., we are able to carry it back, in its finished state, and actually dispose of it *at a profit*, to the growers themselves, amongst whom the cost of labour is not a twentieth part of what it is with us!—these circumstances, we say, appear almost incredible. And the seal of the miraculous is put to the whole by the fact, that all this has been accomplished by the inventive genius of a few humble, and, for the most part, poor and illiterate individuals!

HISTORY.

The period at which the cotton manufacture was first introduced into Great Britain, is conjectured to have been in the early part of the 17th century, as we find the first mention of it made by Lewis Roberts, in his "*Treasure of Traffic*," published in 1641. From the same authority, we learn that Manchester is entitled to the credit of being the first seat of the art—that our cotton wools were originally brought from Cyprus and Smyrna, to which places, as well as to other foreign parts, they were even then re-exported in a manufactured state. As a source of commercial profit, however, this species of traffic must have been, at the above period, very insignificant, the only mechanical power employed in the fabrication of the yarn being the common one-thread spinning-wheel. From the above period until far on in the last century, that simple instrument continued to be the only machine used for the spinning of cotton yarn. During that long interval, the *weft*, or transverse threads of the web, only, were cotton, it having been found difficult, if not reckoned impossible, owing to the want of proper machinery, to manufacture cotton *warp* (the longitudinal threads) of sufficient strength, and in place of which, *linen* yarn, principally from Germany and Ireland, was substituted. The cotton manufacture was then wholly conducted on what may be called the *cottage system*. Every weaver was a master manufacturer; his cottage was his factory, and himself the sole artisan. He provided himself with the weft and warp as he best could; wove them into a web, and disposed of it at market to the highest bidder. As the demand for the manufacture increased, however, it began to attract the attention of the merchants, or purchasers of the ready-made goods; and, about 1760, a new system was introduced. The Manchester capitalists began to send agents through the country, who employed the weavers at so much *per piece*, furnishing them with the foreign or Irish linen yarn for warp, and with raw cotton for weft. The carding and spinning of the cotton (the latter process being, even then, generally done with the spindle and distaff), by giving employment to all the branches of the family above a state of infancy, was a wonderful benefit to these domestic manufacturers, who were thus also relieved from the expenditure of their time and limited means in the providing of the materials; although it must be obvious, that, in a commercial point of view, it was impossible to prosecute the manufacture, on any very extensive scale, by such a mode. By the custom-house returns, it appears that in 1705 the average weight of cotton-wool imported into Great Britain amounted to only 1,170,881 lbs.; nor did any considerable increase take place for upwards of sixty years afterwards. It was estimated, on the accession of George the Third, in 1760, by Dr Perceval of Manchester, that the entire value of all the cotton goods at that time manufactured in Great Britain did not exceed L.200,000 a-year. The year 1767, however, was destined to form a new era in this branch of manufacture, and to witness the commencement of a series of mechanical inventions altogether unparalleled in their nature and results. James Hargreaves, a common weaver at Stanhill, near Church, in Lancashire, and, according to some, originally a carpenter at Blackburn, having by chance seen a common spinning-wheel, which happened to be overturned, continue its rotatory motion for some time whilst lying on its side, conceived the idea of his *spinning-jenny*, which he afterwards constructed with his own hands in a very rude manner, containing only eight spindles driven by bands from a horizontal wheel; but which, by subsequent improvements, was soon so much enlarged as to enable a little girl to work no fewer than from *eighty* to *one hundred and twenty* spindles at the same moment. The amazing facility derived from this invention in the process of spinning, soon of course became publicly known, and excited, as all such beneficial inventions generally do in the minds of the ignorant, the greatest alarm and indignation amongst those who earned their living by the old mode of spinning. Their fury at last broke out into open violence; they attacked Hargreaves's house, forced the door, and broke his machine to pieces. Nor did they stop here. Several years previous to the invention of his *jenny*, the same ingenious individual had effected a great improvement in the process of carding, by which one man was enabled to perform double the work, and with more ease, than by the original method. Although soon superseded, it unquestionably had given rise to the *carding-engine*, the real author of which is not exactly known; but it has been ascertained that the grandfather of the present Sir Robert Peel was the first manufacturer who erected one of the latter, which he did with the assistance of Hargreaves, at Blackburn, in the year 1762. With the latter fact also still fresh in their minds, the old one-thread spinners and hand-carders became so exasperated against poor Hargreaves, that they rose in a body, scoured the country in all directions, and demolished every piece of the new machinery on which they could lay their hands. The unfortunate object of their dislike was compelled to flee from his native place, and retired to Nottingham, where he took out a patent for his invention. But even there he was not allowed peaceably to enjoy the fruits of his ingenuity. His patent was invaded, and he found it necessary to apply to the courts for redress. A numerous and powerful association was in consequence formed to defeat his efforts, the wealth and influence of which, he was, unassisted, unable to contend against; and he was obliged to give up the contest, and submit in silence to see himself robbed of his just rights. He soon after fell into a state of extreme poverty, and, to the disgrace of his age and nation, was permitted to end his days in Nottingham workhouse! It must here be mentioned, however, that Hargreaves's *jenny* was only of use in the weaving of *weft*, or the transverse threads of the web, the warp continuing to be spun of Irish or foreign linen yarn. The honour of discovering the mode of spinning cotton yarn of sufficient strength and texture for the latter purpose, was reserved for another, who, almost contemporaneously with Hargreaves, was employed in perfecting an invention which soon produced a complete revolution in the whole art of cotton-spinning.

Having in an early number of our Journal given a sketch of the life and mechanical inventions of Sir Richard Arkwright, our readers might reckon a repetition of it here superfluous. We shall, therefore, for the sake of preserving the chain of our narrative of mechanical improvements unbroken, do little more than glance at the nature and dates of his various inventions, referring such as may not have seen the biographical sketch alluded to, to No. 16 of our Journal, or to the "Library of Entertaining Knowledge," whence it was taken. Arkwright was born at Preston in 1732, of very poor parents. He was the youngest son of thirteen children, and was bred to the trade of a barber, at which he continued until nearly thirty years of age, when he gave up shaving and cropping, and became an itinerant dealer in hair. It was whilst engaged in this peripatetic occupation that he first turned his thoughts to mechanics, and commenced an ardent search for the discovery of the *perpetual motion*. At an after period of his life, Arkwright (then Sir Richard) used to state that he derived the first hint of his great invention of the *spinning-frame* from seeing a red-hot bar of iron elongated by being made to pass between rollers. The precise time when he received this hint is not exactly known, but it is conjectured to have been nearly about the same time with Hargreaves's novel conception of the *spinning-jenny*; as it is ascertained, that, when the latter made his valuable invention known, in 1767, his rival in ingenuity was busy in the construction of his spinning-frame. Arkwright's want of funds, however, together with his utter ignorance of mechanism, long hindered his getting the conceptions of his genius embodied in a visible and tangible shape; and, even after his model was completed, by the assistance of a watchmaker named Kay, at Warrington, whom he employed to prepare the parts of the machine, the benefit of his invention was nearly for ever lost to mankind, for want of friends and patrons to assist him in giving it a trial on a proper scale of magnitude. Like poor Hargreaves, too, he began to experience the persecution of the ignorant and deluded rabble of Lancashire, who soon got notice of the important nature of his machine; and he, too, took refuge in Nottingham in 1768. But his future fortune was destined to be of a far different description from that of his unfortunate mechanical rival. Having procured an introduction to the celebrated Jedediah Strutt (the first adapter of the stocking-frame to the manufacture of *ribbed* stockings), to whom he explained the principles of his machine, that sagacious man perceived at a glance the value of the invention, and immediately entered, conjointly with his partner Mr Need, into partnership with Arkwright. Accordingly, in the following year, 1769, a patent for spinning by rollers was taken out in Arkwright's name, and the first mill upon that principle, driven by horses, was erected at Nottingham in the same year. The working by horse-power was soon found too expensive, and a second factory, upon a much larger scale, was erected at Cromford, in Derbyshire, in 1771, which was driven by a water-wheel. It is from the successful application of the latter power to the process that the invention has derived its denomination of the *water-frame*, and the yarn manufactured by it that of *water-twist*.

If ever any invention deserved the appellation of *original*, it was that of Arkwright. The discoveries of Hargreaves, and others who preceded him, can only be viewed as *improvements* upon previously established principles, wonderful and ingenious although they certainly were. The *spinning-frame*, on the other hand, bears not the least affinity to any mode of spinning previously known, or from which the inventor could derive the most distant suggestion. It was the genuine offspring of natural genius, conceived, matured, and brought into operation under difficulties and privations which only the ardent mind of an enthusiast could have borne up against and overcome. For a full description of the *spinning-frame*—a machine which performs in itself the whole process of spinning, leaving to man only the trouble of feeding, or supplying it with the raw cotton—we refer our readers to the biographical sketch above alluded to; the article on "Cotton Manufacture," in *Brewster's Encyclopædia*; the Supplement to the *Encyclopædia Britannica*, Vol. III.; and a very valuable work on cotton-spinning, published by Mr Niven, jun., bookseller, Glasgow, in 1832, entitled, the "Carding and Spinning Master's Assistant." We shall here only shortly mention the principle of its operation. It consists of two pairs of rollers turned by machinery. The lower roller of each pair is furrowed or fluted longitudinally, and the upper one is covered with leather, to make them take hold of the cotton. As soon as the carding, or *roving*, as it is technically called, of cotton, has begun to pass through the first pair of rollers, it is received by the second pair, which are made to revolve with three, four, or five times the velocity of the first pair, according to the desired tenuity of the thread. A twist is, at the same time, given to it by the adaptation of the spindle and fly of the common flax-wheel to the machinery.

As in the case of poor Hargreaves, the vast importance of Arkwright's discovery speedily raised up against him a host of opponents, rivals in trade, who left no effort untried to get his patent set aside, and to appropriate to themselves the merit and profits of his ingenuity. For the sake of brevity, as well as for the credit of the nation, we refrain from recapitulating the particulars of these disgraceful and malicious ebullitions of envy and avarice. The result of the first of these, in 1772, terminated in the discomfiture of his enemies. A verdict was given in his favour, and he was permitted to enjoy the benefit of his patent, without further opposition, until the expiry of the term of fourteen years. Having subsequently taken out another patent, however, for further inventions in other departments of the carding and spinning processes, the exertions of his opponents were more successful, and his patent was set aside on the score of *deficiency in the specification of the various inventions.* But the most extraordinary and invidious feature of these proceedings was, that, on the latter occasion, in 1786, *sixteen years after* Arkwright's claim to the invention of spinning by rollers had been fully established, a poor reed-maker at Bolton, of the name of Highs, or Hayes, was brought forward, *for the first time*, to dispute the originality of it with him. This man, who had also formerly attempted to deprive poor Hargreaves of the merit of the spinning-jenny, deponed to his having invented the roller-spinning machine previously to 1768; that he employed the watchmaker, Kay (above mentioned), to make a model of it; and Kay was brought forward to swear that he had communicated that model to Arkwright. The utter falsity and groundlessness of this trumped-up story is too apparent to need refutation—were it only from the fact of the pretender remaining for such a length of time, not only in the most abject poverty, but maintaining the profoundest silence, whilst the alleged pilferer was accumulating a princely fortune before his eyes. Independently, also, of this circumstance, the testimony both of Hayes and Kay is evidently unworthy of any credit—the former, from his previous base attempt on Hargreaves' patent; and the latter, from having, according to his own statement, betrayed a secret invention, entrusted to his keeping, to a stranger. Sir Richard Arkwright (having been knighted on the occasion of presenting a congratulatory address to his Majesty George the Third, in 1786, upon his escape from the treasonable attempt against his life by Margaret Nicholson, when he (Sir Richard) was high sheriff of Derbyshire) died at his seat, at Cromford, on the 3d of August 1792, in the sixtieth year of his age; a noble and encouraging example, even to the humblest of mankind, of the wonders to be achieved by sober industry, habits of observation, reflection, and perseverance, and a virtuous and well-regulated moral conduct.

Great, incalculably great and important, however, as were the results of Sir Richard Arkwright's spinning-frame to the art of cotton-spinning, it nevertheless had its drawbacks and deficiencies. Although, by its means, the previously insurmountable difficulty of spinning the *warp* from cotton had been overcome, it was found that the yarn it produced was of too firm and hard a texture to render it suitable for weft, and that it could not be used with advantage in weaving cloth of a finer quality than what is technically termed No. 50. But this objection was soon obviated by the ingenious contrivance of another individual, who may be termed the *third* great benefactor of this branch of our national manufactures. In 1775, and during the currency of Sir Richard's first patent, Mr Samuel Crompton, of Bolton-le-moors, Lancashire, invented his *mule-jenny*, being an union of the essential properties of the inventions of his two predecessors in discovery. With this machine commenced an entirely new era in the art of cotton-spinning, in as much as it was found capable of producing varieties and qualities of yarn before unattainable; and all the finer descriptions of cotton fabrics may date their origin from its introduction. As an illustration of the degree of tenuity or fineness of which it has been found practicable to spin cotton yarn by this machine, we may mention, that a single pound of raw cotton has been spun by it into 350 hanks, each hank measuring 840 yards, and forming together a thread 167 miles long! The usual price paid by the muslin manufacturers of Glasgow for the finer yarns at first spun by the mule was *twenty guineas per pound.* The mule, however, did not come into general use until after the dissolution of Sir Richard Arkwright's second patent in 1785, ten years after its discovery; yet so rapid was the progress it made, that, in 1787, only two years after its introduction, no less than 500,000 pieces of cotton muslin—a species of fabric never before attempted—were made in Great Britain, the manufacture of it having been begun simultaneously in Bolton, Glasgow, and Paisley. Mr Crompton never took out a patent for his invention, but upon an application to Parliament, which he was advised to make in 1812, a reward of L.5000 was voted to him. During the investigation that took place at the time before a Committee of the House of Commons, it was proved that there were then *four millions* of spindles employed on Mr Crompton's principle; that two-thirds of the steam-engines for spinning cotton, turned *mules*; and that the value of the buildings, machinery, &c., employed on the same principle, amounted to about *four millions* sterling.

The mule was originally wrought by the hand; one man being able to manage two mules, each containing 144 spindles. But, in 1792, Mr William Kelly, of Glasgow, then manager of the Lanark mills, invented, and took out a patent for, a mode of moving it by machinery. By this new mechanical power, it was found practicable for a man to manage 800 spindles at the same time! Like poor Hargreaves, however, Mr Kelly never derived any substantial benefit from his invention. His patent was immediately invaded by others, of too much wealth and influence for him to contend against; and, though the undisputed inventor of the machine, he chose rather to submit to that most cruel and intolerable of robberies, than involve himself in an expensive, and, at best, doubtful litigation.

Whilst Arkwright and others were contributing the efforts of their genius to raise the character of manufactures in England, the celebrated James Watt, of Glasgow, was employing all the powers of his original mind in endeavouring to adapt his steam-engine to almost every species of machinery, particularly to *rotative motions.* In this he at last perfectly succeeded, and, in 1782, erected the first engine on this principle at the Bradely iron-works. In 1785, Messrs Bolton and Watt were employed by the Messrs Robinsons, Popplewick, Nottingham, to erect a steam-engine in their manufactory there; and this was the first instance of the application of that power to the spinning of cotton. What must have been the emotions of Watt and Arkwright had they been (and we cannot say they were not) present together at this first union of their great inventions, and seen the plans brooded over so long and earnestly in the hidden recesses of their minds, brought thus practically, and upon so splendid a scale, to co-operate together for the benefit of mankind! During the same year, no less than eight other engines were erected by Messrs Bolton and Watt, in as many cotton manufactories in England; and it is needless to say how far, since then, that power has gone to supersede the employment of every other, in all branches of manufacture. The above year, indeed (1785), may be regarded as the first of the "golden age" of British cotton manufacture, not only from the circumstance just named, but two others, which equally contributed to give an impetus to the trade altogether unprecedented, and which has never since showed symptoms of a reaction. These were—the cancelling of Sir Richard Arkwright's second patent, and the discovery of the power-loom.

The invention of the *power-loom* was attended with circumstances every way as singular as those which marked any of the inventions which preceded it. The Rev. E. Cartwright, a clergyman at Hollander House, Kent, happening to be in company with some Manchester gentlemen at Matlock, in 1784, the conversation turned upon Arkwright's inventions, when these gentlemen all stated their conviction, that, upon the expiry of the patent, so many mills would be erected, and so much yarn spun, that it would be impossible to procure hands to weave it. Mr Cartwright observed, that Mr Arkwright must in that case set his wits to work to invent a weaving-mill. The Manchestrians all declared this to be impracticable; but Mr Cartwright denied there could be any greater impossibility in inventing a machine to weave than to spin; and having subsequently set his *own* wits to work, actually produced, in the following year, a loom, every movement of which was performed by machinery. Previously to the construction of his machine, he states that he knew nothing whatever of the principles of mechanics, had never seen a loom at work, and was utterly ignorant of the process of weaving. In an interesting account which he sent to Mr Bannatyne at Glasgow (author of the article on Cotton in the Supplement to the *Ency. Brit.*) of this his first initiation in the mysteries of mechanism, he gives a ludicrous picture of the style in which his machine wrought when first set a-going. "The warps," says he, "were placed perpendicularly; the reed fell with the weight of at least half a hundredweight; and the springs which threw the shuttles were strong enough to have thrown a Congreve rocket! In fact, it required the strength of two powerful men to work it at a very slow rate." He took out a patent for his invention in 1785, and a second, upon an improved system, in 1787. Many years elapsed, however, ere power-loom weaving became general, or was even found at all advantageous. The first power-loom mill, erected by Mr Cartwright himself at Doncaster, failed, as did also subsequent ones at Manchester and Glasgow. The first approach to any thing like success was made in a large weaving-mill, erected at Catrine, in Ayrshire, by Messrs James Finlay and Company. This was in 1805, eighteen years after the invention was made public. In 1806, the same spirited Company erected another mill at Doune, in Stirlingshire, the two establishments containing between them 462 looms. The great defect in the system of power-loom weaving was, that it was found necessary to stop the loom from time to time, in order to dress the webs, which made it impossible for one man to attend to more than one loom at a time. Owing to this great drawback, it is more than probable that the plan would have been long since abandoned, but for the invention of a beautiful and ingenious machine by a Mr Thomas Johnson of Bradbury (but which is generally attributed erroneously, even by Mr Bannatyne, in the *Supp.* to the *Ency. Brit.*, to Mr Ratcliffe of Stockport, from that gentleman's being the first to render it effective, and bring it into notice), for warping and dressing the warps without stopping the loom, and by which means a boy or girl of twelve or fourteen years of age can now manage two looms, and produce three times as much cloth, and of a better quality, as the best hand-weaver could produce! The date of this last invention was about the year 1813, since which time the employment of power-looms has spread with astonishing rapidity. The number at present at work in Great Britain is estimated at considerably above 50,000, of which 10,000 are conjectured to be in Scotland. Is it too much to predicate, judging from what we have already seen, that hand-weaving will speedily be entirely superseded by machinery? Mr Cartwright afterwards obtained a Parliamentary grant of L.10,000 for his discovery.

A great improvement on the power-loom was subsequently made by Mr Peter Marsland of Stockport, by the invention of the *double crank*, the value of which consists in making the lathe strike the cloth a quick blow, in coming in contact with it, which renders it more stout and evenly.

From what has been before stated, it will at once be inferred that Scotland followed considerably in the wake of the sister kingdom in the art of manufacturing cotton cloth. Yet it is a singular fact, that, almost immediately upon its introduction amongst us, we took and have uniformly kept the lead in the fabrication of all the finer and more fanciful sorts of cotton goods. Although checked by many unavoidable obstacles—the chief of which was the want of experienced mechanics and other workmen—it was not long ere Arkwright's plan of spinning by water began to be acted on. The first cotton spun by that power in Scotland is supposed to have been in the island of Bute, in what had previously been a lint-mill, and afterwards became the corn-mill of Rothsay; and about the same period it was also begun to be spun at Pennycuick mills, nine miles south of Edinburgh. In 1780, the Barrhead mill, in the parish of Neilston, was completed; soon after, that of Busby, in the parish of Mearns. In 1782, a large mill, of six stories, now the property of Browns, Malloch, and Company, was erected at Johnston, in Renfrewshire; shortly after this, a large establishment was erected at Blantyre; and next followed Mr Dale's works at Lanark, in which Mr Arkwright himself was for some time a partner. Without further detail, suffice it to say, that there are now considerably above one hundred cotton-spinning mills in Scotland.

What are called *fancy goods*, were first manufactured of cotton, at Paisley, which had previously been the chief seat of the silk gauze manufacture. All the yarns for the finer cotton muslins, nevertheless, continued to be brought from Manchester, not from any defect in the machinery, or scarcity of proper machine-makers in Scotland, but owing to a peculiar adroitness or sleight of hand acquired by a few out of the great bulk of the English cotton-spinners. About the year 1815, a most ingenious machine was invented by Mr John Duncan, of Glasgow, for *tambouring.* Each machine, at the very outset, contained forty tambouring needles, and was superintended by a little girl, whose duty was to piece the threads together when they broke. For this invention, Mr Duncan took out a patent, which afterwards became the property of the Messrs Mitchell, at Glasgow. Pullicat handkerchiefs were first made in Glasgow, in 1785, which place still continues the principal mart of that article. Blue and white checks and stripes for exportation, were, until Sir Richard Arkwright's discoveries, entirely composed of linen, but are now wholly made of cotton, and are manufactured in great quantities in various parts of Scotland. The chief seat of them, however, is Carlisle. Cotton cambrics began also to be made about the same time—the manufacture of which separated itself *spontaneously*, if we may use such a term, into two branches—namely, that of cotton-cambric for garments, in a white or printed state; and cambric, in imitation of French linen-cambric, and intended to be used as garments along with that article. The first of these was adopted by the Lancashire, and the second by the Lanarkshire weavers; nor have either of the parties ever been able to rival the workmanship of the other in their respective departments. Bandana handkerchiefs were first manufactured in Glasgow, in 1802, nor have they ever been attempted to be made any where else. They are first dyed of a bright Turkey red, and the colour afterwards discharged from those parts which form the pattern or figure, by passing a chemical preparation through them. Calicoes were not wrought in Scotland until the year 1801, unless upon a very insignificant scale at Perth. The total value of the manufactured cotton goods in Scotland—that is to say, the expenses of labour and profit, superadded to the price of the raw material—was estimated some years ago by Sir J. Sinclair at very nearly L.7,000,000; but that its present amount is much beyond this, is evident from the ascertained fact, that in and around Glasgow alone, the value of the goods manufactured at this moment is upwards of L.6,000,000 sterling.

PRESENT EXTENT AND VALUE OF THE COTTON MANUFACTURE IN GREAT BRITAIN.

The present prodigious extent of the cotton manufacture in Great Britain, can only be properly judged of by comparing it with what it was formerly. To go no farther back than 1781—fourteen years, even, after the invention of Hargreaves's jenny—we find that in that year there were imported of cotton wool 5,198,778 lbs. In 1831, the imports were 280,800,000 lbs.! In the former year the exports of cotton yarn were 96,788 lbs.; in 1831, they exceeded 70,125,000. The number of yards of cotton *cloth* exported in 1829 was 402,517,196, valued at nearly L.13,000,000 sterling. Since that time, however, a great increase has taken place. In 1760, the value of the whole cotton goods, when manufactured, was, as we have stated, estimated at L.200,000; at present they may be rated at L.40,000,000! Mr M'Culloch calculates the amount of capital employed in the manufacture at fully L.50,000,000. L.23,000,000 is employed in the payment of wages alone; L.35,000,000 invested in spinning mills, power and hand looms, workshops, warehouses, &c.; and L.6,000,000 in the purchase of the raw material.

Suppose the quantity of cotton wool consumed and converted into yarn in England and Scotland, in 1831,

to be - - -	262,500,000 lbs.
allowing 1½ oz. per lb. lost in spinning	24,609,375
Quantity of yarn produced -	237,890,625 lbs.
Suppose the average size to be No. 50, the number of hanks produced would be -	11,894,531,250
Number of spindles employed, supposing each to produce 2½ hanks per day, 300 working days in a year - - - - -	15,859,375
Number of persons employed, supposing each to produce 120 hanks per day - -	330,400

This is supposed to include merely those that are employed within the factories; it does not take in machine makers, founders, carriers, warehousemen, engineers, wrights, masons, cardmakers, &c. &c.

Suppose the above yarn, No. 50, to be woven into 10.00° jaconet, with warp and weft the same quality, 2½ lbs. of yarn will make 24 square yards of cloth. The quantity of yarn produced in one year would make 2,283,750,000 yards, sufficient to cover a space of 1,208,153 square miles, which would about eleven times cover the whole surface ground of England, Scotland and Ireland, the superficial extent of which are 57,960—29,167—30,370 square miles respectively, equal to 117,497 square miles. If the number of spindles employed be 15,859,375, allowing 500 to each horse power, then to move the above spindles will require 31,719 horses' power.

EFFECTS ON THE POPULATION.

But there is no point of view in which the rise and growth of the cotton manufacture appears so remarkable as in its results on the population of the districts where it is carried on, being chiefly in Lancashire and Lanarkshire. The parish of Manchester, for instance, which in 1774 contained 41,000 inhabitants, had increased in 1831 to upwards of 187,000. The population of Preston, which in 1780 was 6000, is now 34,000. In Bolton, Blackburn, Wigan, &c. &c., the ratio of increase is equally great. But the progress of Liverpool (not properly a seat of the manufacture, but one of the sea-ports, where the consequent importing and exporting are carried on) is, perhaps, the most extraordinary. In 1700, its population amounted to 5145. In 1770, before mechanical invention had given such an impetus to the cotton manufacture, it had increased to 34,000; in 1801, it had risen to 78,000; and in 1831, to 176,000. In 1780, Glasgow contained about 43,000 inhabitants; in 1801, 83,000; and in 1831, they reached nearly 203,000. The case of Paisley is even more striking. In 1782, the number of inhabitants, including the Abbey Parish, was 17,700; in 1831, they amounted to nearly 60,000.

But however gratifying a picture of increasing national prosperity the foregoing results may present, there are one or two considerations therewith connected which have given rise to much anxious reflection in the minds of philanthropists. One of these is the effect on the moral character of the community, which must ensue from the crowding together under one roof, and in promiscuous communication, of such masses of human beings as the factory system—the direct result of mechanical invention—has introduced. On a question of such delicacy and importance, however, it is not our province here to enter. Neither would it suit our limits to discuss the merits of another subject, which has long engaged the sympathies of the humane, but which, we trust, is now in the course of being thoroughly investigated, and, where wrong, corrected—the treatment of the many thousands of helpless little children employed in the various factories.

In Ireland, the cotton manufacture is as yet of little importance in a national point of view, but it has been thriving very rapidly since the abolition of the protecting duties in 1823, in so much that the increase in the two subsequent years—viz. to 1825—was no less than *twelvefold*. The return for the latter year showed 6,418,645 yards of manufactured cotton, of which the chief proportion is of yarn sent from England. In fact, it has in many places utterly superseded the great staple manufacture of linen. The chief seat of it is around Belfast; but it is also carried on to a great extent at Dublin, Kildare, Wicklow, Wexford, and Louth. Calicoes and muslins are likewise extensively manufactured in the counties of Wicklow, Cork, Down, and Queen's County.

THE COTTON PLANT—REARING, GATHERING, AND STORING THE COTTON.

The name of "cotton" is supposed to be a corruption, or modification, of its Arabic denomination, *cootin*. The plant is indigenous to all the tropical regions of Asia, Africa, and America. It is also partially cultivated in Russia, Spain, and other countries of Europe; but, latterly, to a very great extent in the southern states of the American Union. Herodotus records, that in India there are wild trees that produce a sort of wool superior to that of sheep, and that the natives dress themselves in cloth made from it. The cotton plant has even been known to ripen in some sheltered situations in England. J. Blackburn, Esq. M. P. had a gown made from cotton grown in his own garden, for a dress for his lady to appear in at court. Four ounces of the raw material made 7½ yards muslin, 1½ yard broad. The cotton plant is raised from seed, and consists of two distinct kinds, *annual* and *perennial*, which require different modes of rearing, and treatment. At first, the young plants are extremely tender, and are easily killed with frost. These are all pulled up by the roots when they are six or seven inches high, and transplanted into regular beds. Light showery weather is most favourable for the crop. The seed is generally planted in March or April, and, in September and October, the gathering of the cotton is general; but it usually continues till Christmas, as the pods ripen very slowly and gradually. The *perennial* cotton tree is almost exclusively raised in Guiana and the Brazils upon the alluvial soil thrown out by the overflowing of the great rivers. The cotton tree is frequently attacked by a large caterpillar, which commits great destruction; and one singular peculiarity attending its ravages, and which has never been explained by naturalists, is, that, when feeding, a fragrant odour is emitted from the plant, although neither the plant nor the insect possess any scent whatever when separate. All cottons, except Upland and New Orleans, yield black seed; but these two give green seed. Between three and four leaves, with which the unripe nuts are surrounded, grow flowers larger than roses, of a yellow colour, streaked with red. These blossoms afterwards change into a green fruit, which becomes black as it ripens, resembling exactly in shape and colour our common small black plum. When fully ripe, this fruit bursts into three parts, thrusting out white cotton full of black seeds. After the cotton is gathered, it is exposed to the rays of the sun till it is perfectly dry and hard. The seeds are then separated by passing through between two wooden rollers, slightly grooved, and about ⅝ths of an inch in diameter; this is called ginning the cotton. It is then carefully picked to free it from broken seeds, leaves, &c. A method of switching it for this purpose was at one time tried, but it was found to break the cotton too much. The cotton is next compressed into bales by means of a screw-press, and in this state it is sent to Europe.

DIFFERENT GROWTHS AND QUALITIES OF COTTON—WHERE IMPORTED FROM.

Few vegetable productions vary so much in quality and kind as cotton. It is distinguished in commerce by its colour; the length, strength, and fineness of its fibre: that of a natural yellowish hue is reckoned the best. Cottons are classed into *long* and *short stapled*. The East India cotton, from Surat, Bengal, &c., was long reckoned the best quality, but it now stands lowest in the market. Smyrna wool was, as we have before noticed, the first imported into Britain, but a very trifling quantity is now used, and that chiefly for candle-wick. The cotton grown in the West India islands is in general a strong, coarse article, and little of it is now imported. It is said, however, that the finest cotton ever brought to England was raised by a Mr Robley, in the island of Tobago, about the year 1790, and it is thought the plant might still be cultivated there with success and profit. The imports from the Brazils have been remarkably steady for upwards of twenty years; in 1831, they amounted to 29,786,970 lbs. Those from the other parts of South America have been decreasing for some years. Wool from Egypt was first imported in 1823, and is of a very superior kind. It is from North America, however, that the great proportion of wool is imported into Great Britain—exceeding considerably, it is estimated at the present moment, *two hundred and thirty millions of pounds annually*; although, previous to 1790, not one single pound of raw cotton was derived thence. By far the finest cotton known is that raised in the southern states of Georgia and Carolina, where it only began to be cultivated after the conclusion of the American war. American cotton is known by the names of *Sea Island, Upland, New Orleans, Alabama*, &c.; of these, the *Sea Island* is far superior to all other kinds. It is grown on the low sandy islands, stretching along the shores of Georgia, and on the low grounds bordering the sea. The *Upland* is that grown farther into the interior; but, from the difficulty at first found to separate this cotton from the seed, it was scarcely thought worth cultivating, until a Mr Whitney, in 1793, invented a machine for performing this so effectually, that upwards of 100,000,000 pounds of this cotton are now imported into Great Britain.

PREPARATION OF RAW COTTONS FOR MANUFACTURE.

As it is quite impossible, without the aid of diagrams, to give the unskilled reader any intelligible idea of the numerous and complicated machines employed in the preparing, dressing, spinning, &c. of cotton, we must confine ourselves to a brief enumeration of the various processes which it undergoes in its way to the hands of the weaver.

The first, and one of the most important things to be attended to, is the *mixing*, by spreading in a *bing* of regular layers, of the peculiar sorts of cottons found most advantageous for weft or warp, as the case may be. There is only one *general* rule which obtains in this part of the process, viz. that all the cottons thus mixed be, as nearly as possible, of equal length in the staple. All the rest must be left to the skill and experience of the manager, who regulates the mixing according to the quality of yarn required, &c. The cottons, when well mixed, are then put through a machine called the *willow*, the use of which is to tear asunder the lumps of cotton, which are almost as hard as wood on their arrival in this country. After the cotton is thus opened up, it is put into the *scutching machine*, which beats and opens out the fibres of the cotton, so as to make it spread easily and equally, and also cleanses it of sand, seeds, dead cotton, &c. This was formerly all done by the hand with switches; but that mode was latterly found far too tedious, as well as too expensive. After being thus beaten and cleansed, the cotton is placed on the *spreading machine*, a recent substitute for hand labour, the use of which is to spread a given weight of cotton into a given length and breadth, so as to prepare it, of a uniform thickness, for the cards. This is a most important process, and but for the *economy* of the machine, hand-spreading would still be most in use, being found much more certain and uniform. The next process is that of *carding* the cotton, the nature of which all our readers must be familiar with. We have before mentioned the improvement in this stage by the invention of the carding-engine. The cotton on coming out of the engine is formed into a thick soft ribbon, called an *end*, which is conveyed by machinery into the *drawing-frame*. This was the great triumph of Arkwright's genius. Previous to his time, the *drawing* was all done by the finger and thumb; but his double rollers, the principle of which we have before explained, at once entirely superseded that mode, being at once incalculably cheaper and more perfect. Between the *draw-frame* and the *mule-jenny*, by which the cotton is finally converted into finished yarn, there are various other subsidiary processes, which it is needless here minutely to describe. Their principal use is to reduce the grist of the end, preparatory to its being spun into a thread of the required tenuity. The machines for that purpose, some of which are fast becoming obsolete, and others just newly introduced, are severally termed the SLABBING-FRAME, the CAN-FRAME, the SKELETON-FRAME, the JACK-FRAME, the THROSTLE-FRAME, the FLY-FRAME, the TUBE-FRAME, the STRETCHING-FRAME, &c. &c. In addition to these machines, it is of importance to notice, that a new throstle-frame has been invented by Mr Robert Montgomery of Johnston, Scotland, for which he last year (1832) obtained a patent, which it is considered will soon supersede all the machines hitherto used for spinning low numbers and for making copes.

SILK MANUFACTURE.

It is universally agreed that to the Chinese the world is indebted for the discovery of this beautiful species of fabric. The period of its origin is, however, totally unknown, like almost every other national art and attribute of that extraordinary and exclusive people. Their written records date it nearly 3000 years before the Christian era, but the subject is so much enveloped in traditionary mystifications, as to baffle all attempts to get at any thing like certainty on the subject. It need only be mentioned, therefore, that long before even the very existence of the material was known to other nations in ancient times, the weaving of silk had attained a degree of perfection in China which appears altogether extraordinary and unaccountable. The period of the first introduction of silk amongst the Romans is conjectured to have been during the reign of Julius Cæsar, but for a long time afterwards it was merely used as an article of theatrical decoration. Laws were even made prohibiting its being worn as male attire, both on account of its costliness and the effeminate disposition it was supposed to denote. The voluptuous and profligate Emperor Heliogabalus was the first to break through the prohibition, and the custom of wearing silk speedily became a national one, although its high price necessarily restricted the luxury to the wealthier classes. Down to the time of Justinian, about the middle of the sixth century of the Christian era, the manufacture of silk continued to be wholly monopolised by the Chinese, the intercourse between whom and the Romans was carried on by means of caravans, which traversed the interior of the Persian empire. About the period just mentioned, however, war having broken out between the Romans and the Persians, the usual supplies from China were at once stopped; and this circumstance, which, of course, was regarded at the moment as a great national misfortune, was the direct means of the first introduction of the manufacture into Europe. As silk, from being a luxury, had then become an indispensable article of apparel, the Roman Emperor, after the breaking out of hostilities with the intermediate state, offered splendid rewards for the discovery of a mode of cultivating and weaving silk in his own territories. Encouraged by these promises, two Persian monks, who had gone as Christian missionaries into China, and had resided long enough to make themselves perfectly acquainted with the then mysterious process, contrived to secrete a quantity of silk-worms' eggs in a hollow cane, which they brought to Justinian at Constantinople. These eggs were duly hatched and propagated under the care of the monks, who, at the same time, instructed the Romans in the whole process of manufacturing their production. The insects thus produced were the progenitors of all the silkworms which have since been reared in Europe and the western parts of Asia, and ultimately became the means of establishing a source of manual industry throughout many nations of the world, the extent and importance of which it would be no easy task to calculate. From Turkey, the silk manufacture, together with the rearing of the insects, rapidly spread into Greece, Italy, Spain, and Sicily. In 1480, that sagacious and politic monarch, Louis the Eleventh, who clearly saw the value and advantages of the silk manufacture, invited workmen from different parts of Italy, and by bestowing on them many important and exclusive privileges, induced them to establish themselves at Tours. Little progress, however, was made in the manufacture until the reign of Francis the First, who, upon getting possession of the Duchy of Milan, in 1521, prevailed upon some of the native artisans to remove to Lyons, and establish themselves under his protection. The art quickly spread into Provence, and other provinces of the south of France, where the rearing of the silk-worms was carried to great perfection, and continued to thrive still faster under the subsequent reign of Henry the Fourth, who rewarded the early manufacturers, who had pursued the trade for twelve years, with patents of nobility.

The weaving of silk, that is to say, raw silk, imported from abroad, appears to have been practised in England long previous to its introduction into France, and at an early period of the fourteenth century, as mention of it is made in an act of Parliament, in the year 1363 (37 Edw. III). But little progress appears to have been made in it, whether as respects quality or quantity, until the time of Elizabeth—and, even then, only in such small wares as ribbons, purses, and girdles. It is worthy of mention, that Elizabeth herself was the only individual of her court who wore silk stockings. It was near the close of the reign of James the First before the manufacture of broad silk was first begun in England by some throwsters, dyers, and weavers, who were induced to emigrate from the Continent, and establish themselves in London. From that moment, the trade increased so rapidly, that, in 1629, the throwsters of London formed a body of sufficient importance to be incorporated. A short interruption to the progress and prosperity of the manufacture took place during the Parliamentary wars, but it speedily revived after the Restoration; and we learn from an act, passed in 1661 (14 Car. II.), that the incorporation of silk throwsters at that time employed 40,000 men, women, and children. It must here be observed that, hitherto, although several temporary prohibitions had from time to time been laid on the importation of woven silks, these were seldom enforced, and the trade may almost be said to have been quite free.

But it was not until the famous revocation of the edict of Nantes, in 1685, by Louis the Fourteenth, that the English silk manufacture assumed much importance in a commercial point of view. Upon that event, which drove nearly a million of individuals, most of them merchants, manufacturers, and artificers, from France, a large number of silk weavers emigrated to London, and established themselves in the district of Spitalfields, London, which has ever since continued to be the chief seat of this manufacture in Great Britain. The stimulus thus given, both in numbers and mechanical skill, speedily placed the English silks on a par with, if not superior to, the workmanship of foreign countries; yet, strange to tell, it was at this very time, when all cause of apprehension from foreign competition seemed to be at an end, that that blind system of prohibitions against importation of silks from abroad commenced, which has continued, until the last few years, to operate so fatally against the prosperity of this important branch of art. In 1692, an act was passed in favour of the Spitalfields refugees (who were at the same time incorporated by charter, under the name of "the Royal Lustring Company," prohibiting the importation of lustrings and alamodes, the articles then most generally in use. That this measure was passed from the most patriotic motives, and as a special mark of national gratitude to the Spitalfields emigrants, there can be no doubt; and it is only to be regretted that such short-sighted policy has been persevered in up to so late a date. The immediate consequence of the act was a relaxation of exertion and industry, from a sense of security from foreign rivalry, on the part of the monopolists. Inferior manufacture and discretionary prices again gave rise to a contraband traffic; and as one bad act generally germinates, like a fly-blow, a host of others in the statute-book, so, in 1698, a new charter was granted greatly enlarging the privileges of the Spitalfields Company, and extending the term of prohibition in their favour, which was made to include various other articles of manufacture besides those formerly prohibited, to fourteen years. The ingenious Frenchmen immediately adopted a new expedient for assailing their self-secure rivals; they set themselves to improving, with all their ingenious skill, those articles not underlying the bans of prohibition, and the result was, that, long before the expiration of their patent, the fashions underwent an entire change, and the Spitalfields Company, indolently trusting to a reaction in their favour, instead of pushing forward in the new field of competition, was completely ruined.

The popular doctrine of the present day, that governments are ever in the rear of the people as regards liberal views of policy, does not seem always to have obtained in practice. Upon the settlement of the treaty of Utrecht, in 1713, a commercial treaty was at the same time drawn up between England and France, for the mutual importation of the manufactures of each kingdom at a low *ad valorem* duty. So violent and general, however, was the outcry immediately raised against this contemplated measure, that it was found necessary to withdraw the Parliamentary bill for its ratification; the chief arguments against its adoption being the extraordinary ones, that the silk manufacture had increased twenty-fold in the course of fifty years—that almost every sort of silk fabric was made as good in England as in France—and that black silk for hoods and scarfs, which formerly was all imported, was now made at home to the amount of L.300,000, whereby an immense increase had taken place in the exportation of woollen and other goods, to Turkey, Italy, and other countries abroad, whence the raw silk was imported.

Up to 1718, our silk weavers were almost wholly dependent upon the throwsters of Italy for the supply of organzined silk; but, in that year, a Mr (afterwards Sir Thomas) Lombe, having, in the disguise of a common workman, succeeded in taking accurate drawings of the throwing machinery at Piedmont, erected a stupendous mill of five stories high, and one-eighth of a mile in length, for that purpose, at Derby, and obtained an exclusive patent for fourteen years. This enormous erection contained 26,586 wheels, and 97,746 movements, which worked 73,726 yards of organzined silk thread, with every revolution of the water-wheel, whereby the whole machinery was driven; and as this wheel revolved three times in each minute, no less than 318,504,960 yards of organzined silk could be produced daily. Sir Thomas's patent expired before he had received any thing like an adequate remuneration from his establishment for the expense of its erection, and an application for the renewal of it was rejected. The sum of L.14,000 was, however, awarded to him by Parliament. Dr M'Culloch states as his opinion, that the introduction of throwing-mills into this country has greatly deteriorated, instead of having benefited, our silk manufacture; but, we confess, we do not very clearly see the force of his reasons for coming to this conclusion.

For nearly a century after the above period—that is to say, from the decade of 1730 to 1824—the history of our silk manufacture presents little else than a succession of complaints, by the manufacturers, of the importation of foreign silks, ineffectual attempts on the part of the legislature to check it, and combinations and outrages amongst the workmen. Motions and suggestions innumerable were made in Parliament, Committees appointed to investigate and report, &c.; but all the legislative attempts on the subject seem to have been conceived with a narrowness of view, and a partiality of application, which rather tended to aggravate than ameliorate the evil. These attempts consisted almost solely in eking, altering, and patching old acts, or devising limited new ones, to suit temporary emergencies and appease troublesome clamour. In 1773, an act was passed, called the "Spitalfields Act," by which the *magistrates of Middlesex* were empowered to settle the rate of wages between master and workman, and severe penalties were exigible both from him who gave and him who received more than the fixed sum; while the manufacturers were forbid from employing any other than Spitalfields weavers! This act, after producing incalculable mischief, was repealed in 1824, when more liberal views began to be entertained on the subject of the silk manufacture. At that time the duty on organzined or thrown silk was no less than 14s. 7½d. per lb.; on raw silk from Bengal, 4s. per lb.; and from other places, 5s. 7½d. At the suggestion of Mr Huskisson, the duty on the first was reduced to 7s. 6d. (it was further reduced to 5s. in 1826), and the duty on raw silk to 3d. per lb.; great reductions were also made in the duties on dye stuffs. It is most gratifying to know, that, since 1826, when the removal of the previous restrictions took place, our silk manufacture has rapidly increased in value and importance; and it is no exaggeration to say, that it has, within the last six or seven years, made more progress than during a whole century preceding. The greatest importation of raw and thrown silk during any one year previous to the repeal of the prohibitory system was in 1823—namely, 2,432,286 lbs.; whereas, in 1831, it amounted to 4,693,517 lbs., being nearly twice the quantity imported when the monopoly was in its vigour. (Perhaps it ought here to be mentioned, that the removal of the restrictive duties on foreign silk was first suggested and strenuously recommended by a Committee of the House of Lords.) Most of the machines and processes known on the Continent have been introduced amongst us, and many of them materially improved. In every species of plain and substantial silk fabrics, the manufacture of Britain is acknowledged to be infinitely superior to that of France, as well as in all mixed manufactures, such as silk with wool, silk with cotton, silk with linen, &c. For many years bypast, Edinburgh has been much distinguished for the manufacture of shawls, which, for richness and substantial quality, we believe, are now second to none produced in any part of the world, with the exception of India. In the manufacture of ribbons, gauzes, and other light fancy goods, as well as in the style of *finish*, the French still maintain the superiority, but the difference is becoming daily less perceptible. Since the alteration of the duties, however, the importation of French gauze goods has driven our own almost entirely out of the market. Several Paisley manufacturers are now working for the London market in imitation of French gauzes.

The best black dye of silk is reckoned to be that used in Genoa. The next is our own. From the great depression of prices in consequence of foreign competition, our silk dyers are at present vying with each other in endeavours to dye the silk without discharging the gum. This is a great deterioration in the silk fabrics. It is called supple; the French first commenced the practice.

One great cause of the inferiority of the British silk fancy goods to those of the French, is, that in this country there is no common standard of fashion; every manufacturer makes goods for the year which his own taste suggests, so that there is no certainty of the article coming into general fashion. In France, the leading manufacturers communicate with each other, and fix on one or two colours and kinds of goods, which are submitted to the taste and decision of some leading person of fashion. By this means, the energies of all the manufacturers are engaged in competing for the superiority in producing the best fabrics of the same pattern.

We obtain the greatest part of our plain ribbons from Switzerland.

Having thus given a brief outline of the rise and progress of the silk manufacture up to the present time, we shall now advert in detail to some of the more curious processes in its production, dressing, weaving, &c. And it is proper we should here state, that in what follows we have been indebted for much of our information to an admirable Treatise on the Silk Manufacture, lately published by Dr Lardner, in his Cabinet Cyclopædia.

THE SILK-WORM, OR BOMBYX.

We have already noticed that the discovery of the valuable properties of this little animal belongs to China. It is a species of caterpillar, and undergoes a variety of changes during the short period of its life, assuming, in each of three successive transformations, a form wholly dissimilar from that with which it was previously invested. It is produced from eggs, laid in summer by a greyish kind of moth. These eggs are about the size of a grain of mustard seed; their colour, when first laid, being yellow, but afterwards becoming of a bluish hue. In temperate climes, and with proper precautions, these eggs may be preserved a long time without hatching or rotting. The three successive states of being of the silk-worm are those of the caterpillar, the chrysalis or aurelia, and the moth; and, in addition to these, it undergoes five other distinct modifications of being. When first hatched, it is a small black worm, about a quarter of an inch in length. On being brought forth, it almost immediately begins searching for its natural food, the leaves of the mulberry tree, which it devours with avidity. In about eight days, the head grows much larger, and the worm is attacked by its first sickness. This lasts for three days, during which time it refuses food, and remains perfectly motionless. It then begins to cast its skin, which it accomplishes after much pain and exertion. So complete is this moulting, that not only the covering of the body, but of the feet, the skull, the jaws, and even the teeth, is cast off. The insect then begins to feed with recruited appetite, and continues for five days, when a second moulting takes place, exactly like the first, and so on through a third and fourth course, the animal progressively increasing in size. After the last moulting, it feeds voraciously, and increases rapidly in size during ten days, when it has attained its full growth—being then generally from two and a half to three inches long. At this period, it begins to leave off eating, and soon entirely ceases—becomes restless and uneasy, and looks out for a convenient place to commence its spinning labours. Its colour is now a light green; but as the material for forming the silk gets digested, it becomes glossy, and somewhat transparent. The silky substance is secreted in the form of a fine yellow transparent gum, in two vessels, which are wound, as it were, on two spindles in the stomach. When the animal has found a suitable angle, or hollow, for the deposition of its silken ball, or cocoon, it begins to spin thin and irregular threads at first, the silk being drawn through two minute apertures beneath the jaws. In four days the cocoon is completed, the labourer remaining, of course, always on the inside of the sphere it is forming. The cocoon resembles a pigeon's egg in shape and colour, but is not quite so large. As may be imagined, the insect, from the continual emission of the gummy silk, together with the want of food, gradually contracts in size, and if the cocoon be opened after it is finished, the animal will appear in the form of a chrysalis (something like a kidney bean), with a smooth brown skin—its former covering lying beside it. The silk-worm goes through all the transformations above mentioned in the space of from twenty-two to thirty days, according to the temperature to which it is exposed. The cocoons containing the insects intended to be preserved for laying eggs, are left undisturbed, and the chrysalis gradually undergoes a transformation into the state of a moth. This change is accomplished in the space of about twenty days; and the moth, by great labour and ingenuity, works its way through the cocoon, but without injuring it, and sets itself at liberty. It then appears as a large moth, of a greyish-white colour, furnished with four wings, two eyes, and two black horns, or antlers, of a feathery appearance. This moth enjoys its existence only a very short time. It remains almost entirely fixed to one spot, the wings never being used for the purpose of flying, but only in assisting it in fluttering while seeking its mate. When this object is attained, the female deposits her eggs, and both end their being in the course of two or three days afterwards. The number of eggs laid by the female varies from 250 to 500; and these eggs, in about six months after, produce larvæ as before. It will scarcely be credited, but is nevertheless true, that in a few short weeks—that is to say, from its being hatched to the period of its full-grown size—the weight of the silk-worm is increased more than nine thousand fold.

Repeated efforts have been made at different periods to naturalise the silk-worm in England. The first of these was made by James the First, seemingly from a feeling of rivalry to the French monarch. He sent circulars to all the counties of England, strongly recommending the planting of mulberry trees, which, it seems, "were to be had in London at the rate of ¾d. per plant." But the scheme, as well as many other subsequent attempts of the same nature, was quite unsuccessful, although prosecuted for some time with great ardour; and we believe it is now generally admitted that the climate of Britain is too cold for cultivating the propagation of the silk-worm with success. At one period (1718), a joint-stock company was formed for producing raw silk, the growth of England, and Chelsea Park, from its convenient situation and favourable soil, was fixed upon as the spot for conducting the operations. A lease of this ground for 122 years was granted; and upwards of 2000 mulberry trees were actually planted, and several expensive edifices erected, the remains of which may still be traced, but the result ultimately turned out as above stated. It will be in the recollection of all our readers, that, during the joint-stock mania in 1825, a company was formed under the name of the "British, Irish, and Colonial Silk Company," for producing raw silk in Ireland. Between 80 and 90 acres were selected for the purpose in the county of Cork; about 400,000 white mulberry trees were planted, with buildings for the hatching of the silk-worms, &c. The project, like most others of that date, at first promised well, but it was ultimately found prudent to abandon it. In British India, the rearing of the silk-worm has been rapidly increasing for many years. In the Bengal establishment alone, there are eight principal silk factories belonging to the East India Company. The number of people employed in each, including mulberry planters, worm-feeders, &c. may be stated at from 10,000 to 40,000. The rearing of silk-worms has also been introduced into the Mauritius of late years with decided success. In Russia, it was first introduced and encouraged by the Empress Catherine, and the production of raw silk is now rapidly increasing. It is calculated that upwards of fourteen millions of silk-worms annually live and die to supply Great Britain with the luxurious fabric of silk.

TREATMENT OF THE COCOONS FOR SILK.

The cocoons vary both in size, colour, and quality, and great care is taken in separating these into different assortments. The first proceeding is to destroy the vitality of the chrysalides. In tropical climes, this is done by exposing the cocoons to the burning heat of the sun, and in more temperate climes, by baking in an oven or steaming them above hot water. Great nicety is required in this part of the process, so that they get just so much heat as to kill the insect, and no more. The test of determining when this is accomplished, is by a profuse moisture or sweat which comes out upon the blankets or cloths wherein they are enveloped, and which exudes from the body of the insect. The cocoons are then spread out to cool very gradually, still carefully covered; and after this they are exposed to the sun and air to dry. The cocoons lose in weight about 77 per cent. by the desiccation of the chrysalis. The weight and strength of reeled silk that can be obtained from each cocoon are very variously stated, and they in fact actually vary much according to circumstances. Count Dandolo, perhaps the most trustworthy authority on the subject, found that a cocoon, weighing about four grains, when drawn out, extended 625 yards, which is certainly a most astonishing quantity, considering the short period employed by so small a creature for its production. It has been calculated that 1 lb. avoirdupois would extend 585 miles, and 47 lbs. would encircle the globe! Owing to the quantity of floss, or loose, inferior, silky fibres which encircles the firm ball of the cocoon, it is found, on an average, to require twelve pounds of cocoon to obtain a pound of reeled silk. A pound of reeled silk is capable of being converted into sixteen yards of gros de Naples, or fourteen yards of the best description.

REELING.

Previous to reeling the cocoons, it is necessary carefully to separate them from the outer floss above mentioned, which is very simply done, by merely opening the floss at one end, and pushing out the hard compact ball. Great care is here necessary in classing the cocoons according to their quality, as each quality requires a different mode of treatment in the reeling. The cocoons are all submerged for some minutes in hot water almost boiling, in order to soften the viscidity of the gummy substance which envelopes the whole silken portion of them. This is done by means of a copper boiler, eighteen inches long and six deep, set in brickwork only so far off the ground as to admit a fire beneath it, and filled with *soft* water. This small oblong boiler stands at one end of the reeling-machine, at the other is the reel itself, which is merely a wooden spindle turned with the hand by a crank handle at one side of the frame, and to which the skeins are guided by small wire loops or eyes attached to the end of the frame immediately above the boiler. Two skeins are generally wove at one time. When the water in the boiler is nearly boiling, two or three handfuls of the cocoons are thrown into it, and allowed to remain a few minutes. The reeler then takes her seat at the sides, and presses the cocoons with a brush about six inches long, made of the finest twigs or tops of heath bound together and cut evenly at the ends. By this operation, the loose threads of the balls adhere to the brush, and are drawn out by its means, when the reeler disengages them, and draws their ends through her fingers, in order to clear them from any loose flossy silk. These preliminary steps are called the *battue*. The ends of four or more (according to the fineness of the silk wanted) of these threads, thus cleared, are passed through each of two holes in an iron bar raised upon the inner rim of the boiler. Two of these compound threads are then twisted twenty or more times round each other, in order that the filaments may better unite by these mutual crossings; they are thence led through the two wire loops or eyes, and from there conducted to the reel, where they are made fast. The proper heat of the water is judged of by the manner in which the filaments come away from the rest of the cocoon, and by this also must the rapidity with which the reel is turned be determined. These, however, with all the other minutiæ of the reeling process, depend so entirely upon the attention and experience of the reeler, that it would be endless as well as useless here to detail all the various rules for the management of them. Silk may be wound of any size, from one cocoon to a hundred, but it is difficult to unite more than thirty in one thread. The great point in reeling is to make the thread of as even a thickness as possible; *perfect equality* is scarcely attainable. An experienced reeler, with the assistance of a girl to turn the wheel, can with ease wind off a pound of silk in a day. Six or eight pounds may be wound off in a day; but a coarse, foul, and ordinary silk, will be the produce. The modes of reeling silk in Italy and France are very different, but that of the former is reckoned the best. The floss or inferior silk of the cocoons is not reeled, but spun, after being mixed with the silk of the injured or inferior cocoons.

THROWING.

After reeling, the next process for preparing the raw silk for the weaver is that of throwing. It has already been mentioned, that this branch of the art was introduced by Sir Thomas Lombe into England in 1718, from models surreptitiously obtained by him at Piedmont. Considering the remarkable perfection now attained in this country in the science of mechanics, it will not appear strange that these throwing-mills have been long since superseded in Great Britain by subsequent improvements; but it is certainly not a little remarkable, that, in Italy, the same machinery is still employed, without alteration or improvement of any kind; and even in France, the organzine used for the manufacture of the best fabrics continues to be almost wholly imported from Italy. Raw silk, preparatory to weaving, must be made to take one of three forms, respectively termed *singles*, *tram*, or *organzine*.

Singles is merely the raw silk twisted, in order to give more firmness to its texture. All raw silk, for whatever manufacture designed, must undergo this process.

Tram is formed by twisting together, not very closely, two or more threads of raw silk, and this generally forms the weft, or transverse threads of the web.

Organzine, which is principally used for warp, is produced by a very elaborate process, of which it would be impossible to convey any correct idea to the general reader without the aid of a diagram. The principle of the process, however, may be generally stated to be like that of making rope, where the combined strands are twisted in an opposite direction to that given to the separate threads, and this is accomplished by giving a reverse motion to the machinery; whereas, singles and tram are twisted only in one direction, similarly to twine, or to the individual strands of which the larger rope is made. Silk thread intended for organzine is in the first process twisted in a left hand direction. The organzine, when finished, is transferred to reels instead of bobbins, whence it is made up into skeins, and sorted for sale or use. Previously to this, however, the reels are subjected to a process of steaming for two or three minutes, in order to prevent any after crinkling. The silk thus thrown is called hard silk, and must be boiled for some hours with a quantity of soap, in order to discharge the gum, and thereafter well washed in a current of clear water to discharge the soap, after which the silk appears soft and glossy.

PLAIN WEAVING.

The principle of the weaving-loom, whatever be the material which it is employed to manufacture, varies little or nothing. The date of the invention of the loom is completely lost, and that of the whole art of spinning and weaving, indeed, is shrouded in impenetrable obscurity. With the exception of the more recent improvements in the particular details of the various processes, however, the nature and action of the weaving-loom is so generally understood, that it would be utterly useless to enter upon an elaborate description of it in this paper. That the art of weaving had its origin in the East, there can be no doubt; and so little has the first rude principle of the loom been departed from, or improved upon, that the wretched Indian, performing his labours in the open air, with his threads tied to pieces of bamboo and stick fixed in the ground, the cords for raising and depressing the alternate threads of the warp attached to a branch of the tree which shrouds him from the noon-day sun, and seated upon the bare ground, with a hole dug for the reception of his feet, can yet produce fabrics, which, for delicacy of texture, cannot be surpassed, and scarcely rivalled, by the European weaver, who is possessed of the most elaborate machinery. The improvements of modern times have been more for increasing the power and productiveness of the loom, than improving upon its principle.

FIGURE WEAVING

Is the art of producing various patterns in the cloth, either by the introduction of threads of different colours, or by a different arrangement of the threads, or by using in the same fabric threads of different substances. The art is of ancient invention, as it is known to have been practised by the Egyptians at a very early period. The improvements more recently made in it have been many and important. Stripes which occur throughout the length of the piece are the effect of using threads of different colours or substances in the warp alone, and give the weaver no additional trouble. Stripes which run across the piece, or in the direction of the shoot, are caused by using different shuttles, furnished with threads of the requisite colours and substances for the formation of the shoot. The only additional labour here is that of changing the shuttle at certain intervals. A combination of these two methods produces, of course, a chequered pattern, and in the same way a great variety of rectilinear patterns is obtained. To call forth figures, flowers, or patterns of any description, different means are necessary. By dividing the warp between several leaves of heddles, which can be depressed at pleasure by separate treadles, threads of different colours may be either concealed or brought forward upon the face of the goods at the pleasure of the weaver. These threads may be made to change places one with the other, so as to reveal or conceal each in such a way as to make out the particular pattern wanted. The regularity and precision necessary in producing fanciful patterns in great variety, required a very different sort of loom from the common loom; and to meet which, the draw-loom and "*draw-boy*" was invented, by means of which, the most comprehensive patterns are wrought, with an immense saving of trouble, labour, and expense. The working of this apparatus at first required the constant attention and utmost care of two persons, but subsequent inventions and improvements simplified, as well as perfected it, to an extraordinary degree, the most of which were devised by practical weavers in our own country. All previous modes and machinery for silk figuring, however, including the draw-loom and draw-boy, were superseded of late years by the "*Jacquard machine*" (named after its inventor, a practical weaver at Lyons), which effected almost as great a revolution in this department of silk manufacture as Sir R. Arkwright's spinning-frame caused in the spinning of cotton. It is a great drawback, and proves a source of much regret to us, that our being necessarily restricted to mere verbal description debars us from giving the general reader any clear idea of the nature and construction of those complex machines we are now treating of. The *Jacquard* loom has proved especially beneficial to the poor weaver, by simplifying the most difficult, and, at the same time, utterly profitless portion of his labour, the preparation of his loom for figuring, which, previous to its invention, sometimes cost him many weeks' incessant toil and care, ere he got properly adjusted for weaving. Great improvements and simplifications have of late been made in the *Jacquard* machine, in Great Britain, while in Lyons, the city of its birth, it remains unaltered from the day of its invention.

SILK POWER WEAVING.

The substitution of machine for hand-weaving, introduced by the Reverend Mr Cartwright into the manufacture of cotton, has also been applied to that of silk; and various improvements and modifications, in its application to the latter material, have subsequently been made, the most important of which are those of Mr Austin of Glasgow, and Mr Sadler of Paddington. But it is very doubtful if the power-loom will ever prove of any advantage in silk-weaving, unless in the very coarsest species of the manufacture. Owing to the peculiar nature of silk, little or no saving of labour is accomplished by it, as it is not possible (as in the case of linen or cotton-weaving) for one man to manage more than one power-loom at a time, while an actual waste of time takes place.

SILK-VELVET WEAVING.

This branch of the silk manufacture, although it has now been made and used for several centuries in Europe, is comparatively a modern invention. It had its origin in Italy, and was for a long time solely made in that country, particularly in Florence, Milan, Venice, Lucca, and Genoa. After its introduction into France, however, the French weavers speedily excelled their instructors. At the period of the revocation of the edict of Nantes, before mentioned, it was introduced by the French refugees into England, and established at Spitalfields. Velvets are also manufactured in China, but these are not equal in point of quality to the very worst of European production. The soft shag or pile which distinguishes velvet is produced during the process of weaving, by inserting short pieces of thread doubled under the shoot or weft, and which stand upright in such a way and so close together as entirely to conceal the interlacings of the warp and shoot. In the production of every yard of velvet, six yards of pile at least are used. The loops of the doubled threads intended for the pile are supported by grooved wires, and the loops are afterwards divided by running a sharp instrument, called a treval, along the groove. This is done by the hand, and, of course, requires great dexterity, as the slightest deviation from the proper line would infallibly injure, if not wholly destroy, the silk. It is considered a good day's work for one man to weave one yard of plain velvet, for which he is paid about five times as much as for weaving gros-de-Naples. The warp, shoot, and pile of silk-velvet should all be of organsined silk. The cotton-velvet introduced of late years is only fit for ornamental hangings, &c., not subjected to much wear, which they will not stand.

GAUZE.

The manufacture of this light and transparent fabric (which is supposed to derive its name from Gaza, a city on the frontiers of Egypt) was many years ago very extensively carried on at Spitalfields. About the year 1760, it was introduced into Paisley, where it was soon brought to the very highest perfection. The patterns and designs were originally composed in Paris; but it was not long until the Paisley manufacturers established draughtsmen of their own, and opened warehouses in London, Dublin, and even Paris itself. The Spitalfield weavers, unable to rival their northern brethren, have entirely discontinued the gauze manufacture; but it is one of the few light fabrics in which the French are still acknowledged to excel all others.

We have now enumerated all the principal sorts of silk fabrics manufactured in Great Britain. There are various other descriptions of silk goods made, distinguished by different appellations, but as these are in a great measure only modifications, varying in thickness, quality, dressing, &c. of those above mentioned, we have thought it unnecessary to enter upon a description of them. The old, stiff, costly, and magnificent brocades and damasks, the pride and glory of our great-grandmothers, have now utterly fallen into disuse; and as their extinction is, in our opinion, any thing but a matter to be regretted, we will piously refrain from disturbing their slumbers, or seeking "their merits to disclose," unless in the event of their again showing a disposition to enter into fashionable society.

WOOLLEN MANUFACTURE.

The manufacture of wool, as it was the earliest, so it continued to be the most important branch of British manufactures up to a very recent period, when that of cotton, with a rapidity of progress altogether unprecedented, took the precedence of it. There can be no doubt that the art was first introduced by the Romans, previous to whose invasion the inhabitants were wholly clothed in skins; and it is recorded that the first manufacture was established at Winchester, for the purpose of supplying the Roman army with clothing. After this, all trace of the manufacture is lost for many centuries. Some stray notices of it occur in the tenth, chiefly referring to the great progressive increase in the price of fleeces, which, in 1135, is stated to have advanced fifty per cent., while that of the sheep themselves had decreased to the same amount. But it seems certain that this rise in the value of wool was occasioned almost solely by the demand for it abroad, especially in Flanders, where the cloth manufacture then flourished most. In a history of the state of the woollen manufacture of Great Britain, drawn up in 1813 by "John May, Deputy-Aulnager," it is observed, that "the antiquitie of wool within this kingdom hath been beyond the memorie of man so highly respected for those many benefittes therein, that a customable use has always been observed to make it the seat of our wise learned judges, in the sight of our noble peers (in the Parliament house), to imprint the memorie of the worthie commoditie within the mindes of those firme supporters and chiefe rulers of the lande." We have evidence, however, that the woollen manufacture had been domesticated, and reached no small perfection in England early in the thirteenth century, when fine Spanish wool began to be imported. This article was soon prohibited, and the importation of cloth itself encouraged; and this was done, both on account of the superiority of the foreign cloths, and with the view of promoting the foreign demand for English wool. This interchange of English produce and foreign industry continued upwards of a century; and it was not until the reign of Edward the Third that the manufacture of broadcloth began to be patronised in England. In 1331, John Kemp, a Flemish manufacturer, came over and established himself, by the invitation and under a special "letter of protection" of Edward, who, at the same time, induced fullers, dyers, &c. to emigrate. These foreigners fixed themselves at Cranbrook, in Kent; and for their encouragement acts were passed, prohibiting the importation or wearing of foreign cloths, and the exportation of English wool. These, however, were shortly afterwards repealed. In the "Memoirs of Wool," by John Smith, LL. D., published at London in 1747, there is much curious information regarding the ancient laws regulating the export and import of wool, the customs imposed, &c. &c. From the same author we learn that the first *staple* for woollen cloths, *i. e.* market, or public place, whither the merchants were obliged to carry their cloths for sale, was fixed at Canterbury, in honour of *St Thomas*. From the time of Edward the Third, the woollen manufacture may be considered as firmly established in England, and it rapidly spread through Suffolk, Yorkshire, Lancashire, and all the north of England. It is recorded, that, in 1520, there were three famous clothiers in the north—Cuthbert of Kendal, Hodgkins of Halifax, and Martin Brian of Manchester, each of whom had large establishments of spinners, carders, weavers, fullers, dyers, &c. Rippon and Halifax were the two first places in Yorkshire where the manufacture was introduced. In 1614, a great improvement took place in the west of England woollen manufactures, by the invention of what is called medley or mixed cloths, for which Gloucestershire is still famous. Worsted goods were first produced at Worsted, a small town in Norfolk, from which the yarn they were made from takes its name. This species of manufacture seems afterwards to have been mostly transferred to Norwich, as, in an act of Henry the Eighth, we find worsted yarn denominated "the private property" of that town. Perhaps one of the most extraordinary pieces of legislation ever devised for the encouragement of national produce, was an act passed in the reign of Charles the Second, ordering that all persons should be buried in *woollen shrouds!* and yet this act continued in the statute-book down to the beginning of the present century. In the year 1700, the value of woollen goods manufactured in England was estimated at no less than L.8,000,000, of which L.2,000,000 worth were exported. From this period up till 1777, little increase took place in the exports, although unquestionably the manufacture throughout the country continued progressively to increase with the immense increase in the wealth and population of the kingdom. The highest official value which the exports of woollen goods from England ever attained was in 1802, when they reached L.7,321,012 sterling. From 1812 to the present time, they have alternated between L.4,500,000 and L.6,000,000.

The great increase of the cotton manufacture after 1780, contributed much to check the progress of that of woollen in England, but the latter has, nevertheless, continued steadily to augment. In 1800, a Committee of the House of Commons was appointed to investigate into the state of the wool trade in England, when almost all the principal manufacturers in Yorkshire and the west of England were examined. The results of their evidence are both interesting and important, and fall naturally to be stated here. It was estimated that the number of sheep then kept in England and Wales was about 26,000,000, and the produce of the fleeces from these sheep was 600,000 packs, of 240 pounds each pack. Rating the wool at L.11 per pack, the total value of it was L.6,600,000. The next point investigated was the increased value of the wool, after being manufactured. This was found to vary much; in some goods being scarcely double, in others nine-fold. By striking an average, the total value of the whole manufactured woollen goods was estimated at nearly L.20,000,000. The manufacturing of these was supposed to give employment to about 3,000,000 of men, women, boys, and girls; it being at the same time stated, that, from the late inventions in machinery, 35 persons were able to do as much work as 1634 persons could do in 1785! The capital vested in the machinery, buildings, &c. appropriated to the woollen manufacture, was estimated at L.6,000,000 sterling. In the West Riding of Yorkshire alone, which has been at all times the most important and extensive seat of the woollen manufacture, the annual value of the goods of *every* description, broad and narrow cloths, kerseymeres, blankets, &c. was calculated to be about L.8,000,000.

The accuracy of many of these statements of the English manufacturers has been much canvassed, and there seems little doubt as to some of their calculations being somewhat exaggerated, especially as regards the quantity of wool manufactured, and number of hands employed. At the same time, Mr Stevenson, who has always been esteemed a veracious authority, and whose calculations have uniformly been found rather under than over the mark, states the total value of the manufactured woollen goods at L.18,000,000. The number of adults employed in producing them he reckons at 480,000 or 500,000. A statistical estimate made so late as last year (1832), was to the following effect: sheep fed in England and Wales, 36,000,000, each of which yields a fleece of four pounds weight, or one hundred and forty-four millions of pounds, which, at one shilling per pound (or L.12 per pack), is worth L.7,400,000. These, manufactured, produce L.20,000,000, leaving a profit of L.12,000,000 per annum to the various manufacturers.

The woollen manufacture is divided into two principal heads—the weaving or manufacturing of yarn into cloth, blankets, carpets, &c.; and the worsted fabrics, such as stockings, gloves, mits, pantaloons, &c.; and we shall now shortly enumerate the various seats of these branches of manufacture.

The principal seats of the former kind are the West Riding of Yorkshire, and the western counties of Wiltshire, Somersetshire, and Gloucestershire. The manufacturing district of the West Riding extends over an area of upwards of 200 square miles, including, however, the hardware manufacture in and near Sheffield. Of the northern cloth manufacture, Leeds, Bradford, Halifax, Huddersfield, Saddleworth, and Wakefield, are the principal centres. Leeds is the chief mart for coloured and white broadcloths. The former are sometimes called mixed cloths, and are made of dyed wool. These two branches are for the most part kept quite distinct and separate. The principal woollen manufactures in and near Halifax are flannels and baizes. The blanket and flushing manufacturing district lies between Leeds and Huddersfield, at the latter of which places narrow cloths are also made. *Blankets* take their name from an individual, Thomas Blanket, at Bristol, who in 1339, after the passing of the act prohibiting the exportation of English wool, first set up a loom in his own house. The manufacture of stuffs is chiefly carried on at Bradford and Halifax. At Shuttleworth the manufacture of very fine broadcloths as well as kerseymeres is likewise carried on. Wakefield is chiefly distinguished for the importance of its wool market, and its mode of dyeing. By various stamping acts, returns are ordered to be made every Easter to the justices at Pontefract sessions of the quantities of broad and narrow cloths made in the West Riding during the preceding year.

In Gloucestershire, the manufacture of broadcloths, but chiefly superfine, made of Spanish wool, is carried on to a great extent. The parish of Stroud exhibits a remarkable picture of manufacturing industry, almost the entire population, men, women, and children, being engaged in one or other of the branches of the woollen trade.

In Wiltshire, the town of Bradford is reckoned the chief centre of the superfine broadcloth manufacture of England. Thin woollen cloths are also made at Wilton.

In Somersetshire, the principal seats are Taunton, Frome, and Shepton-Mallet—the first for coarse fabrics, the second for second cloths, and the last for superfine. Stourminster-Newton, in Dorsetshire, is also famous for broadcloths and flannels.

The woollen manufacture of England is carried on in three different modes—that of the master clothier, who buys his own wool from the importer, and afterwards gives it out to be manufactured, either in factories or at private houses; the factory system, by which every process of the manufacture is carried on under the same roof; the last is the domestic system, in which private weavers purchase wool from the dealer, and employ themselves, wives, children, and sometimes several journeymen, in the various manufacturing processes under their own roofs. The factory system is evidently the one best adapted for carrying the manufacture to its utmost extent.

The mode of disposing of the various woollen cloths is different in Yorkshire and the west of England, but in both upon a scale in keeping with the magnitude of the manufacture and the commercial importance of the kingdom. In the west of England the goods are exposed at periodical markets or fairs; in Yorkshire, in cloth-halls, of which there are three at Leeds, besides others at Halifax, Bradford, Huddersfield, Wakefield, &c. These halls consist of long walks or galleries, through the whole length of which the master-manufacturers have their stands in double rows. Between these the merchants pass, and make their purchases. At a certain hour a bell rings, and the market closes, those goods which are purchased being then carried to the merchants' quarters, and those unsold remaining in the stands. The goods are bought in their undressed state, the merchant afterwards getting them finished for himself. Dressing and finishing has of late years become a business entirely distinct from the manufacturing department, and in which to attain perfection has been the chief aim of the Yorkshire merchants. So proficient, indeed, have they become as to defy any but the most experienced judges to distinguish their cloths from the more costly fabrics of the west of England. Almost all the machinery now used in the *manufacture* of cloth is borrowed from that of cotton—the spinning-jennies, the slubbing-mill, the carding-engine, &c.

In almost no species of British manufacture has there been such great improvement in recent years as in the article of superfine broadcloths. Till not a very distant date, the continental fine black and blue cloths were eminently superior to those produced in this country. But the peace having opened the ports to the importation of the finest foreign wools, and an impetus being collaterally given to the spirit of enterprise, the fabrics have since been made of the most delicate texture; and as the art of dyeing has at the same time been wonderfully advanced, superfine cloths, in black and blue, as well as in tasteful fancy colours, are now made in England, which far transcend in excellence and beauty the manufactures of any continental country. Every year the appearance of these English superfine cloths is improving, while, from the effects of competition and ingenuity, the price is not only not advancing, but falling. Thus the lower and middle classes of the community are now, in a great measure, as well dressed as the higher; and it is hardly too much to say that this circumstance alone has a powerful tendency to produce better moral feelings among the people, and to sustain Great Britain in its elevated and enviable condition among the nations of the earth.

Several departments of the woollen manufacture have been rapidly flourishing in Scotland of late years. That of cloth is nearly confined to two places —Galashiels and Aberdeen. At the former place, so great an improvement has taken place in the making of broad and narrow cloths, that the goods are reckoned fully equal to those of Yorkshire, except as regards the final dressing and finishing. Almost all the yarn, however, used in this, as well as the other branches of the manufacture, is procured either from England or abroad. Our inferiority in the making of yarn may be accounted for by the fact, that the business of wool-stapling is as yet little practised or understood amongst us. The kinds of yarn chiefly spun in Scotland are for hosiery, which was formerly exported to a great amount. Aberdeen and Hawick have always been the principal seats of the hosiery manufacture. At the latter place, especially, the stocking manufacture has increased of late years to a very great extent. Fully six hundred looms are now busy. Many of the stocking-weavers are also yarn-spinners, a great proportion of the yarn being sold to the manufacturers in Leicestershire, Derbyshire, and Glasgow. The stocking manufacture was first begun in Hawick in 1771, by a Mr Hardie, and it was by individuals trained up with him that the manufacture spread into the adjacent towns and districts—Kelso, Jedburgh, Langholm, Melrose, Selkirk, Wooler (in Northumberland), &c. Scotch worsted is in great request abroad, the coarse worsteds used for Scotch carpets and shawls being chiefly made at Tillicoultry, Kilmarnock, Bannockburn, and Stirling. The Board of Trustees have this year (1833) offered liberal premiums for the best worsted yarns spun in Scotland of various sorts, particularly one large premium of L.300, to encourage the introduction of the spinning of the Cashmere or Thibet wool (wool of the Thibet goat), used in the manufacture of the finer shawls. Our artisans are entirely ignorant of the principle upon which the spinning of this material is conducted. Upwards of 50,000 individuals are at present engaged in the manufacture of shawls from Thibet wool in Scotland, while the whole of the *yarn* used for that purpose is spun in France. The most of it, however, is dyed in this country.

The manufacture of carpets has been improving and increasing amazingly in Scotland in recent times, chiefly from the encouragement given to it by the Board of Trustees. More than ten years ago, Brussels, and others of the finer kinds of carpets, were made at Kilmarnock and Bannockburn, almost all the yarn being brought from England. Of late years, however, several mills have begun to spin the kinds of yarn used in the manufacture of these carpets, and, from the premiums offered by the Board, specimens have been brought forward at some of the latest annual exhibitions in imitation of Turkey and Persian carpets, but decidedly superior to the originals, both in quality and brightness of colours. Carpets of the value of L.60 and upwards have been sold to Scotch families, and many sent into England. These finer carpets are principally made at Stewarton, in Ayrshire, and at Edinburgh. At the latter place a rich carpet of a perfectly new kind has lately been brought forward, for which the manufacturer has obtained a patent.

The largest manufactory of Scotch carpets, we believe, is that of Messrs Wilson and Company, at Bannockburn, where there are upwards of one hundred looms constantly at work. Fully 10,000 stones of Scotch wool are there annually consumed in the manufacture of Scotch carpets and hearth-rugs. Besides this, the same gentlemen have about forty looms employed in fabricating Brussels carpets. Imitation Turkey rugs have been very successfully made.

LINEN MANUFACTURE.

This manufacture is of very ancient introduction into England. It is ascertained to have existed to a considerable extent so far back as the year 1189, and was undoubtedly, as well as the culture of flax, introduced by the Romans, who, again, gained their knowledge of the art from the Egyptians. Even in the time of Joseph, the manufacture of linen had risen to a considerable height. For a long time, however, the greatest part, as well as the finest qualities, of the linen first used in England, was brought from Flanders; but that the art soon attained considerable perfection in Britain, appears from a royal mandate of Henry the Third, who in 1253 enjoined the sheriffs of Wilts and Sussex to send a large quantity from these counties for use in his own wardrobe. In 1386, a company of Flemish linen weavers established themselves in London, under the patronage of Edward the Third.

The manufacturing from native produce, however, progressed very tardily, as is evident by a mandate of Henry the Eighth, a century and a half later than the period just mentioned, ordering a certain quantity flax to be raised for the purpose of providing nets for the fisheries. This fact, together with the circumstance, that, during the reign of Elizabeth, the fabrication of sail-cloths, if not then first commenced, was, for the first time, improved and encouraged, leads to the conclusion that only the very coarsest articles were, up to a comparatively recent period, attempted in England, the woollen continuing to be the great staple manufacture of the kingdom. About the year 1550, the manufacture of linen was engaged in in the county of Norfolk, and a particular privilege extended to it for the making of a linen cloth called *dorneck*. About a century later, linen yarn began to be imported in large quantities from Ireland, and manufactured at Manchester, the want of proper machinery preventing the Irish themselves from prosecuting this trade as an article of foreign traffic, although it had for many previous generations been established amongst them as a domestic manufacture from flax raised by themselves. Towards the end of the seventeenth century, the importations of linen from France amounted, it has been calculated, to nearly L.1,000,000 sterling, although the English manufacture itself was then rapidly increasing. Besides the French manufacture, large importations of linen into England took place from Germany, from Holland, and even Scotland—from the latter, to the value of no less than L.100,000 sterling. Mr King, in his "*British Merchant*," rates the consumption of linen in England, in the year 1702, at L.1,700,000, of which the English manufacturers supplied L.746,569. Previously to this, in the reign of Charles the Second, duties were for the first time imposed on foreign linens, and Parliament seems, from this time forward, to have taken an interest in the success of the linen manufacture, more particularly in Scotland and Ireland. It seems questionable, however, how far this patronage, especially as regards the latter kingdom, proceeded either from patriotic or disinterested motives. Great outcry had been made in England against the increasing manufacture of woollen goods in Ireland, by which, of course, the demand for that staple manufacture of England was much deteriorated. In 1698, both Houses of Parliament addressed his Majesty, William the Third, complaining of this national grievance, and recommending that the Irish wool manufacture should be discouraged, and that of linen established in its stead; to which his Majesty replied, "I shall do all that in me lies *to discourage the woollen manufacture in Ireland, and encourage the linen manufacture, and promote the trade of England!*" The duties imposed on foreign linens seem to have benefited our own manufacturers little; and, in the year 1743, a new expedient was tried, by granting a bounty on the exportation of British linens. Even this temptation seems to have had little effect, as we find, from the custom-house books, that, prior to 1746, not more than 200,000 yards were exported from England, and only 00,000 from Scotland. The progressive increase in this manufacture, which afterwards took place in the former country, will appear from the following facts:—In the year 1753, the quantity exported, drawing bounty, was 641,510 yards; in 1763, 2,308,310 yards; in 1773, 5,868,230 yards; and in 1783, 8,667,915 yards. On an average of ten years, from January 1776 to January 1786, the linen, drawing bounty, exported from England, was 5,315,354 yards, and the total average quantity of what was exported, and what was consumed in England, was, in 1786, estimated to be 30,000,000, in value nearly L.1,600,000 per annum, and employing and supporting fully 200,000 people. It ought also to be remarked, that the increase in the exportation of the finer linens not entitled to bounty, between 1743 and 1783, was nearly as great in value, though not in quantity. Notwithstanding this rapid increase, however, in the English linen manufacture, the importations from Ireland gradually increased. Those from foreign countries, at the same time, proportionally decreased, in so much, that, in thirty years, viz., from 1743 to 1773, there was a diminution of nearly 6,000,000 of ells, in the foreign importations.

The general introduction of the cotton manufacture, about the year 1780, greatly deteriorated that of linen. Besides the substitution of printed cottons for printed linens, in dress, the latter trade suffered by the general adoption of cotton stockings for thread ones, whilst the great increase in the importation of Irish linens discouraged another branch of the trade. The amount of the latter may be judged of by the fact, that, from the Union of Ireland till the year 1813, there were, on an average, annually consumed in England very nearly 33,000,000 yards of Irish linen.

We shall now mention a few of the principal places in England where articles are manufactured from flax and hemp:—

Canvass for sail-cloth is manufactured at Werrington, Kirkham, and other places in Lancashire, Whitehaven, Workington, Stockton, Whitby, Hull, Retford, Reading, Oxford, Bridport, and in various other places in the shires of Dorset and Somerset. During the late war there were, at one time, no less than twenty-three contractors for the manufacture of sail-cloth for the navy, having twenty looms each, constantly employed; but yet, so far were these from supplying the requisite quantity, that by far the greatest portion was obtained from Scotland. A considerable quantity of hemp is grown in Suffolk, and manufactured into sacking and cordage. The latter, however, are chiefly made in the vicinity of Stowmarket. Sheeting is made at Broomsgrove, in Worcestershire; in Berkshire, many thousands of people are employed in the manufacture of sacking, for hops. Great quantities of linen thread are manufactured by poor people in cottages, near Workington. These, with some other manufactories in Westmoreland, Lancashire, Durham, &c. are the principal in England. Mills for spinning flax were first erected at Darlington.

In Scotland, the manufacture of linen was, in all probability, introduced, as in England, by the Romans, but there are no means of tracing its origin or subsequent progress up to a very recent period. From the continual state of turmoil in which Scotland existed, however, equally from internal dissensions and foreign broils, previous to the Union of the crowns—a state of society totally incompatible with the successful cultivation of the peaceful arts—it is improbable that the manufacture of linen was prosecuted otherwise than as an article of merely domestic occupation and consumption. Until 1728, indeed, every description of manufacture was at a very low ebb in Scotland. In that year a Board of Trustees was appointed "for overseeing, directing, and better improving the linen and hemp manufactures in Scotland," under whose fostering care, and by means of premiums, bounties, and various other modes of encouragement, they have ultimately obtained great prosperity and importance. From the extensive powers conferred on the trustees, they have greatly extended their patronage, and continue still to watch over the trade in all its branches, from the sowing of the flax, to the finishing of the bleached cloth.

Very little flax is raised in Scotland, and it is supposed that there are not altogether 20,000 acres under this crop in the whole country; the yarn being principally imported from Russia, Germany, Holland, &c. The raising of flax has been tried to its greatest extent in and around Airdrie, but the superiority of foreign flax is so great, that it is now almost entirely given up. It is entirely from Holland and Flanders that the flax for the finest linen manufactured in this country is drawn. At Dunfermline, the Scots flax is nearly unknown. The difference between Scotch and Dutch flax lies principally in this peculiarity, that the Scotch flax becomes progressively worse in the process of manufacturing; whereas the Dutch flax goes on always improving in the course of working, as long as it is wrought within what is called the *grist*, or its natural point of strength. The spinning of flax was, of course, anciently performed by the distaff, or rock and spindle, these being afterwards superseded by the spinning-wheel, which is still to be found in almost every cottage and farm-house of Scotland. This mode of spinning was formerly carried on to a very great extent in some of the northern counties, more especially in the districts of Aberdeen, Angus, Perth, Orkney, &c. As was formerly the case with cotton in England, the linen yarn is given out by agents to females, who spin it at so much per spindle. The spinning by machinery was first introduced in 1790, the first flax-mill being erected at Inverbervie in Kincardineshire. Since then, this branch of the manufacture has increased immensely, and it is calculated, that, at the present time, there are upwards of 6,000,000 of spindles of linen yarn spun annually by the hand and machinery together. (Each spindle contains four hanks, and each hank twelve cuts, of 120 threads, ninety inches in length.) But the yarn spun by the latter mode, although strong and even, cannot be made nearly so fine for the lighter fabrics as by the common wheel; the latter machine, therefore, is likely to keep its place. From the manufacture, however, being of late years principally confined to coarse articles, such as osnaburghs, bagging, &c., hand-spinning is little practised (except in the places above stated), and that only by private families for domestic use.

The progress and extent of the linen manufacture, since the year 1727, can easily be traced by the records of the Trustees' Office. In 1728, the number of yards stamped was 2,183,978, value L.103,312, 9s. 8d. sterling; the quantity stamped in 1812 was 18,975,862½ yards, value L.1,020,403, 11s. 2¾d. sterling.

One somewhat remarkable circumstance must here be noticed, namely, that, from 1728 up to 1812, and notwithstanding the many changes, by machinery, bounties, competition, &c., the average value of linen cloth has not varied more than fourpence sterling per yard, the original price being about ninepence, and scarcely ever after, up to the foresaid year, having exceeded a shilling.

Fifeshire (including part of Kinross-shire) is the busy seat of the Scottish linen manufacture, which was introduced to it about sixty years since, when the London trade was opened up. In the course of the intervening period of time, the county has been overspread with spinning-mills, bleachfields, weaving-looms, and other essentials for carrying on a great trade. From time to time, considerable changes have occurred, according as the demand for particular articles varied; and in the present day the weaving o fine diapers and shirtings is the chief employ. Some of the most meritorious improvements in the art of bleaching and hand-weaving have been the discovery of natives of Fife. Dunfermline, in this county, enjoys the reputation of being the first town in Scotland for fine linens. The value of the table linen annually manufactured in Dunfermline is estimated to exceed L.100,000. There are six or seven large establishments for the spinning of linen yarn; the weaving is done by the hand, and employs a vast number of looms in the town and adjacent country. It may be mentioned that the Dunfermline linens have long been disposed of in Scotland principally by salesmen or hawkers, who travel on foot over the whole kingdom. Great improvement has taken place in the *patterns* of table linens of late years, in consequence of a drawing establishment having been instituted.

The yarns used are from foreign flax, and are mostly spun and bleached on the river Leven. The Kirkland spinning-mills, near the sea-port town of Leven, are the most extensive in the county. In the weaving of linens, whole towns, villages, and hamlets, are constantly employed. The cloth produced is, for the greater part, exported to London, as the Scotch themselves wear almost none of their own goods, being contented with the cheaper linens of Ireland. Blankets and plaidings are also manufactured in this shire. The operative weavers of Fife form an independent respectable class of artisans, thoroughly national in their habits and sentiments; and being, in most instances, provided with gardens and potato grounds, if not pigs and cows, near their cottages, they live in a state of peace and comfort, perhaps nowhere equalled, at least not surpassed, among the working classes in any portion of the United Kingdom.

Forfarshire, which lies immediately north from Fife, has the chief trade in manufacturing coarse flaxen and hempen goods, principally from Baltic produce. The seat of this lucrative branch of manufactures is at Dundee, a town which, like Paisley and Glasgow, has made extraordinary advances within the last fifty years. The precise period at which the trade was established is not ascertained, but is conjectured to be about the beginning of the last century. It made little progress for some time, as in 1745 only 74 tons of flax were imported, and no hemp. The quantity of linen then exported is estimated at one million of yards, but there is no mention of sail-cloth or bagging. In 1791, the import of flax amounted to 2444 tons, and of hemp 299 tons. The quantity of linen exported that year had increased to 7,842,000 yards, besides 280,000 yards of sail-cloth, and 65,000 yards of bagging. After the general introduction of machinery in 1814, the importation of flax at Dundee increased from 3000 tons to 15,000 tons per annum, and the exportation of linen in an equal proportion. The following abstract of imports and exports for the year ending 31st May 1831, shows an increase of the trade almost wonderful. Flax imported, 15,010 tons; hemp, 3062; linen shipped off, 356,817 pieces, measuring about 50 millions of yards; sail-cloth, 65,522 pieces, measuring about 3½ millions of yards; bagging, 62,199 pieces, measuring about 4 millions of yards. Total, 57½ millions of yards.

Brown linen has always been, and continues to be, the largest article of manufacture in Dundee. It is of a great variety of fabrics; but osnaburghs, for clothing to the negroes in the West Indies, is the chief. There are also bleached linens, or imitations of the sheeting and duck of Russia, and the dowlas and sheeting of Germany. The yarn of this article is generally bleached before it is woven, and the chemical process of bleaching has been introduced and practised with great success. Bagging used for packing cotton is likewise a staple article. It is generally made of hemp, and is exported to the United States, the West Indies, &c. Coarse linens for household purposes are also made. A great proportion of these goods are woven by the hand in the town and neighbourhood, and employ great numbers of workmen in Forfar, Kirriemuir, Glammis, Cupar-Angus, Alyth, and other places. Dundee is the grand depôt of these places, into which all the home-made stuffs are brought either for sale, or on payment of wages. The introduction of spinning machinery, in which great improvements have recently been made, has been the means of preserving the manufactures of Dundee against foreign competition. There are at present between twenty and thirty spinning-mills, each being an edifice of from four to six or seven stories high, with spindles and carding-machines on every flat, all moved by steam, and tended by boys and girls. Almost all the flax is imported from Russia.

Besides the hemp used in the making of sail-cloth and bagging, it is most extensively used in the manufacture of ropes, cordage, twine, &c. In every town of any extent there is one or more ropewalks, the product of which is generally applied to mercantile and agricultural purposes in the town and surrounding districts.

The manufacturing of thread was introduced in 1720, and has ever since been carried on to a considerable extent; but cotton thread has now in a great measure superseded that of linen throughout the kingdom.

Owing to the discontinuance of stamping the linen for sale in Scotland after the year 1822, it is impossible to give the returns up to a later period. In that year the number of yards stamped was 36,268,530¼; value, L.1,396,296; averaging rather less than 9½d. per yard—the manufacture having very nearly doubled since the year 1813 *in quantity*, though not exactly in *value*, owing to the depression in the price of linen cloths.

It has been calculated that about 80,000 persons are engaged in the linen manufacture in Scotland. The value of the linen cloth manufacture cannot be less than L.1,500,000. The average amount of the bounties paid on the exportation of linen goods was about L.50,000 sterling. These are now in the progress of being abolished, but it is satisfactory to know that this measure does not as yet seem to have had a prejudicial effect on the manufacture.

The amount of the various premiums offered by the Board of Trustees for 1830, on all sorts of Scottish manufacture, was L.1330.

In point of quality, the Hollands sheeting manufactured in Edinburgh is reckoned the best in the market.

Linens and yarns are now lower in price in Scotland than ever they were before.

The manufacture of linen has long been the staple one of Ireland, and is conjectured to have been domesticated there previous even to its introduction into Great Britain, at least it is ascertained to have been brought to much greater perfection in Ireland at a very early period than it had attained in England. In a description of Ireland, published at Leyden in 1627, it is stated that "this country abounds in flax, which is sent ready in great quantities to foreign nations." "Formerly," says the writer, "they wove great quantities of linen, which was mostly consumed at home, the natives requiring above thirty yards of linen in a shift or shirt, from the numerous plaits or folds made in it." This inclination to dandyism appears to have excited no small jealousy in their English conquerors, as we find an act passed in the reign of Henry the Eighth, prohibiting, under a severe penalty, the use of more than seven yards of linen to a shirt or shift in Ireland! What would be said to such an interference with the arrangements of the toilet at the present day? It was to the Earl of Strafford, when Lord Lieutenant under Charles the First, that Ireland was indebted (as Scotland was to Mr Pelham) for the first effectual legislative encouragement given to her manufactures, particularly that of linen. He imported flax-seed from Holland, and brought spinners and manufacturers from France and Flanders, and embarked an immense private capital of his own (some say L.30,000) in the business. Its next patron was the Duke of Ormond, under whose long administration, notwithstanding of the interruption given to all the peaceful arts by the Parliamentary wars, the linen manufacture was fully established, and left by him in a flourishing condition. In the beginning of the eighteenth century, the English government took the linen trade under its especial protection; but it is questionable how far its motives in doing so were entirely disinterested, and the patronage seems to have been extended chiefly with the view of discouraging the Irish woollen manufacture, the amount of which was then exciting the jealousy of the English.

A Board of Trustees, upon the plan and for the same purpose as that in Scotland, was afterwards established, and bounties were granted upon the exportation of Irish linen. In 1737, the manufacture of cambric was first introduced from France. The introduction of cotton affected, of course, the linen manufacture in Ireland, as it did in every other part of the United Kingdom, but the latter has nevertheless continued to increase, and, in some places, at this moment, exhibits more favourable symptoms than it has ever yet shown. In 1825, the imports of Irish linen into Great Britain amounted to 52,560,000 yards, the declared value of which was L.2,803,618. Of these, 38,784,908 yards were retained for home consumption. The raw material is almost exclusively grown in Ireland, and it is calculated that there are at present between 130,000 and 150,000 acres sown in flax. Up to the beginning of the present century, the spinning of flax was done entirely by the hand, and even yet the spinning by machinery bears no proportion to the old method, as the work is executed not only better, but actually cheaper, by the poor female peasantry, than can be done by machinery even in England. These poor creatures can scarcely earn more than twopence or threepence a-day, even with the most diligent labour. Another and very sufficient reason for the continuance of hand-spinning, is the circumstance that, by that mode, from twelve to twenty hanks to the pound of flax may be spun, whereas by machinery scarcely more than three hanks can be spun. The Irish women have always been celebrated for their skill in spinning, which is supposed to arise from the delicacy and suppleness of their fingers.

We have already mentioned that great quantities of linen yarn were formerly exported to England, and even yet the spinners are much more numerous than the weavers. In many districts, indeed, the manufacture is entirely confined to the spinning, while, in not a few, the flax is grown, dressed, spun, and woven by the same family. The earnings of a linen-weaver will average about 7s. a-week. Ulster has long been the chief seat of the linen manufacture, but it is also extensively pursued in Galway, Mayo, Sligo, Drogheda, &c. For the most part, each particular district has its own particular kind of manufacture. For instance, unbleached linens of 32 inches wide are manufactured in Londonderry, Donegal, Antrim, and Tyrone—cambrics, lawns, and diapers, at Belfast, Lisburn, and Lurgan; and so forth. There is an extensive manufacture of sail-cloth at Cork. Most of the bleaching-greens are in the counties of Fermanagh and Sligo.

The United States of America have lately passed an act for admitting Irish linens into their ports free of duty after January 1834. This will, no doubt, have a most powerful effect in stimulating the manufacture in Ireland.

The demand for foreign linens in Great Britain is but trifling. During 1825, the real or declared value of those entered for home consumption only amounted to L.2301, 12s. 4d.

In 1829, the exports of linen from the United Kingdom amounted to 57,693,372 yards, of the declared value of L.1,953,007, exclusive of L.52,037, the value of the thread and small wares exported. The exports from Ireland direct to foreign countries were about one seventeenth part of the whole. The United States, the West Indies, and South America, have always been the best markets for British linens. Of the total quantity exported in 1829, 18,367,899 yards were destined for the United States, 11,854,207 yards for the British West Indies, 5,700,962 yards for Brazil, 6,822,637 yards for Spain, &c.

There are no means by which to form any accurate estimate of the entire value of the linen manufacture of Great Britain and Ireland. Dr Colquhoun estimated it at L.15,000,000.

It is worthy of notice, in reference to manufactures in general, that great evils have resulted of late years from the introduction of an entirely new system of business. Individuals, going under the name of money-lenders and commission-agents, in London, contract with manufacturers to transmit to them their stock in hand for disposal, for which they grant bills to a certain date. If the goods are disposed of at the prices fixed by the manufacturer, so far all is well; but if not, the broker is, of course, at liberty to sell the goods for what can be obtained, paying himself the amount of his bills, but under the temptation of *collusively* disposing of his goods at a lower rate to one dealing in a similar way with himself. The articles, when the bills are not paid, are seldom disposed of at full price. In either case, however, these money-lenders, or commission-dealers, retain samples of the article as a pattern, which they employ subordinate manufacturers to imitate upon an inferior scale of quality, thus deteriorating the value of the fair article in the market.

A Statement showing with sufficient clearness the slow but sure progress of the manufacture of Scotland, of her domestic consumption, and of her trade—linen representing the manufacture; the excise, the domestic consumption; and the customs, the foreign trade:—

Years	LINEN FOR SALE. Yards.	LINEN FOR SALE. Value.	EXCISE. Gross.	EXCISE. Net.	CUSTOMS. Gross.	CUSTOMS. Net.
		£	£	£	£	£
1707	1,500,000	—	—	33,500	34,000	30,000
1727	2,183,978	103,102	69,758	40,815	67,928	6,077
1737	4,721,420	183,691	65,124	43,788	69,324	16,444
1747	6,661,788	262,866	67,190	40,057	106,565	24,233
1757	9,764,408	401,511	68,301	42,636	148,421	13,546
1767	12,763,043	633,854	61,792	63,447	190,544	9,201
1817	26,784,967	1,492,680	1,072,901	1,575,647	913,937	709,081
1819	29,334,428	1,157,923	2,166,900	1,800,476	906,090	896,371

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ACCOUNT OF THE HUMAN BODY.

WHEN we see a beautifully constructed machine, as a steam-engine, with its piston rising and falling, and its valves opening and shutting with the greatest precision and accuracy, and the whole of its parts conjoining to produce the necessary power and motion required, we are irresistibly led to inquire into the structure of its parts, and how these are arranged and set together so as to accomplish with such wonderful facility their various movements. The animal body is a machine far more admirable in its construction, and more wonderful in its offices, than any devised by human art; and although there has hitherto existed an aversion to inquire into its form, founded on vague prejudice, happily such feelings are rapidly passing away; and a laudable curiosity to know something of the most perfect of the works of the Great Architect of the Universe is beginning to be excited among mankind in general. A general knowledge of the parts of the human body and of their several offices may be very easily obtained; the study is within the comprehension of all; and as human reason was given us, not only to "know ourselves" morally, but to minister to our physical or natural wants, the total ignorance of these must be culpable. A knowledge of the human frame, so far from exciting in us fear or alarm, is rather calculated to call forth feelings of gratitude and admiration. We find in it very nice, and delicate, and complicated parts; but yet we find all these so admirably fitted and adjusted for performing their several offices, that they very rarely, indeed, go wrong, unless deranged and interrupted by the ignorance, the neglect, or wilful folly of man.

The human body is composed of several parts or systems, which serve particular purposes, and perform distinct offices, all conjoining to one general end. There is a skeleton or frame-work of bones on which the whole is built, and which gives solidity and strength; a system of muscles and tendons, which are the means of motion; a system of blood-vessels and absorbents, for conveying the fluids of the body; a nervous system, for imparting sensation; a stomach and digestive organs, for supplying nourishment; lungs, for respiring the air which is necessary for upholding the principle of life; and several inferior parts, which call for less prominent notice. All these parts come to be described in their order.

THE BONES.

The bones are composed of the earthy matter of lime, and of gelatine, or animal glue. The lime gives them hardness and solidity—the animal matter renders them pliant, and not so readily broken. The outer surface of the bones is smooth, firm, and compact, while the inside is spongy and porous, with numerous vessels running through them. The large round bones of the body, such as the arm and leg, are hollow, like pipes, by which their strength is increased, while the necessary lightness is preserved. The marrow is contained in the hollow inside, and also the blood-vessels that nourish the bones. In the human body there are altogether 248 bones. The skull or head bone is composed of several pieces joined together by ragged or toothed edges, somewhat like the teeth of a common saw. In the new-born child these bones do not meet together, but are joined by the membrane below; as the child grows, and the head increases in size, the bones gradually extend, till, at last, when the size of the brain is complete, they join together, and form what is called *sutures*, or seams. Thus the bones form a strong and firm arch around the head, well suited for the safe protection of the important organ within—the brain. Proceeding from the lower part of the skull, there is a chain of twenty-four bones, firmly and curiously jointed the one into the other, and extending down the back; these bones are called vertebræ, and the line or chain which they form is called the spine, or back-bone.

The second of these bones in the neck contains a projecting pinion, or tooth, which is received into a corresponding depression in the first bone of the series, and on which the head turns round from side to side. The bones of the spine end in the pelvis, a large hollow basin-shaped cavity, which composes the lower part of the body, and gives to it firmness and stability. At the top of the spine, immediately below the neck bones, are situated on each side the thin shoulder bones or blades, to which are attached the bones of the arm; these shoulder blades lie above the ribs at the back; they are not joined to them, or to any of the neighbouring bones, but are kept in their position by numerous muscles attached to them on all sides; by this means they have a free and easy motion. To the shoulder blades on each side are attached the arm bones, which move in a beautifully formed ball and socket joint, that admits of motion in all directions; with this, and the yielding motion of the shoulder bones, the arm has every facility of movement. At the elbow-joint the arm divides into two bones, and these are so fitted on each other as to permit of extensive motion to the hand. Eight small bones, firmly wedged together, form part of the hollow of the hand; from these proceed five other small straight bones, which form the remaining part of the palm. To these are attached the fingers, which consist of three bones each. The thumb contains only two joints. On each side of the pelvis, in the lower part of the body, the thigh bones are attached. At their upper ends they move in a ball and socket joint, formed by a deep hollow circle in the pelvis. From the knee proceed two bones, which compose the leg. The front one is the larger; the side bone is thin and slender, and is attached to the other like a spring or clasp. A small bone covers the knee in front, called the patella, or knee-pan. To this bone are fixed the strong muscles that move the knee-joint. A round projecting bone forms the heel, which, with six wedge-shaped bones, compose the foot; from these, four bones proceed, to which the toes are fixed; each of the toes, like the fingers, consists of three small bones, the great toe having only two.

The ribs proceed from the vertebræ, or back-bones, and are twelve in number on each side; they bend round in a circular manner to the front, and join by means of long elastic cartilages to the breast-bone; thus forming a hollow space for the lungs, the heart, and other parts contained in the chest. The ribs move in an easy joint, fixed by tendons into the spine bones; and with the elastic cartilage in front, they expand and contract to suit the motions of the lungs. Thus the skeleton or frame-work of the body is completed. All animals have not this frame of bones; it is only found in a certain number of classes, including man, quadrupeds, birds, reptiles, and fishes; and from all these having a series of vertebræ, or back-bones, they are called vertebrated animals. Some of the other tribes of beings have their frame-work corresponding to bones, on the outside of the body, in the form of a coat of mail; this is the case with shell-fish, as the lobster, and with many insects that have a hard horny external covering, as beetles.

THE MUSCLES.

The soft fleshy substance of the body, which gives plumpness and form to the whole, is the muscular part, or muscles. These are the instruments of motion. And when we consider the various positions which the different parts of the body assume, the agility and quickness by which the most intricate movements are made, the ceaseless play of the heart, the heaving of the lungs, and the singular rapidity of articulation or speech, we need not be surprised that these muscles should be many in number, and important agents in the human economy. The muscles are thick fleshy substances, of a red colour: they are composed of numerous fibres, or layers, placed lengthways, sometimes straight, and sometimes oblique. They are of an elastic nature, somewhat like a piece of India rubber, and contract and extend at the impulse of the will, by which they are lengthened and shortened alternately. A muscle is generally thick or swelled out in the middle: it gradually gets thinner towards the extremities, and, in many instances, passes at one or both ends into a tendon, or tough white substance, which is attached to a bone, and serves the same purpose as a rope or cord, to fix the muscle to a point from which it is intended to act. These tendons are most numerous about the joints, especially the larger joints, where they allow of free and unrestrained action, and yet occupy little space in situations where a large swelling muscle would have been inconvenient. About the larger joints of the body also, such as the knee, elbow, and shoulder-joints, there are numerous glands, which pour out an oily substance, that serves to lubricate the joints, and facilitates the play of the tendons. There are from four to five hundred muscles in the human body, all necessary for performing the various movements and operations of the complicated machine. On each side of the back-bone there are several layers of strong muscles, which are fixed by tendons to every projection of the numerous bones which compose the spine. These muscles keep the trunk of the body erect, and also permit of the various motions of the back. There are a number of small muscles about the face, and head, and eyes, whose various action imparts that expression to the human countenance which indicates the prevailing feelings and passions of the individual. The tongue, besides being of muscular form itself, is also supplied by a number of intricate muscular fibres, which give that amazing volubility of action by which the vast number of sounds composing language are expressed. Several are attached to the lower jaw; but two in particular, the temporal muscles, proceed upwards through an arch formed by a projecting arm of the temple-bone, and are fixed to the tendons of the head. These two muscles are the most powerful in moving the jaws in the operation of chewing the food, and are very large in several animals of prey. Another flat muscle inside the cheek is called the trumpeter-muscle, because it assists in blowing from the mouth, and in sounding wind instruments. The chest is supplied with numerous muscles, which move the ribs upwards and downwards in the action of breathing. A large flat muscle, called the diaphragm, stretched across the lower ribs from side to side, and separating the hollow of the chest from that of the belly, also contributes to the process of breathing. The arm and hand are rolled inward and outward by a set of muscles, which are placed on the outside and inside of the respective bones; thus, the outside muscles act in a contrary manner to the inside, and reverse motions are thus alternately performed. The muscles of the fore-arm are fixed to the scapula, or shoulder blade, at one end, and to the bone of the arm at the other. The fingers are moved by muscles situated in the fore part of the arm, and have long slender tendons, by which they are attached. Two beautiful provisions of nature are here observed; at the wrist, a circular ring of tendonous substance binds down the long tendons, which would, in their various motions, otherwise start up from their places at the same time that this ring permits their free and unhampered play; the other is in the construction of the tendons of the fingers. There are two principal muscles which move the joints of the fingers, and two sets of tendons, which are inserted, the one into the middle bones of the finger, the other into the third row of bones, or the extremities of the finger. In order to preserve their free action, and to make them lie in the most convenient manner, there is a loop or slit in the shorter tendon, by which the other passes through to its insertion in the point of the finger. By this means the longest and strongest muscle moves the extremities of the finger, where the greatest power is wanted. The muscles which move the lower extremities are much of the same kind, but thicker, and more powerful than those of the arms. Several large muscles, acting in opposition to each other, are situated around the thigh joints, and move them. They are fixed, one end to the trunk of the body, some pretty far up, especially two, which are half-way within the abdomen, or belly, on each side of the spine, with the other end attached to the thigh bone. Several thick muscles also are situated at the back, forming the hips. Two large muscles compose the calf of the leg, and join to form the tendon of Achilles, which is fixed to the heel bone; these muscles act powerfully in bending the leg and supporting the body in walking. The foot and toes are moved by several long slender muscles, situated in the leg, which have tendons attached to them exactly like those of the hand and fingers. The pelvis and lower limbs of man differ greatly from those of all other animals in their superior proportional strength, and in the number and fullness of the muscles. This was necessary, as man is evidently intended by nature for the erect position. In the monkey tribe, whose general form approaches nearest to that of man, the narrowness of the pelvis, or hip bones, and the smallness of the muscles of the lower extremities, clearly show that they were not destined by nature for the erect attitude; in fact, all animals of this class are furnished with four hands, the hinder pair exactly resembling those in front. When they attempt to walk on the hind extremities, they cannot put the sole to the ground, but press on it edge-ways. By the nice balancing of the muscles, and the great force which they exert, man is enabled to stand erect, and to maintain a firm position, or move forward at pleasure, notwithstanding that the body is without the perpendicular line of the centre of gravity; and consequently, according to the laws of inert matter, it would have a constant tendency to tumble down. This is the case not only with the trunk of the body as a whole, but the head also is balanced upon the neck by means of strong muscles, whose constant exertion is necessary to maintain it in its position; for in young children, when the muscles are as yet weak, the head has an inclination to droop, and in the dead body it falls down on the shoulder or breast.

THE BLOOD-VESSELS.

These consist of the heart, with its arteries and veins, that branch out through every part of the body, and carry the blood, by a constant circulation, through them. The heart is placed in the left side of the chest, and midway between the back and breast bones; it is of a round conical shape, with the base or broad part uppermost, and the point slanting downwards to the left. It is of a thick muscular form, with hollow cavities inside, and numerous cords or pillars of fleshy or tendonous substance stretching through these to give them support. In man, and all the more perfect animals that breathe air through the lungs, it is double, or has two distinct sides, each performing separate offices. In fishes, again, the heart is single; in insects there is no proper heart, but a vessel that runs along the back, somewhat like an artery, through which the fluid, corresponding to blood, circulates through their bodies; other animals, still more simple in structure, have no trace of heart or blood-vessels. The heart not only sends the blood through the whole body by means of the arteries, which blood is again returned by the veins, but it also sends this venous blood through the lungs, to be renewed and purified by the air, from whence it is carried back to the heart, to be again circulated through the body. The heart, then, consists of two sides, a right and a left; and each of these sides contains two hollow cavities; the one called an auricle, from its fancied resemblance to a dog's ear; the other a ventricle, or belly. The manner in which the blood is circulated is as follows:—Two large veins, one from the upper part of the body, the other from the lower, enter the right auricle of the heart, and carry the blood, which has made the round of the body, into this cavity. Here it is of a dark purple colour, and is called venous blood, from its coming from the veins. From the right auricle it is sent, by a sudden contraction or forcing together of the two sides of the cavity, into the right ventricle immediately below the auricle, and communicating with this by a small opening furnished with a valve; by the right ventricle contracting, it is conveyed by the pulmonary arteries into the lungs, which are two large cell-formed substances on each side of the chest, surrounding the heart. In the lungs the blood undergoes an important change, to be afterwards mentioned, by which it changes from a dark purple hue to the colour of scarlet. After passing through the lungs, it is returned by the pulmonary veins to the left auricle of the heart; from this it is sent into the adjoining left ventricle, and by a powerful contraction of this muscular cavity, it flows out by the great artery of the heart, the carotid, which distributes it through every part of the body, again to be returned by the veins; and thus the round of circulation is continually going on.

The heart being so extremely thick muscle, the force with which it contracts is very considerable. The left ventricle of the heart, too, although somewhat smaller, is much thicker and more muscular than the right, it having to send the blood through the whole of the body. A beautiful provision is observable in the heart, to prevent the flowing back of the blood into its different cavities, during their alternate pulsations. In the passage of communication between the left auricle and ventricle are placed valves, which, when the ventricle contracts to send the blood through the aorta, close accurately, so as to prevent a reflowing into the auricle. There is the same provision between the right auricle and ventricle, and also at the mouth or commencement of the aorta and pulmonary arteries, and the veins which communicate with the right auricle. These valves are of beautiful structure: they are composed of three flaps that join accurately over each other; and to prevent their being pushed by the impetus of the blood beyond their proper position, they have little tendonous cords attached, of exactly the length required. In the child before birth, as it cannot breathe, and therefore the lungs are not used, there is a small hole or communication between the right and left auricles, by which the blood from the veins flows directly through to the arteries, and thus avoids going to the lungs; at birth this hole closes up whenever the child begins to respire. The aorta, or great artery of the body, after it leaves the heart, passes upwards in the form of an arch, when it gives off the carotid branches to supply the brain, and face, and arteries, to the arms and chest. It then bends downwards, and gives off branches to the stomach and other viscera; and when it comes to the lower part of the belly, it divides into two parts, which pass out and become the arteries of the thighs and legs. The arteries of the body are composed of three coats or coverings, the principal one being a thick muscular ring, which encircles the artery, and which contracts and expands so as to assist in sending the blood onwards. The principal trunks of the arteries lie deep in the fleshy parts of the body; but their ramifications are so numerous and minute, that they may be said to pervade every particle of the human structure—bones, tendons, and every other texture. These extreme branches of the arteries being so minute, anatomists have had great difficulty in tracing the exact point at which they pass into veins. They do so, however, as is seen on the surface of the brain. The veins are another system of vessels which return the blood from the extremities of the body to the heart. They are larger and more flaccid than the arteries, and are distinguished from them by having no pulsation. A large vein generally accompanies the corresponding artery, but the great proportion of the veins lie more towards the surface, and are easily distinguished swelling out under the skin. The numerous veins from the lower extremities join into one trunk in the belly, which vein, after passing through the liver, as will be afterwards described, joins the right auricle of the heart, the blood from the upper half of the body joining also by another similar vein. In the veins of the extremities that hang downwards, and are apt to be gorged with blood, there are inserted numerous valves, at short distances, which prevent reflux of any kind.

THE BRAIN AND NERVES.

Like the arteries, the nerves branch out into every part of the body, however minute; and it is by the influence of the nerves communicating with the brain, that motion and sensation are derived. The brain is the great centre of the nervous system; it is contained within the bones of the head, and consists of a large pulpy mass, formed on its surface into numerous waved or convoluted furrows; inside, it is of a whitish cream colour, and of the consistence of soft cheese: there are two large cavities in the centre, called ventricles, and three smaller ones below, all communicating with each other. The brain is also supplied with numerous blood-vessels, and there is always more or less of a fluid serum in its hollows. The internal structure of the brain has been accurately studied and minutely described by anatomists, but still these descriptions throw no light on the nature of its functions. The human brain is divided into the cerebrum, or brain proper, and the cerebellum, or lesser brain. The cerebrum is the uppermost portion, and is much larger in man than in any other animal, in proportion to the cerebellum, which, in the lower animals, always has the preponderance. From the lower part of the brain proceeds the spinal cord, or marrow, as it is sometimes called, although it has nothing in common with the marrow of bones. It is a long round cord, of the thickness of the finger, of the same kind of substance as the brain, and formed of a number of smaller nervous cords, running parallel to each other: it descends in a groove or circular cavity, formed in the numerous small bones composing the spine, and runs along the whole length of the back down to the pelvis. The nerves are small whitish-looking cords, which proceed from the brain and spinal marrow, and spread out in innumerable branches to every part of the body. A large branch of a nerve generally accompanies every large artery, and every important part of the body has a branch of a nerve sent off to it. The nerves for supplying the organs of sight, of smell, of hearing, and of taste, together with the great sympathetic nerves, which give branches to the heart, lungs, stomach, and other important viscera, proceed directly from the brain. The nerves of motion and sensation to the muscular parts of the body, take their origin, with a few exceptions, from the spinal cord. Two sets of nervous branches proceed from the cord on each side, corresponding to the junction of every vertebral bone; and it is found that a branch of these nerves imparts motion, and the other the sense of touch, of heat, and of cold. The brain has a covering of three thin membranes; the outward one strong and thick, the inner extremely thin and delicate. The nerves, which are soft and pulpy inside, have also a thin external covering which protects them. The nervous branches are never seen or felt in the living body, and what are vulgarly called nerves, are the tendons of the muscles, especially those about the wrists, fingers, and ankle joints. Their great numbers and minute divisions are manifest, however, because we cannot prick any part of the body with the sharp point of a needle, without wounding some of them, and thereby causing the sensation of pain. When the nerves are completely destroyed by disease, the sense of feeling in the part is entirely lost. The brain in the lower animals is not generally nearly so large, in proportion to their bulk, as in man; and the cerebrum, or upper brain, is greatly smaller than the cerebellum, or lower brain. In many classes of the inferior animals there is no distinct brain, but only nerves running along their bodies, and joining into knots or ganglions. Insects and worms are of this description. In the polypus, and some other similar animals, a distinct nervous system can scarcely be traced.

THE LUNGS.

In the highest part of the cavity of the chest, on each side of the breast-bone, the lungs are situated. A membrane passing from the breast-bone to the back, divides them into two lobes, the right and the left—the left lobe lying immediately above, and partly encircling the heart and its great blood-vessels. The lungs have a dark-bluish appearance, a familiar example of which is afforded in the *lights* of sheep, that part generally appended to the heart and windpipe. Inside they are composed of an immense number of cells, which alternately inflate or collapse as the lungs are filled and emptied of air. When an inspiration is made, and the lungs are filled with air, these cells become expanded; and the blood sent from the right side of the heart, and spread over the cells, is exposed through an extremely thin membrane to the air. An important change here takes place on the blood: from being of a dark purple colour, it immediately changes to a bright scarlet; it is found that it has absorbed or taken up all the oxygen, or vital part of the air, and has parted with a corresponding volume of carbonic acid gas or fixed air, which it had acquired in its circuit through the vessels of the body. So essential is the matter imparted by the air to the blood for sustaining animal existence, that the breathing cannot be suspended even for a very short period without extinguishing life. It is probable, too, that the heat of the body is generated, and constantly kept up, in some way or other, by means of this process of breathing, and the change which the blood undergoes. The lungs, like every other internal organ, are covered with a thin transparent membrane called the pleura: this membrane, as well as the substance of the lungs themselves, is liable to inflammation; and hence the name of the disease called pleurisy. The trachea or windpipe, the communication between the mouth and lungs, is a hollow tube, having a series of cartilaginous rings passing round it, to prevent the possibility of its being compressed either by external means, or from the food in the act of swallowing, and, in consequence, the breathing obstructed. It takes its rise from the bottom of the mouth, and passes in front of the neck, where its strong cartilage may be seen and felt. At its lower part it divides into two parts, like the prongs of a fork, one going to join the right lobe of the lungs, the other the left. Lungs for breathing air are only found in the higher classes of animals. Fishes are furnished with gills, those comb-like substances which lie within a flap on each side of the head; over them a stream of water is constantly sent by inhaling it at the mouth in a similar manner to breathing. The air, which is always present in considerable quantities in water, is thus absorbed by the blood-vessels while ramifying over the gills, and all the purposes of breathing are answered. In insects there are no lungs, nor do they breathe by the mouth, but along the sides of their bodies, by numerous holes with small tubes or spiracles, leading to a longer middle tube, by which the air enters and mixes with their fluids. When we descend lower in the animal scale, even this substitute for breathing ceases, and probably the vital air is absorbed by such animals by simple pores, or openings in the skin.

THE STOMACH.

Behind the windpipe, taking its rise also from the bottom of the mouth, lies the œsophagus, or tube which passes into the stomach. This tube expands at the top into what is called the pharynx, forming the whole of the upper part of the throat immediately behind the tongue. Into this cavity the windpipe opens, and, to guard against any particle of the food or drink passing into the windpipe instead of into the passage to the stomach, there is a little tongue or valve which closes accurately over the mouth of the windpipe every time food or drink is swallowed. When the substances have passed, the valve again springs open, and admits of free breathing. To show how accurately and precisely every part of the human machine performs its duties, a celebrated writer has instanced this same valve, which, in a multitude of persons dining together, not one time out of a hundred in any one individual instance is at fault. When a drop of fluid or particle of food does by chance insinuate itself into the windpipe, so sensitive is this tube that a convulsive cough is excited, till it is again expelled. There is another little tongue or flap attached to the roof of the palate, and seen above the tongue when the mouth is opened. This, which guards the passage to the nose, is not, however, to be confounded with the other, which is farther down the throat, and invisible. The œsophagus passes down through the chest in a ring formed by the tendons of the diaphragm, that large muscle which stretches across the lower ribs, and which assists so materially in breathing. Immediately below this muscle on the left side is situated the stomach, which is suspended in its place by being attached to the œsophagus, or tube from the mouth. The stomach is an oval bag of considerable size, occupying a slanting position immediately below the heart, with its right side overlapped by the edge of the liver, and extending to the lower end of the breast-bone. The stomach has three coats, an external membranous one, a muscular, and a soft villous inner covering. The upper passage, by which this bag communicates with the œsophagus, is called the *cardiac* opening; the lower, where the first gut commences, is called the *pyloric* orifice.

THE LIVER.

Opposite the stomach on the right side lies the liver, a large flat substance, of a dark brown colour, divided into two lobes. The liver has a round, convex, outer surface, and is hollow or concave below; it is also thick and solid at the back part, and its edge becomes thinner towards the front, where it lies over a portion of the stomach and bowels. It is suspended in its place by several ligaments attached to the surrounding parts. In the under side of the liver, in a small hollow, is situated the gall-bladder, a small oval bag which contains the bile. A tube from this bladder, called the bile-duct, passes into the upper portion of the bowels, carrying the bile there. The liver is supplied by several branches of an artery in the usual way that the other organs are, but it has also a peculiarity which no other intestine has. The large veins, which return the blood from the lower part of the bowels, before going to the heart, enter the substance of the liver, and there spread into innumerable branches throughout its whole surface. From this venous blood the bile is secreted, and after having yielded this substance, the vessels collect again into one large trunk, and join the large vein which carries the blood to the heart. The liver weighs, on an average, from three to four pounds weight, and the quantity of bile which it secretes, taking into account its large supply of blood, must be very considerable. The greater proportion of animal beings are provided with an apparatus of some kind or other for preparing a supply of bile, and in many the liver bears a large proportion to the other contents of the belly. In some animals, as the horse, the gall-bladder is awanting, where there is merely a duct to convey the bile into the intestines. In the lowest classes of animals, all traces of liver or gall-ducts disappear.

THE SPLEEN.

This substance is situated below the stomach, on the left side, between it and the ribs. It is in shape a flat oval, and of a dark iron colour. No duct or opening has been discovered proceeding from it, nor has its use been as yet accurately ascertained. It is probable that it serves to relieve the stomach of its surplus quantity of blood while this organ is distended with food; or it may be the medium of conveying fluids from the stomach into the blood. It has been frequently cut out from living dogs, without causing any apparent derangement in the health or digestion of these animals.

THE PANCREAS.

This substance, known under the name of the sweet-bread, is a large oblong gland, lying across the back part of the belly, extending between the spleen and the middle of the liver. This gland pours out a substance something like the saliva, or spittle of the mouth; and by means of a small duct or canal, pours it into the upper bowels, along with the bile from the gall-bladder, both these substances aiding in digestion, and the preparation of the nutritious fluid to be afterwards mentioned.

THE BOWELS.

From the lower, or pyloric orifice of the stomach, the duodenum, the first portion of the intestinal canal, takes its origin. This gut passes below the liver and receives the bile-duct, and the duct from the pancreas, when it terminates in the jegunum, which again passes into the ileum, or small intestines. These are of great length, and occupy the greater part of the lower belly, being folded and twisted backwards and forwards in many intricate windings. At the end of the ileum, the colon, a large gut, makes an arch upward towards the right side, and across the belly, and descending at the back part, ends in the rectum, the termination of the intestinal canal. The whole length of the intestines in man is generally about six times that of his average height, or from thirty to thirty-six feet. In all animals that feed on vegetables, the guts are of great length; whereas, in those that derive their nourishment from animal food, the intestines are of much shorter proportions. Two membranous substances, called the omentum and mesentery, run along the whole length of the intestines, and serve as a means of their attachment and proper suspension in their places. The bowels have three coats—an external one, common to them with the other viscera, a muscular coat, and an internal villous covering.

LACTEAL VESSELS.

These are innumerably small tubes, proceeding from the ileum or small intestines, along their whole course, and spreading along the mesentery, where they form an immense number of small knots, or glands, by joining together. These are the vessels which take up the fluid chyle, or milky-like substance, after it has been digested and properly prepared in the stomach and bowels. From these mesenteric glands, the chyle is conveyed by these ducts, or canals, to another large gland, situated in the loins, on the right side of the aorta, and immediately below the diaphragm, called the receptacle of the chyle. From this receptacle the thoracic duct arises, and passing upwards by the side of the aorta, or great artery of the body, it joins the left subclavian vein, lying under the left clavicle, or collar-bone, and thus pours the whole of the chyle into the general circulation.

THE KIDNEYS.

These are situated in the loins, one on each side of the back-bone, about one-third up the spine. They are in shape somewhat like a French bean, and their internal form consists of a number of minute porous tubes. They each at the middle hollow part receive a large artery, and their use is to filter from the blood the superabundant fluid, and salts and juices unnecessary for the system, and transmit these, by means of two small tubes, or ureters, to the urinary bladder. These tubes enter the back part of the bladder in a slanting direction, which serves the purpose of valves, preventing a flowing back of the fluid when the bladder is full. The bladder is situated in front, immediately above the bone of the pelvis, called the pubis.

The whole cavity of the belly is lined by a thin membrane, called the peritoneum, above which is the muscular fibre. This peritoneum is liable to inflammation, in the same manner as was mentioned of the pleura, which produces a very violent disease. The coats of the intestines, too, are also subject to the same affection.

THE LYMPHATIC VESSELS, OR ABSORBENTS.

These are another distinct set of vessels spread over all the inner cavities of the body, and also throughout the skin, on which they open by innumerable small porous mouths. Their office appears to be to take up from the blood a thin lymph, which they convey into the receptacle of the chyle and thoracic duct, and also to exhale or carry off from the skin the superfluous moisture of the body. This moisture forms the sweat, and several pounds of fluid are daily drained off from the body in this manner, even when little or no bodily exercise is taken. These vessels are composed of a series of extremely small tubes, and, joining and interweaving, form numerous glands, especially in the groin, armpits, and neck; when swelled by disease, they harden and enlarge, forming knots like a pea or bean. But they are no less numerous on the surface of the inner cavities of the body as on the skin; they are found in the brain, on the surface of the lungs, where they give out a large proportion of vapour at every expiration of the breath, and in the abdomen or belly. It is a disease or sluggishness of these vessels, whereby they do not perform their necessary duty of taking up all the superabundant fluids, that causes dropsies of the chest, belly, and legs. The branches of the lymphatics of the lower half of the body join the receptacle of the chyle; those of the upper part enter the thoracic duct just before the latter pours its contents into the subclavian vein.

THE SKIN.

An external compact membrane or skin covers the whole body. The outer skin, or cuticle, is unprovided with any blood-vessels or nerves, consequently is insensible; in this manner it is well suited for a protection to the parts beneath; it is pierced by innumerable minute pores, which are the mouths of the exhalent vessels: it is thicker in the palms of the hand and soles of the feet than in any other parts of the body. Below the outer skin is a thin membrane, called the rete mucosum, which, assuming different hues in different nations, gives rise to the variety of colour in the human race. In Europeans, it is white, passing into yellowish brown; in native Americans, of a copper colour; in negroes, of a deep black. It is highly probable that climate has the effect of modifying this colour of the skin, as the black skin only occurs in tropical regions, and it is found that there it is a protection against the scorching influence of the sun's rays. Negroes will remain cool and comfortable exposed to a sun which would be intolerable to a white-skinned person. Immediately below this net-work is the cutis, or true skin, an extremely sensible membrane, so thickly studded with minute blood-vessels and branches of nerves, that the smallest pointed needle cannot prick it without touching many of them. On the points of the fingers, lips, and other parts of the body, these vessels are very numerous; and hence these parts are endowed with exquisite feelings of touch. Below the skin is situated the cellular membrane, which is a net-work, whose interstices are filled with fat, and it thus serves to fill up the spaces between the muscles, and to make up the shape, and preserve the symmetry, plumpness, and beauty of the whole frame. In cases of emaciation, this fatty matter is sometimes entirely taken up by the absorbent vessels; as, after a tedious fever, or other lingering disease, when the rough outlines and indentations of the muscles, and the projections of the bones, become painfully apparent.

THE TEETH.

These are placed in the upper and lower jaw, to which they are attached by roots, which sink into the porous sockets of the jaw, somewhat in the same manner as a nail is fixed in a piece of wood. The teeth are composed of bony matter, and covered externally with a thin coat of an extremely hard substance, called enamel. The teeth are furnished with nerves and blood-vessels, which run in hollows of thin substance; they have thus vitality like the rest of the body, although possessing life in a less perfect degree than most other parts of the structure, and hence they are very liable to disease and decay. In decaying teeth a blackish spot is first perceived upon the outer crust or enamel; this substance gradually gives way, and then the bone below proceeds to rapid decay. The irritation of the air, and particles of the food, inflame the nerves and soft pulpy parts inside, and thus the excruciating pain of toothach is produced. The first set, or temporary teeth, begin to make their appearance in the child about the fifth or sixth month, and towards the end of the eighteenth month generally the whole set of temporary teeth, consisting of twenty, have cut through the gums. These teeth continue till about the sixth or seventh year, from which time, till about the twelfth or thirteenth year, they gradually fall out one by one, and are succeeded by the second or permanent teeth. The roots of the temporary teeth are much smaller, and sink less deep into the jaw than their successors. The rudiments of the second set of teeth begin to form early in cavities below the others, and gradually growing and pressing upwards, displace them. The number of the permanent teeth is thirty-two, consisting of sixteen in each jaw. The four front teeth are called the incisors, and have one long root; on each side next to these is one eye or dog tooth; then there are placed two small grinders on each side, having double roots, and three large grinders, or molar teeth. The last of these is called the wisdom tooth, from its making its appearance latest in the jaw, from the seventeenth to the twentieth year, or even later. By this change and gradual succession of teeth, we have a beautiful provision of nature for permitting the jaws to increase in size, and, at the same time, for preserving the relative positions and regularity of the different teeth; for had the first teeth of childhood been permanent, it is impossible that the jaw could have increased in growth without deranging the order and position of the whole. The teeth of various animals differ according to the kind of food on which they live. In carnivorous, or flesh-feeding animals, the teeth are sharp-pointed, and adapted for tearing their prey to pieces; in those animals called graminivorous, that live on grasses and other herbage, the teeth are of a rounded form, with broad surfaces, and the grinders are furnished with several layers of the hard enamel following each other in succession, with a slight layer of common bone interposed; so that, when the grinder is worn down by the friction of chewing, it is not rendered useless, but a new layer of the enamel is presented at the worn-down surface. Some animals, as the hare, rabbit, beaver, and mouse, have the front teeth of a chisel shape, with enamel only on the outer side of them. These animals are called gnawers, because they chew or gnaw down their food in this particular manner; and by the inner soft part of the tooth being liable to be worn down, while the outer is harder, the enamel is thus always kept with a sharp edge. Some animals have large projecting tusks for defence, as the elephant, wild boar, &c.; others, as fishes, are provided with teeth more for holding fast their prey than for mastication. Many have no teeth at all, as birds, worms, and other soft formed animals. Man is characterised by having all his teeth set close to each other in a half circle; they are of a medium form, between that of carnivorous and herbivorous animals; the front teeth are adapted for cutting; the canine are sharp, though not of undue length; and the grinders are suited for masticating vegetable and farinaceous matters, as nuts, &c. In short, the form of the teeth of man evidently points out that he is adapted to live on either kind of diet, or a conjunction of both vegetables and flesh.

THE HAIR AND NAILS.

The hair grows out from the skin somewhat in the manner of a vegetable production. Hairs are fixed by roots in the skin, from whence, by a series of minute vessels, they draw nourishment, and continually increase in length. They possess no sensibility, however, and, unlike the other parts of the frame, may be cut off without producing the least pain. Hair is of different colours in different individuals—is fair in those of light complexion, and deep black in the swarthy. As old age approaches, and even in many young persons, where there is a particular disease in the hair, or dryness in the skin, this colour changes to grey and white. The colouring matter of the hair is contained in the centre, which is of a hollow form, and consists of an oily substance, in which carbon or charcoal, in minute particles, is more or less mingled. The nails are somewhat like hair in their production and composition; they are, like hairs, insensible to the touch, and may be cut or pared without producing pain. They receive nourishment from the blood-vessels of the extremities, and have a constant growth or renewal of their substance. Nails serve as a defence to the tender parts of the fingers; in animals they form formidable weapons of attack. The horns of cattle are exactly of the same nature as nails, and are chiefly composed of animal gelatine.

THE EYE.

We now come to consider the organs of sense. The eye may be compared in its structure to a telescope, the purpose of both being to collect the rays of light proceeding from the surface of bodies, to concentrate these rays, by means of a refracting lens, into a focus, and, therefore, to form a very small image or picture of the object before them. The human eye is placed in a large hollow or socket in the upper bones of the face, surrounded by fatty substance, and the various muscles necessary for moving the eye-ball and eye-lid. At the upper and outer angle of the eye-socket is placed a gland, which secretes the tears that serve to moisten the delicate surface of the eye, to wash off any dust or other substance, and to keep the eye continually wet and transparent, for the purpose of perfect vision. The tears, after spreading over the eye-ball, collect at the inner angle, where, at each corner of the eye-lid, both above and below, there is a small opening visible, which carries the tears down a passage into the nose. The edges of the eye-lids are also supplied with glands, which pour out a mucus that prevents them from adhering together; and these, when irritated and inflamed, are often the seat of disease. The membrane which covers and imparts the white colour to part of the eye-ball in front, is called the sclerotic coat. The middle transparent part of the eye in front is called the cornea, which is filled with the aqueous humour of the eye. Immediately behind the cornea is seen a circular fringed-like substance, which varies in colour in different individuals, being blue, black, hazel, &c.; and hence it is called the iris, or rainbow curtain. This iris has the property of opening and closing, according to the quantity of light which falls upon the eye; and thus the pupil, a black circle contained within the iris, is enlarged or lessened. Behind the iris is situated the crystalline lens, in shape resembling the small lens, or ground glass of a common telescope, but of unequal swell on each side, being more flattened before than behind. This lens is contained within a capsule, or thin covering of delicate membrane. A familiar example of the lens of a fish's eye is presented every day in that white globular substance found in such eyes after boiling. The heat coagulates the lens, which is of the same nature as the white of an egg; and in the fish it is nearly a circular body, to adapt the animal's vision to the dense medium of water. The lens is the substance which receives the rays of light entering the eye, and refracts or bends them inwards, whereby they are collected into one point upon the back chamber of the eye or retina, and thus a minute picture of the object seen is formed. If a bullock's eye is taken when fresh, and a hole cut in the skin covering the back part, and then presented to the light with a piece of white paper put opposite the hole, a representation of the objects in front of the eye will be distinctly traced on the paper. When through disease the lens becomes of an opaque white colour, and will not transmit the rays of light, the affection is known as the cataract, producing blindness. The fluid filling the lens is called the crystalline humour. Behind the lens is the back chamber of the eye, filled with a fluid, called, from its thickness, the *crystalline* humour. Over this back chamber the retina is spread out like a lining or covering. It is covered over with a black pigment, the better to prevent the intermixture or reflection of the rays of light. On this membrane the optic nerve, which comes from the front part of the middle brain, and enters the eye-ball at the back part, spreads out in numerous branches; and here the small images of the outward objects presented to the eye are painted in miniature. All these objects are painted on the retina in a reversed position, or turned upside down, the same as happens in a common microscope; and how they are perceived in their upright position through the medium of sensation, is a curious question, not easily admitting of explanation. Each eye, too, forms a distinct impression of every object, and yet things are not seen double, but both eyes combine to give one impression to the brain or seat of perception. Besides the numerous muscles which roll the eye-ball in various directions, to adapt it to the various positions of vision, there seems also a power, in the cornea or front portion of the eye, whereby it can flatten or become more convex according as the object viewed is at a greater or less distance from the eye, thus adapting itself to the focus of vision in a similar manner as the joints of a telescope are drawn out or pushed inwards. When the cornea is, from its natural form, of too rounded or convex a structure, distant objects are always seen imperfectly, hence causing what is called nigh-sightedness; on the other hand, when it is too flat in form, near objects are then seen indistinctly. This change occurs generally to the cornea as old age approaches, and hence spectacles, or artificial rounded lenses, to aid the flatness of the eye, are in such cases made use of with the desired effect. From the different densities of the three humours composing the eye, the refraction, or breaking of the light into the various coloured rays, is avoided. This for a long time was a great objection to telescopes, till different kinds of glass were joined together in the lenses, thus imitating the resources of nature in the eye. The eyes are supplied by two large optic nerves, proceeding by separate trunks from the brain; they join together for a short space within the cranium, where they again separate, and each entering an opening at the back part of the orbit, spread their branches over the retina. Sometimes these nerves lose their power of sensibility, and total blindness is occasioned without any perceptible disease of the eye; this is called *amaurosis*, and is in most cases incurable. All the larger and more perfect animals are possessed of eyes. Birds have in general very acute vision, especially birds of prey, to enable them to distinguish their victims at a great height in the air. They have also a third eye-lid or transparent membrane, which covers the eye-ball when they are darting suddenly through the air, and which thus protects the delicate organ of the eye from injury, at the same time that it allows the transmission of a sufficient quantity of light. Fishes have eyes of a somewhat different form from land animals, to adapt their vision to the denser medium of water, through which the rays of light pass to their eyes. Insects have great numbers of small eyes clustered together, and most probably they are of microscopic structure. Many of the inferior animals, as shell-fish, worms, &c. have no eyes.

THE EAR.

This is the next organ of sense whose situation is the most complicated. The outer part of the ear is formed so as to collect and transmit the currents of air into the passage which leads to the drum. This passage is of a winding description, and, besides being defended at its mouth by a number of small hairs growing up in it, there is also a waxy substance constantly secreted, which keeps the whole moist, and is an effectual bar to the entrance of insects or other offensive substances. At the inner end of this winding passage is the thin membrane, or drum, which is stretched out on four small bones, and which, by its vibrations, conveys, through the medium of the nerves, the sensations of sound. There are also attached to these small bones, several muscles which, by their contraction and relaxation, modify the tension of the thin membrane, and prevent sounds from acting too strongly on it, or render it tighter, in order to be even sensible to feel vibrations. Behind the cavity of the tympanum, or drum, there is another passage which leads from the ear to the mouth, called the *Eustachian tube*, the object of which is most probably the same as the holes in the common drum, to allow the air to escape from behind, and thus promote the vibration of the membrane of the tympanum; for it is found, that if such holes are not made in a drum, little or no sound will be produced; and in the human body, when this tube, leading to the mouth, is choked up by the inflammation of a common cold, deafness is produced. There is another cavity called the vestibule of the ear, covered over also by a thin membrane; on this membrane the nerves of hearing are expanded, and convey the sensations of sound to the brain. The sense of hearing is very acute in some animals, especially those that live by prey. In the lower orders of beings the sense is awanting, but is compensated in a considerable degree by the extreme acuteness of feeling, or touch, which is so diffused over their bodies as to make them sensible of the least agitation in the air by which they are surrounded.

THE NOSE.

The nose is the organ of smell, and is of comparatively simple structure. The bones forming its inner cavity are of a spongy nature, or rather are composed of a number of very thin plates, covered with a soft membrane, over which the branches of the nerves of smell are minutely exposed. The effluvia proceeding from bodies, and which imparts their peculiar odour, must pass in a stream or current through the nose before the odour is perceptible. If the air is perfectly still, and no current allowed in the nose by suspending the breathing through that organ, the strongest smells will make no impression. In some animals the sense of smell is acute and powerful, beyond the conception of human beings; thus a dog, by the acuteness of this sense, will distinguish the footsteps of his master amid those of a hundred other people, and can thus trace him for miles, although he has been a long while out of sight; pointers also scent game at a great distance. On the other hand, this sense is entirely denied to many of the lower animals. In man it is in many cases very imperfect, and may be blunted, or even extinguished, by disease. In colds affecting the delicate membranes lining the nostrils, the smell is very much diminished.

THE MOUTH.

The sense of taste is nearly allied to that of smell. The nerves of taste are spread over the upper surface of the tongue, and are raised up in innumerable small points, like the pile of velvet. In the lion these papillæ are very large and easily distinguishable. No other part of the mouth is endowed with the property of tasting, except the tongue, as may be proved by touching any part of it with a piece of salt or sugar, when no sensation of taste will be communicated until the tongue has come in contact with the part so touched. That the taste or flavour of many bodies is heightened by the accompanying effects on the organ of smell, is evident; because, if the nose is stopped up so as to prevent the exercise of its functions, many substances having different flavours will taste alike. This is the case with the various kinds of wines, but especially with the ardent spirits. It is almost impossible to distinguish between the flavours of different kinds of spirits if they be tried in the dark, and with the passage to the nose accurately shut up. The tongue and whole cavity of the mouth and throat are kept moist by the saliva, or spittle, which continually flows into them from repositories placed around the cheeks and under the tongue, called salivary glands, which communicate with the mouth by means of small ducts. This saliva flows in greatest quantity during meals, and may even be excited by the sight of food when the appetite is good. It is of essential service in moistening the food, and preparing it for the process of digestion in the stomach. The sensation of taste is in all probability diffused among every class of beings, however low in the scale of existence, although it is probable many animals possess little of it in their mouths, especially when these are fond of hard, horny, or even earthy substances, as in many insects—the lobster, crab, &c.—and where any organ corresponding to a tongue is wanting. Even many birds that feed on grain and hard bodies, not chewed or broken down in the mouth, must have little sensation of taste.

SENSE OF TOUCH.

The sensation of touch is diffused more or less over every part of the body, but is most perfect at the points of the fingers, which in man are generally used to examine the figure and texture of bodies. For this purpose they are furnished with a large supply of very minute blood-vessels and nerves. It would appear that there are different nerves that convey the sensation of touch, distinct from those which are the nerves of motion; and that these proceed in pairs from the spinal marrow; and that, moreover, the sensation of heat or cold may be perceived very distinctly, in cases where the pricking of a needle or contact of other bodies is never felt. The sense of touch may be said to belong to every animated being, and is one great characteristic of animal existence. Vegetable bodies possess a certain degree of life, and show what is called irritability of their fibres; but they have no sensation properly so called; they are not sensible of pain or injury, as the lowest and simplest sentient animal is; neither have they the compensating perceptions of pleasure. It is probable, however, that sensation is not by any means equally acute in all animals: some feel more intensely than others, and it is a [illegible] provision of nature that it should be so. The lower insects and reptiles, from their structure and habits, are continually exposed to injury; and did they feel it as acutely as the larger animals, the degree of animal suffering throughout nature would be excessive. Many animals bear the loss of limbs with impunity, and have the power of restoring these lost members in a very short time. It is probable, that, according to the perfection of the nervous system, is the acuteness of animal sensation.

On thus reviewing the different parts of the human body, it will be observed that most of its organs are double. On a line being drawn in the middle, on each side will be found parts which are exactly similar to the corresponding side. This is the case with the brain, which is a double organ, having two series of nerves proceeding out from each side of it to go to the respective sides of the body. There are two eyes also, each reflecting a distinct image on the retina; yet the nerves communicate so that only one impression is conveyed to the sense. The arms are double, to suit the various purposes for which they are employed, and so are the lower limbs, an essential requisite for the support of the body, and for progressive motion. The lungs, too, may be said to be double, having two distinct lobes; and it sometimes happens that one of them is entirely shrunk or diseased, and yet the important office of respiration is still carried on. The stomach, the liver, and some of the other viscera of the abdomen, are, however, single, their several offices being common to the whole body.

DIGESTION.

One of the most important operations in the animal economy, is that of digestion, whereby the various substances used for food are dissolved in the stomach, and undergo changes, by which they are formed into matter fit for entering into the composition of the different parts of the body, to nourish its growth, and supply the daily waste which takes place in the system; for such is the constitution of animal bodies, that the substances of which they are composed are liable to constant waste; the solid parts are worn down, and taken up by the absorbent vessels, and a large quantity of fluid is as constantly given off by the exhalent vessels, both from the skin and the surface of the lungs. This is manifest in the sweat and the vapoury exhalations constantly passing off by the mouth; and there is also an imperceptible perspiration regularly proceeding from the surface of the body, which has been computed to amount to several pounds in the course of a day. It must be evident, therefore, that if this waste was allowed to proceed but for a very short period, the body would soon be reduced to a state of complete decay. A constant supply of new material is therefore daily needed, to replace that which is wasted; and thus it has been supposed that a human body changes its whole materials many hundred times from the period of its birth till death; and that an individual, as regards his mere corporeal structure, is not at all the same at the period of manhood to what he was when a boy, nor in old age what he was in his prime. Although this change then is complete, even to the bones and most solid parts of the frame, it is brought about so gradually, and with the regular and minute substitution of one particle for another, that it is never perceptible; and even the marks of spots and blemishes, and the healing scars of wounds, are accurately preserved. Man has been called, with relation to his diet, omnivorous, from his being adapted to live on every kind of food, whereas most other animals are confined to one particular description. The carnivorous animals live on flesh alone, the graminivorous on grass and green herbs, and the granivorous on grains and other smaller seeds. These animals never change their respective diets; nor, from the construction of their teeth, stomachs, and intestines, were they ever intended to do so. But in man it is plainly evident, from his anatomical structure, that he was intended to feed on every sort of food promiscuously, or that he could adapt himself to either animal or vegetable fare, as habit or necessity impelled him. Man also differs from brutes in resorting to the arts of cooking, whereby the food is put into a state more fitted for digestion, and for yielding a sufficiency of nutritious aliment. The food being received into the mouth, is broken down and masticated by the teeth, which are of two kinds, the cutting teeth and the grinders. It is here also reduced into a soft pulp by the saliva, which flows into the mouth by the salivary glands; and thus being sufficiently broken down and softened, it passes into the stomach. The stomach has numerous glands situated on its inner coat or surface, which secrete a peculiar fluid called the gastric juice, which is clear and colourless, with little taste, or smell, or sensible qualities. On this fluid depends the important office of digestion. It has the power of coagulating substances in the stomach, of preventing the contents of the stomach from passing into a state of fermentation or putrifaction, and of dissolving the whole into one homogeneous mass. When the stomach is first filled with food, it appears to remain there for a short period without undergoing any change; gradually, however, successive portions of the food as they come into contact with the gastric fluid are dissolved; till at length, in a shorter or longer period, the whole is collected into a thin greyish paste, called chyme. In the upper or left division of the stomach, it would appear, from some recent observations, that the food is freed from its superabundant moisture, which drains off by some undiscovered means to the blood-vessels, and from thence to the kidneys. The chyme then, as it is gradually formed, moves to the other extremity of the stomach, called the pyloric, where it passes out to enter the intestinal canal. It would appear, also, that the pylorus, or lower mouth of the stomach, has a sensitive power, whereby it freely permits the digested chyme to pass out, but refuses exit to the undigested matter. The chyme having passed into the first part of the intestines, or duodenum, is then mixed with the bile from the gall-bladder, and with the pancreatic juice. Both these substances, especially the bile, seem essential for the conversion of the chyme into proper alimentary matter, but their peculiar action has not yet been satisfactorily explained. That the liver and bile ducts are of the utmost importance, however, cannot be doubted, from their magnitude, and the care by which they are supplied with numerous vessels, and from their being universally present in a great proportion of animals. The chyme having passed through the duodenum, and having been mixed with the bile and pancreatic juice, now changes its appearance and properties, and becomes the chyle, or nutritious matter destined to supply the various parts of the system with nourishment. The digested mass is passed gradually along the course of the small intestines, urged forward by what is called their *peristaltic* motion, which is effected by a successive contraction of their fibrous coats. Here the minute mouths of the lacteal vessels, opening on the inner surface of the small intestines, take up the chyle, and carry it, as has already been described, to the receptacle of the chyle, and from thence, by the thoracic duct, it joins the blood-vessels. The refuse of the aliment which has not been taken up by these lacteal vessels passes on through the large intestines, and at length is ejected from the body. It is conjectured that, in the colon, or large gut, which follows after the smaller intestines, the fatty matter of the body is secreted. Digestion is not brought about, as has by some been supposed, by any mechanical means, as by the grinding powers of the coats or sides of the stomach, nor by heat alone, nor fermentation, nor by the simple solution of the food in a fluid, but it is evident that it undergoes a series of chemical actions in the stomach and bowels, whereby its nature and properties are completely changed; and thus animal and vegetable substances, however different, are reduced to one peculiar kind of fluid, the chyle, which, though it may be found to vary slightly according to the kind of food, is, in its general properties, always the same. The gastric juice varies in different animals. In those which feed on vegetable matter, it dissolves these substances only; whereas, grain and vegetables pass through the stomach of a carnivorous animal without undergoing any change. It has this singular property, too, that although it readily dissolves dead animal matters, and reduces them in a short time to a thin pulp, it will not usually act on the living fibre; so that, after death, the coats of the stomach have been found dissolved into holes, by the same juice, that, when living, had no such effect. A stomach of some kind or other is found in all animals; for it is by this organ that nutrition and growth are solely promoted. There are some very simple animals whose whole body consists of a membrane formed into an oval hollow bag, or stomach, with a simple outlet for the mouth to take in nourishment, and no other organ whatever. Of this kind, too, is the polypus, which has a mouth and hollow stomach, with several tentacula, or arms, by which it seizes the worms and grubs on which it feeds; these it swallows, abstracts their juices, and then voids the remainder from its mouth. The common leech has its whole body divided into a number of small cells, like a piece of honeycomb; and these receive the water, and sometimes blood, on which it feeds. Flesh-feeding animals have a simple bag for a stomach, and their food is easily and soon digested. Those animals, again, that feed on grass, which is of more difficult digestion, have three and four stomachs, into which the food successively passes after it has been masticated or chewed a second time in the mouth. This is the case with cows, sheep, deer, &c. Birds that feed on grain have first a sap-bag, or crop, into which the food enters, and remains for a considerable time, mixed with a juice somewhat like saliva; here it is softened and rendered moist, preparatory to its passing into the true stomach, or gizzard, which is an extremely strong muscular bag; in this, with the assistance of a number of sharp-pointed pebbles, which such birds always swallow, it is ground down and acted on by the gastric juice. This compensates for the deficiency of teeth in fowls. Crabs and lobsters have no teeth in their mouths; but in their stomachs will be found three or more teeth, which assist in grinding down the tough sea-weed on which they feed. By domestication, the qualities of the gastric fluid may be so changed, that animals accustomed to live entirely on flesh will exist and thrive on a vegetable diet. This is the case with dogs, and many birds.

THE BLOOD.

The blood is the medium by which all the solid and fluid parts of the body are supplied with nourishment. In its composition, therefore, will be found all the various substances of which the body is composed. The blood consists of a solid coagulable matter, called fibrin, or animal jelly; of a series of red globules which form the colouring matter; and of serum, or whey-like matter, which gives the whole the necessary fluidity. The circulation of the blood through the arteries, and its return to the heart by the veins, has already been explained. The purpose of its thus making the circuit of the whole body, is to supply the necessary materials for increasing the bulk and repairing the daily waste which takes place by perspiration, and the absorbing actions of the lymphatic vessels already described. The blood, again, is replenished by the chyle, or nutritious juice formed in the intestines from the digested food; this chyle enters the venous side of the heart, by one of the large veins called the left subclavian; from the right side of the heart it goes along with the venous blood to the lungs, and there it is mixed with the oxygen, or vital portion of the atmospheric air, by which process it is converted into bright-red arterial blood. In this state it now contains the material of the bones, of the fleshy or muscular parts of the brain and nervous cords of the hair, nails, enamel of the teeth, and, in short, of every different structure of the system. The average quantity of blood contained in an ordinary sized person, is calculated at about 30 lbs. weight. The coloured globules of blood do not enter into the smallest vessels of the body, but only the thinner part of it which has no colour; thus, in the eye, there are numerous blood-vessels, but these are so minute as not to admit the red parts of the blood; and this is a necessary provision of nature, in order that these organs may retain their pure transparency for the purpose of vision. In inflammation of the eyes, when these vessels are much enlarged, the red globules sometimes enter, and the eyes are then said to be bloodshot. What is called the pulse, is the flow of the blood through the arteries, which is caused partly by the impulse of the heart's contractions, or beatings, and partly by the contractions of the coats of the arteries. The rate of pulsation in a person in the prime of life, is from 65 to 75 beats in a minute. In childhood the pulse is much quicker, from 100 to 140 beats; and in old age it again becomes slower than the medium standard. In fevers, inflammations, and other diseases of excitement, the action of the heart is increased sometimes to 100 and 140 pulsations in a minute.

SLEEP.

As a constant supply of food is necessary to repair the waste of the grosser parts of the body, so sleep is essential for the repose and renovation of the finer and more subtile nervous energy. Mere rest alone will not recruit the animal frame, but sleep, or a profound oblivion of feeling and sensation, and of every external circumstance, seems essentially necessary at every periodical revolution of the day. Toward the close of a day of exertion, the muscular powers which have been employed in motion, and in sustaining the body erect, begin to suffer particularly; the eyes become dim and heavy, and the eyelids close involuntarily; the lower jaw falls down; the circulation of the blood through the lungs is sluggish, hence frequent yawning is caused; the head nods forwards; all external objects affect us less and less; the thoughts become confused; and at last the profound oblivion of sleep ensues. We are unconscious of the exact moment when we pass into sleep, but occasionally it happens that immediately afterwards we are awaked by a convulsive start, which is caused by the sudden breaking in of the powers of volition, when as yet but newly and imperfectly lulled to rest. Sleep is quite essential to existence. Deprive a person of sleep, and the body sinks under the privation more rapidly than under famine. Indeed, no circumstances, however urgent, will prevent the approaches of sleep for any length of time; and under the severest calamities, and even while in the hour of battle, or when suffering from extreme fatigue, or cold, or hunger, sleep steals upon us to steep the senses in oblivion. Healthy sleep is so profound as to resemble, in all that regards self-consciousness, death itself. Sometimes, however, the mind exerts its activity, though it is but a partial exertion; and hence dreams, or the thoughts of sleep, are made up of all incongruous associations, such as thoughts of the past day and incidents of long bygone years; scenes of actual experience, and others totally imaginary, being all mixed up and jumbled together. In sleep the heart continues to beat with regularity, and the circulation of the blood is carried on throughout the body; the lungs perform their functions, the stomach digests, and the bowels, and all the glands for secretion, carry on their operations; in short, every thing is carried on connected with the sustenance of the body and the existence of the vital powers; but for the most part all other powers, such as those over which we have a control in our waking hours, are at rest. This is not always the case, however, as walking during sleep, or somnambulism, is a peculiarity which some individuals are liable to. Dreams are most common when the sleep is imperfect or too long continued, and thus they occur frequently towards morning, or through the night, if the stomach is loaded and oppressed with food, or the mind harassed and deeply impressed with cares and solicitudes. In a state of health and serenity of spirits, the most profound and most refreshing sleep is during the first period of the night. When asleep, the circulation and breathing are both somewhat slower than when awake, hence the animal heat becomes diminished; and this is the reason why more clothing is required in bed than during the day. This is the reason, too, why a person lying down to sleep out of doors, or on a sofa, with the usual allowance of clothes, feels chill and uncomfortable on awaking. Digestion, too, would appear to go on less vigorously during sleep; and hence the impropriety of going to bed with a full stomach. During the night and darkness is the most natural and obvious time to select for repose, and it is only the absurd encroachments of fashion that have well nigh turned day into night. By going early to bed, the damps and colds of night are avoided, which is of essential consequence, especially for the delicate. There is also a natural connection of the functions of the body with the periods of day and night, which makes sleep taken in the first part of the night peculiarly refreshing. The absence of every irritation of the head and other parts of the body—the perfect rest of the mind and external senses—have also great influence in promoting sleep. Again, a variety of causes which weaken and debilitate the body, incline to sleep; such as great losses of blood, cooling medicines, purgatives, coldness of the atmosphere; and narcotics, such as opium and tobacco, drinking largely of wine or spirituous liquors, by first causing great excitement, and afterwards a corresponding debility of the system, also predispose to profound and lethargic sleep. Injuries of the head, by pressing on or otherwise interrupting the functions of the brain, also induce sleep; and great corpulency, by retarding the return of blood through the veins, and thus keeping up a pressure upon the head, is generally accompanied by a disposition to sleepiness.

The period required for sleep, by different individuals, depends much upon temperament and peculiarities of constitution, as well as on mode of life and habit. While some cannot sleep beyond five, six, or seven hours, others, again, cannot well do with less than eight or nine hours. Children sleep more than half of their time, and require it, and thrive under it; while adults need much less repose. On a general average, eight hours has been reckoned a good allowance. Certainly, sleep, beyond this, does no good, and often does harm. In order to enjoy grateful and uninterrupted sleep, it is necessary that due exercise shall have been taken during the day; that temperance in food and drink shall have been observed; that strong tea or coffee, which have a stimulating effect on the system, shall not have been taken within an hour or two of going to bed, and that there has been no supper, or a light one. It is true, gluttony and intoxication produce sometimes deep sleep, but it approaches more to an apoplectic stupor, than the calm repose of the temperate. It is in such cases that the curious circumstance which has been called "nightmare" occurs. When a person is seized with an attack of this kind, if it is very severe, it generally disturbs sleep so much, that the sufferer at last becomes conscious that he is in bed, and only half asleep. He feels to be oppressed with some weight which confines him to his back, and prevents his breathing, which now becomes extremely laborious, so that the lungs cannot be properly filled by any effort he can make. The sensation is now the most painful that can be conceived. The person becomes every instant more and more awake and conscious of his situation. He makes violent efforts to move his limbs, especially his arms, with a view of throwing off the incumbent weight, but not a muscle will obey the impulse of the will. He groans aloud, if he has strength to do it, while every effort he makes seems to exhaust the little remaining vigour. The difficulty of breathing goes on increasing, so that every breath he draws seems to be almost the last that he is likely to draw. The heart generally moves with increased velocity, sometimes is affected with palpitation, the countenance appears ghastly, and the eyes are half open. The patient, if left to himself, lies in this state generally about a minute or two, when he recovers all at once the power of volition, upon which he either jumps out of bed, or instantly changes his position, so as to wake himself thoroughly. If this be not done, the fit is very apt to return again immediately, as the propensity to fall again asleep is almost irresistible, and, if yielded to, another paroxysm of the same kind is for the most part inevitable. Speaking during one's sleep is not an unfrequent occurrence, and takes place with some individuals much more commonly than with others. It would appear to be accompanied frequently with certain dreamy imaginations affecting the mind, and at other times is simply the articulating muscles of the voice called into action without any distinct dreams, at least without the person being capable of recollecting any thing if awakened during his harangue. Many of the lower animals extend their periods of sleep to one-half of the year; this is called a state of torpidity, and occurs in those animals during winter. This state of torpidity resembles, in most respects, a common sleep, only that it is more profound and longer continued, and the vital functions are suspended in a more complete degree; still there is a feeble circulation of the blood in the larger hybernating animals, as bears, hedgehogs, badgers, and a waste of their substance, indicating the actions of the secreting vessels. In many insects and reptiles, the torpidity is so great, and the interruption of the vital functions so complete, as almost exactly to resemble death.

NERVOUS INFLUENCE.

The brain is, in all probability, the seat of thought and consciousness, and, through the instrumentality of the nerves, of motion and sensation. In what manner the brain acts, however, or nervous sensation is conveyed, has as yet, and must always, it is presumed, remain an impenetrable mystery. As the nervous branches have a common origin in the brain, or the spinal marrow, as they extend to every part of the body, and as the branches of even remote parts often join and intermix with each other in various ways, that sympathy of one portion of the frame with another, and those curious flittings and alternations of pains, which so frequently occur in disease, may be readily explained and accounted for. Thus the great sympathetic nerve, which arises from the brain, descends into the chest and abdomen, and gives off branches to the lungs, stomach, heart, and diaphragm. When any one of these organs, then, is diseased, it is not to be wondered at that the others should sympathise with them, or that severe headaches should arise from disorder of the stomach. The brain and nerves, too, being parts of the animal system, it is not surprising that affections of the mind, and excitement of the passions, should have such an influence on the health and general economy of the body, and, on the other hand, that disease of the body should reciprocally affect the mind. Man surpasses all other animals in the height and proportions of the forehead, and in the mass of brain in the upper part of the skull. In the human head the lower parts of the face bear a smaller proportion to the forehead than in the brutes. The face is placed in nearly a perpendicular line with the forehead, instead of projecting outwards into a snout, as in the lower animals. The brute face is merely suited for the purpose of animal wants, and for defence; the jaws are long and narrow, supplied with thick, strong muscles, and short teeth; there is not the elevated nose which in man forms a distinguishing feature—the arched eyebrows—the exquisitely formed lips, and the rounded chin; above all, there is not that play of varied expression, that air of intelligence, and that indescribable emanation of a rational mind, that ray of divinity, at the appearance of which the most wild and ferocious of the brute creation are awed and subdued. But, besides, the Creator seems to have affixed characteristic marks to the passions of the mind, that in social life man might not easily impose on his fellow man; for the various muscles of the face, more especially those employed in the voice and eyes, express the several passions of the mind so faithfully, that they may be even represented in painting. This is said to be the natural expression, and would appear to be understood by animals, as well as practised by them; for a dog, on looking to the countenance of his master, easily recognises the mute expressions either of commendation or dissatisfaction. From the action of these muscles being so often repeated, physiognomy arises; so that the constant expression of the face retains something of the action of the prevailing muscles; and thus some traces of frequent anger often remain in the countenance after the passion itself is gone off. With the power of speech and reason, man has also the means of expressing his feelings and passions by laughter and weeping, which is almost unknown to the lower animals. Weeping proceeds from a deep emotion of the mind, and seems an effort of nature to relieve the system of grief. It begins with a deep inspiration of the lungs, after which follow short alternate inspirations and expirations, and it is finished with a deep long-drawn expiration, which is immediately followed by an inspiration. Hence it has nearly the same good and bad effects, and, when moderate, it relieves the distress arising from grief. Laughter has its rise from some ludicrous ideas impressed upon the mind, and would seem to arise directly from the titillation of the branches of the internal nerves, probably those of the diaphragm; immediately to this succeeds a number of imperfect inspirations and expirations, which seem to be checked by the contraction of the glottis in the throat or larynx. Laughter in a moderate degree may be conducive to health, as it gives a concussion to, and ultimately promotes, the circulation; carried to excess, however, it may prove dangerous, from accumulating too much blood in the lungs. Sneezing consists of one deep inspiration, succeeded by a powerful single expiration, and seems to consist of a convulsive effort of the muscles of breathing to throw off some cause of irritation in the sensitive membrane of the nostrils. The common hiccup is a spasmodic action of the muscles of the stomach, most probably similar to sneezing, and caused by something irritating the stomach itself. Some of the causes by which the felicity of our minds is either increased or diminished, proceed entirely from the bodily sensations. Thus pain is caused by disagreeable sensations, which seem to be produced by every sensation in a nerve that is too strong; and pleasure, by those in which the nerve is irritated beyond what is usual, but in a gentle and moderate degree. Itching is akin to pleasure, and in both the flow of blood is increased into the part in which either pleasure or titillation is perceived; but when farther increased, it degenerates in[illegible] pain, or excessive sensations in the nerves. Anxiety arises from the blood being retarded in its passage through the lungs. Anger violently excites the motion of the spirits, increases the motion of the heart, the frequency of the pulse, and the strength of the muscles; forces the blood into the extreme vessels; and even bursts the smaller vessels themselves: thus passion also increases the secretion of bile. Grief weakens the strength of the nerves and action of the heart, retards the pulse, destroys the appetite, and produces paleness, looseness of the bowels, indigestion, and those slow or lingering diseases that take their rise from an interruption of the secreting glands, and a disease of their structure. Fear diminishes the force of the heart, weakens the muscular motions, relaxes the whole system, and, if long continued, causes a general sinking of the body. Excessive terror increases for the moment the muscular strength, even to convulsions; excites the pulse, interrupts the course of the blood, and in not a few instances has produced sudden death. Love, hope, and joy, promote all the salutary actions of the body, gently quicken the pulse, promote circulation, increase the appetite, and aid the cure of diseases. Excessive and sudden transports of joy, however, often prove fatal, by increasing the motion of the blood, and exciting a fit of apoplexy. Shame, in a peculiar manner, retains the blood in the face, as if the veins were obstructed; when felt in an extreme degree, it has also been known to prove the cause of sudden death. The higher manifestations of the mind are imagination, memory, judgment, &c. The investigation of these does not belong to the present subject, farther than they appear to be connected and influenced by the organization and successive developement of the body.

Imagination consists in that power which the mind has of calling up impressions of scenes and circumstances which are not immediately present to the external senses. This definition is confirmed by the example of the great strength of fancy in certain persons, and in those who are delirious, and in every person, in the case of dreams, in which scenes arise in the mind not at all less vivid than those which originally impressed it by the actual perception of the senses. Attention, quiet, and the absence of all external objects, serve to make such impressions of the mind even more forcible than realities; for the will is much more powerfully determined in those who dream than in those who are awake, and some voluntary muscles perform during sleep functions which, while awake, they never could accomplish, even when the nerves of such muscles were most strongly affected by the real object. It thus appears plain how a very vivid internal impression in delirium may so impose upon the mind as to be mistaken for the perception of a real external object. Memory is a subordinate faculty of the mind to that of imagination; we have the memory of past scenes, past events, words, colours, &c. The imagination is early developed in children. In the first periods of infancy we have scarcely memory; it grows and is strengthened with the accumulation of incidents and scenes that pass before us; in childhood it is quick and retentive. In old age, again, the power of retaining the memory of recent events fails, while the circumstances of long past years are pertinaciously retained. Imagination is most active in the first period of life, from childhood to maturity. Judgment then assumes its sway, and the brilliancy and activity of the fancy somewhat subsides.

INFANCY.

At the moment of birth, the infant begins to exercise an independent existence, whereas, before, it formed a part, and was nourished by the vessels, of its parent. A general similarity takes place in the embryo growth of most animals, and the familiar instance of the chick in the egg may be taken as an example. The egg is composed of a centre part, or yolk, and of the albumen, or white part surrounding it. In this white part, a small darker speck may be seen floating, from whence the first rudiments of the chick are derived. In a few days after the hen has sat on the egg to impart to it the necessary heat, a small whitish spot will be observed, which is the first rudiments of a brain; in a few days more, vessels will be seen spreading out from a central heart, and forming a net-work all around; gradually an appearance of a head is seen, with indications of brain and spinal marrow; the eye-balls next are formed, then the several parts of the viscera, the projections of the wings and legs, and, lastly, the skin and rudiments of the future feathers. During these periods of incubation, the chick has been nourished by the yolk of the egg, which has gradually been absorbed by its vessels for this purpose. At last, when its growth is perfected, and the whole contents of the egg converted into the materials of its body, the little animal begins to pick a hole in the shell, and, by repeated efforts, bursts from its shelly prison, and assumes an independent life. The infancy of man is of much longer duration, and of a much more helpless nature, than the same state in any other animals. A child cannot walk till it is at least twelve months old; and even for a considerable time after that period, it has to be fed and tended with the utmost care: whereas, after a very short time, the young of most animals are able to provide for themselves; in a great many, a few minutes after birth, they are able to walk about, to search for and distinguish the teat of their mother, and to pick up the food that is suitable for them; and having remained under their maternal protection for a short space, they leave their parents, and never know or distinguish them more. It is very different with the infant: during a long and helpless period of childhood, it is tended by a fond mother, who anticipates all its wants; while it, on the other hand, watches her smiles, and imitates her most minute actions; and thus a reciprocal bond of union is established, by which not only every species of knowledge and experience is acquired for the conduct of after life, but those moral ties and affections established which constitute the great boast and solace of human society. Man proceeds from infancy to maturity by a slower and more gradual expanse of the bodily structure than any other animals, and this may be one reason of his superior organization, his greater fitness for supporting labour and fatigue, and the longer period to which his life is prolonged. From infancy upwards, the mental powers also gradually expand. This is also different from animals; for in them the faculty of instinct at once is perfected, and never afterwards increases or undergoes any change. In childhood, the mental faculties are constantly active, and on the alert to catch new information, inquisitive to know every thing, and imitate every gesture. The facility with which children acquire the knowledge of words, and in a few months master a language, is very astonishing, when we reflect for a moment how much time and pains it takes a grown-up person to become a proficient in any unknown language: and our astonishment will be heightened when we consider, that, in the case of children, they have not only to acquire the words and their proper applications, but even to master the articulation of sounds, with all their infinite combinations. The age of puberty, or that period when boyhood terminates and manhood commences, varies somewhat in different climates, according to their high or low temperature: the mean period may be reckoned about fourteen years; and, about the age of twenty, the growth of the body generally terminates. About the age of thirty, man may be said to be in his full vigour, with his mental and bodily powers completely developed. Females arrive earlier at a state of maturity than males: in warm climates females are full grown as early as their ninth or tenth year; in more temperate regions, about their fifteenth or eighteenth year. The proportion of male children born to that of females, is as 21 to 20: there is thus a small superabundance of males; but, from various causes, it so happens that there is generally rather a superabundance of females actually existing in society. Among these causes may be mentioned, the greater hardships and labours to which men are exposed, the effects of war, and, on the whole, the longer life enjoyed by females. This regular proportion of male and female births throughout mankind in all ages, and in all parts of the world, shows the admirable design and precision of an unerring nature.

THE SEXES.

In almost all animals the sexes are distinguished by a difference of form and texture of their bodies; and in many a superior gloss of colour in the hair or fur, or a superior brilliancy of the plumage, very generally characterises the male of the species. In most animals, too, the males are of superior size, and endowed with greater muscular strength. In the human species man is marked by a larger and more muscular body than the female; his chest is square and capacious, and particularly at the shoulders, from whence it tapers gradually downwards; his bones are large, and his joints firm and sinewy; his muscles are round, tense, and conspicuously marked; his limbs thick and fleshy, and his arms powerful; his skin is firm and tense, and his hair strong, crisp, and often curly. The female figure, again, is smaller, less powerful, and, in every respect, more delicately formed; the bones are less projecting, the muscles softer, less conspicuous, and more smoothly blended one into the other; the shoulders are narrow and rounded; the greatest breadth of the body being at the pelvis, from whence it gradually tapers upwards; the skin is soft and delicate; the hair smooth, and of a silken appearance. The mental qualities and dispositions differ somewhat also. Man is commanding, resolute, daring, adventurous, addicted to deep and abstract thought, as well as to high and imaginative speculations. Woman is gentle, submissive, timid; with a mind, perhaps, little inferior in compass to man, she is more commonly distinguished for acute penetration, nice and delicate discrimination, refined and chastened taste, and elegant and playful fancy. It was the opinion of Plato, that, with regard to the mind, there is no natural difference between the sexes, but in point of strength. "When the entire sexes are compared together," says he, "the female is doubtless the inferior; but in individuals, the woman has often the advantage of the man." With warm and tender attachments, pure morals and high religious feelings, she is admirably calculated for the sacred charge of watching over and training up the young, and of instilling into their tender and susceptible minds the beautiful lessons of early wisdom—of faith, truth, and charity. All nations, as they have advanced in civilization, have uniformly increased in that respect and refined attention which is due to the softer sex; and one of the most powerful minds and of the most splendid endowments has been the foremost to appreciate those superior qualities which are to be found in a gentle and unsophisticated female. The late Professor Dugald Stewart thus introduces a quotation from a well-known traveller, which affords a just and beautiful estimate of the tender disposition of woman:—"From the greater delicacy of their frame, and from the numerous ailments connected with their temperament, combined with their constant familiarity with distresses which are not their own, the sympathy of women with the sufferings of others is much more lively, and their promptitude to administer relief, wherever it is possible, is much more eager than in the generality of men. To the truth of this remark every day's experience bears witness; and, from the testimony of travellers, it appears that the observation extends to women in all the different stages of society. The strong testimony of Ledyard, the celebrated pedestrian traveller, on this point, may be regarded as perfectly decisive. "To a woman, whether civilized or savage, I never addressed myself in the language of decency or friendship, without receiving a decent and friendly answer; with men it has been often otherwise. In wandering over the barren plains of Denmark, through Sweden, Lapland, Finland, Russia, and the wide-spread regions of the Tartar, if hungry, dry, cold, wet, or sick, the women have ever been friendly to me, and uniformly so; and, to add to this virtue, these actions have been performed in so free and kind a manner, that, if I was thirsty, I drank the sweetest draught; and, if hungry, I ate the coarse meal with a double relish."

TEMPERAMENT.

There are certain conditions of the bodily frame which evidently constitute varieties of the human constitution, and which have been called temperaments. Thus the sanguineous temperament is characterised by a florid fair complexion, rather tall stature, hair of a flaxen or chestnut colour, a certain plumpness of the form, blue eyes, transparent skin. The accompanying mental qualities are, a quick perception, ready and tenacious memory, lively imagination, a mind disposed to hope, fond of anticipations, amorous, delighting in pleasures, of an active habit, generally healthy, but if attacked with disease, this will be of an inflammatory nature. This temperament descends into the muscular or athletic when the animal powers are in perfection, but the mental less developed; thus the head is small, and the forehead low, but the muscles are well marked and swelling, the shoulders broad and full, the chest large, and the feet and hands small and well proportioned. The bilious temperament is indicated by the hair being black, or dark coloured, the skin brown or yellowish, the muscles firm, the outline of the features well formed and expressive. The mind is also bold in the conception of designs, firm and persevering, courageous, active, inclined to sudden bursts of passion, and the powers of intellect will be found to be generally very early developed. When the body is diseased, and especially when there is any enlargement of the liver, this temperament passes into the melancholic, when there is a great sluggishness of action and of thought, a melancholy foreboding mind, most generally plunged into torpid despair, or occasionally excited by fits and bursts of mirth and transient cheerfulness. In the nervous temperament, the flesh is soft and flabby, the skin fair, the hair flaxen or sandy, the pulse weak and low; the muscular part of the body bearing a smaller proportion to the brain and nerves than in the other varieties of the constitution. The mental faculties are delicate and sensitive, but variable and irresolute. Perhaps the *beau ideal* of the human frame cannot be better described than in the words of Hufeland:—"He has a proper and well-proportioned stature, without, however, being too tall. He is rather of the middle size, and somewhat thick-set: his complexion is not too florid; at any rate, too much ruddiness in youth is seldom a sign of longevity; his hair approaches rather to the fair than to the black; his skin is strong, but not rough; his head is not too big; he has large veins at the extremities, and his shoulders are rather round than flat; his neck is not too long, his belly does not project, and his hands are large, but not too deeply cleft; his foot is rather thick than long, and his legs are firm and round; he has, also, a broad arched chest, a strong voice, and the faculty of retaining his breath for a long time without difficulty. In general, there is a complete harmony in all his parts; his senses are good, but not too delicate; his pulse is slow and regular; his stomach is excellent, his appetite good, and digestion easy. The joys of the table are to him of importance; they tune his mind to serenity, and his soul partakes in the pleasure which they communicate; he does not eat merely for the sake of eating, but each meal is an hour of daily festivity; a kind of delight, attended with this advantage in regard to others, that it does not make him poorer, but richer: he eats slowly, and has not too much thirst. Too great thirst is always a sign of rapid self-consumption. In general, he is serene, loquacious, active; susceptible of joy, love, and hope; but insensible to the impressions of anger, hatred, and avarice; his passions never become too violent or destructive. If he ever gives way to anger, he experiences rather a useful glow of warmth, an artificial and gentle fever, without an overflowing of the gall. He is fond also of employment, particularly calm meditation and agreeable speculations; is an optimist, a friend to active and domestic felicity; has no thirst after honours or riches; and banishes all thoughts of to-morrow.

MAN ADAPTED TO LIVE IN ALL CLIMATES.

Man has this superiority over all other animals, that he can inhabit every different region of the globe, however extreme the degree of temperature. He is found under the scorching sun and amid the arid plains of Africa, as well as in the frost-bound regions of Spitzbergen; and he is found to live and thrive under these different extremes, not only after a gradual naturalization of ages, but can even move from one country to another, and undergo a vicissitude of climate with comparative impunity. Thus we see, even from our own country, emigrants going forth, and naturalizing themselves amid the cold regions of the north, onward to the very verge of the equator. The Esquimaux and the Canadian savage will prosecute their usual employments of the chase in a temperature where mercury freezes into a solid mass, and where even brandy congeals to ice in apartments containing fires; while the African negro, again, feels quite at his ease in a burning climate, where the thermometer in the shade ranges from 90° to 100°, and upwards. Man has an equal facility in adapting himself to the pressure of the atmosphere attendant on low or elevated situations. In Mexico, he is found living in elevated regions, from 6000 to 9000 feet above the level of the sea; and the hamlet of Antisana, in Quito, is 15,500 feet above the level of the ocean. On the contrary, we find almost all animals only adapted to live in the regions in which they are naturally found; and if they are removed from such localities, they seldom enjoy the natural period of their life. Even the dog and the horse, the domesticated companions of man, degenerate and change their natures under extreme varieties of temperature; and the monkey tribe, which, in the structure of their bodies and in the substances on which they feed, approach the nearest to man, become sickly and diseased, and never propagate their species, when removed into any of the colder regions of the globe. In order to enable man thus to subsist in regions having such a diversity of natural productions, he is endowed with the power of feeding on and digesting every possible variety of food—he is, as compared to other animals, in respect to diet, omnivorous. We thus find the Greenlanders and inhabitants of frozen regions living almost exclusively on the fat and flesh of land and sea animals, the only species of food which the barren and ungenial nature of the climate affords, and a species of food, which, from its stimulating and nourishing nature, is the very best for enabling them to live under such an extreme depression of temperature. The inhabitants of hot countries, again, will be found living on rice, fruits, and other vegetable substances, which the warm and genial soil produces in abundance, and which, from their nature, are less heating and stimulating than an animal diet. In the intermediate and temperate regions, a mixed diet of animal and vegetable food is preferred. Much discussion has arisen whether man be more a flesh-feeding or herb-eating animal; experience demonstrates that he is equally adapted to become both—that he will live on an almost purely animal diet, as well as on one purely vegetable; although, were we strictly to compare the form of his jaws and teeth, and the general structure of his intestines with those animals that live on nuts and other fruits, and farinaceous or mealy substances, as, for instance, the monkeys, the near approach of these to the human structure would indicate to us that at all events a farinaceous diet is the most suitable to his natural organization. We thus find among all civilized nations that bread, and the grains and mealy roots, in some shape or other, have always a preponderance in every meal. But the art of cooking, which man resorts to even in the first dawnings of civilization, enables him to change the nature of his various food, and to render it more suitable both for digestion and the purposes of nourishment, and thus gives him a wonderful superiority over all the rest of the animated world. Indeed, it is by this improved mode of preparing his food, perhaps, as much as by original strength and perfection of frame, joined to the other comforts of civilization, that he is enabled to brave the vicissitudes of climate, and to prolong his life to a longer period than the great majority of other animals.

Man has been formed with a naked skin, with the evident intention that he should clothe himself by his own labour and ingenuity. Almost all the larger and more perfect animals have a covering of hair, of feathers, or of down, which is at stated periods renewed, and in some animals in greater length and abundance at particular seasons, to suit the variations of temperature. But man can always adapt his clothing to the climate he inhabits, or to the varying alterations of the seasons; and he can at all times, by his own industry, vary or renew his suits. Man, too, builds for himself a comfortable habitation, to protect him from the inclemency of the weather; and is not contented with a burrow under ground, or the casual shelter of the woods and coppices, as is the case with the animals of the forests. It is true the architecture of bees, and some other animals, is curious, ingeniously combined, and admirably suited to their necessities; but in comparative taste, splendour, or even convenience, how far are all these surpassed by the houses, and temples, and cities of mankind! Though man is naturally defenceless and unarmed, how soon does his ingenuity enable him to obtain a mastery over the beasts of the field and forest, and furnish him with weapons of defence against all his enemies! How soon does his ingenuity enable him to improve and cultivate the soil—to drain marshes, cut down woods, level mountains—to select and cultivate the best species of grain, and the most wholesome and nourishing vegetables, for food—to invent tools and engines, by which he acquires a command over the sea and land, by which he erects bridges, constructs machinery, and launches the towering vessel upon the wide ocean! And, lastly, with what skill he constructs instruments of art and of science, by which he can examine and investigate the most minute objects of nature, as well as bring within his sphere of observation other planets and other suns in the vast dome of the universe!

VARIETIES OF MANKIND.

From comparing the anatomical structure of all races of men throughout the world—from their general similarity in every material point—there can be no doubt but they are all of one species, and consequently must have all sprung from one original pair. The diversity of features, of stature, and of colour, only constitute varieties of this great family, and take their rise from particular circumstances, as climate, food, habits, and the degree of civilization to which they may have arrived. That there is an intimate relation between colour and the climate, is shown by this remarkable fact, that the northern regions exhibit a fair skin, and that, as we gradually proceed southward, the tint deepens. Thus, the Norwegians and Danes are fairer than the English, the English than the French, the French than the Spaniards and Portuguese, and these than the Moors, while the negroes in the burning regions of Africa are darkest of all. Even in this country, exposure to the sun darkens the complexion. Europeans who have been in warm climates come home with a skin permanently darkened in a slight degree, and the yellowish hue which prevails among the Americans of the present day shows the gradual effect of climate in the course of a few centuries. Captains Lewis and Clark were so much browned during their expedition to the Missouri, as to be often taken by the natives for Indians belonging to hostile tribes, and it was only on showing the whiteness of their skin in such parts as were covered that their suspicions were removed. In Lord Amherst's expedition to China, it was observed, that persons who were in the habit of working in the heat of the sun, with their bodies uncovered from their waist upwards, became of a dark copper colour; but when they stripped, either for the purpose of bathing, or of going into the water, in order to have a better view of the expedition, the comparative whiteness of the skin which was usually covered gave them the appearance at a distance of wearing light coloured pantaloons. It is true this effect of the sun is only temporary; but if we are to consider, that races of men, in the first ages of the world, lived the life of rude and unclothed savages for thousands of years, exposed to the full influence of a tropical sun, the gradual effect of altering the colour of the rete mucosum, or under net-work of the skin, is not at all improbable. In warm regions alone, we find this black colour prevail; and the more savage and rude the people, the deeper, climate being the same, is the tint. The final use of this tint is explained under the head of "The Skin." Considerable variety of feature and form of the head prevails among different nations, and five striking varieties have been pointed out. 1st, The Caucasian, or European variety, is distinguished by all the shades which characterise the white inhabitants of the globe. The head is large, especially the upper and fore part of it; the face is oval and straight; the outline of the features distinct and regularly marked, and falling in a nearly perpendicular line below the forehead. All Europeans, except the Laplanders, are included under this division; as are the inhabitants of Western Asia, as the Turks, Georgians, Circassians, Arabs, Persians, and Hindoos of high caste; comprehending all those nations that have been distinguished for civilisation in either ancient or modern times.—The second division is the Mongolian, or yellow race. This variety is distinguished by black eyes; black, straight, strong, and thin hair; little beard; head of a square form, with small and low forehead; broad and flattened face, with the features running together; nose small and flat; rounded and projecting cheeks; eyes placed obliquely; narrow half-shut eyelids; large round thick lips; and skin of a yellowish hue, somewhat like dried lemon-peel. This division includes the Moguls, a numerous tribe, living in the centre of Northern Asia; the Calmucks; the Chinese and Japanese; the inhabitants of Thibet, Cochin-China, Ava, and Siam; together with the Laplanders and Esquimaux inhabiting the northern regions of Europe and America.—In the third, or Ethiopian variety, the skin and eyes are of a jet black; the hair black and woolly; the skull narrowed at the sides and lengthened out in front; the forehead low, narrow, and slanting; the cheek-bones projecting; the jaws narrow and jutting outwards; the upper front teeth oblique; the chin receding; the eyes prominent; the nose broad, thick, and flattened on the face; the lips, and particularly the upper one, thick; the projecting jaw and the retreating forehead distinguish the negro's head from the two foregoing. All the inhabitants of Africa, not comprehended in the Caucasian variety, are comprised in this.—The American variety is characterised by a dark skin, of a more or less red tint; black, straight, and long hair; small beard; countenance and skull very similar to that of the Mongolian tribes; forehead low; eyes deep; face broad, particularly across the cheeks, which are prominent and rounded; mouth large, and lips rather thick. All the native tribes of America, except the Esquimaux, are comprehended in this variety; but the skin in many of them is much more of a brown than a copper colour.—The fifth division is the Malay variety, and it has in it less of a peculiar character than any of the other divisions: the colour is brown, from a light tawny to nearly a black; the hair is black, abundant, and more or less curled; the head rather narrow; bones of the face large and prominent, more full and broad towards the apex; the mouth large. The inhabitants of Malacca, Sumatra, Java, and of most of the adjacent Asiatic islands—of the Molucca, Philippine, and neighbouring groups—of New Holland, New Guinea, New Zealand, and the numberless South Sea islands, are all of this variety; and it may be remarked, that among the East India islands there is a division resembling the negro in the character of the hair, in colour, and in the general form of the skull and features.

Although there is no foundation whatever for the stories related of giants, yet the inhabitants of a district of South America, the Patagonians, are distinguished for considerable strength of body and a height above that of the average size: this is the case also with the inhabitants of the Carribbee Islands, the Cherokees in America, the South Sea Islanders, and the Caffres of the Cape of Good Hope: but, on the whole, savages are not distinguished either for height or strength of body, a European being a match for them in either of these respects. The Esquimaux are remarkable for diminutive forms, and so are the Calmucks and Monguls. Extraordinary instances of dwarfs have occurred, of the height of only sixteen and forty inches; but these are aberrations of the ordinary occurrences of nature.

OLD AGE.

We have seen that there is, within the animal frame, a system of operations, by which a constant supply of nourishment is afforded to make up for the daily waste and decay, and that every part is constantly undergoing a renewal. To view a man in the full vigour of life, then we might suppose, that, excepting accidents, he was calculated to go on, in the course of existence, for an indefinite period. The principle of life, however, seems to have limits sets to its duration, beyond which, it fails to keep in healthy motion the animal faculties. The apparatus of life is evidently destined but to last for a certain time. Old age creeps on apace, and the vital flame burns fainter and fainter, till at last it sinks in the socket, and is seen no more. The commencement of decay is perceptible even in youth itself. The child at first grows quickly, from the soft and yielding state of all its vessels; but gradually these begin to thicken and get harder—a greater proportion of earthy matter is adding to the bones. The extremities grow out large, while the heart itself does not increase in an equal degree; hence the circulation becomes less and less quick, till the period of full growth. When the growth of the body can proceed no farther, a degree of fatness not unfrequently occurs. This proceeds from the superabundant nourishment produced from the food, which, from the impetus or force of the circulation being more lessened by the greater extension and resistance of the body, accumulates in the cellular textures, and by the sides of the extreme vessels. In every part of the body, the induration produced by approaching age becomes conspicuous; in the bones now wholly brittle, in the skin, in the tendons, in the glands, in the arteries, and in the brain itself, which gets firmer and drier. Moreover, the arteries continue to get denser, narrower, and even shut up in their minute branches. At the same time, the nerves become more and more callous and insensible to the impressions of the senses, and the muscles to irritation; thus, the contractile force of the heart, and the frequency of its pulsations, are diminished, and, of consequence, every force which impels the blood into the ultimate vessels. The quality of humours is diminished in the denser body; the moisture which lubricates the solid parts every where manifestly decreases; nor is the quantity of humours only diminished; they themselves likewise become vitiated. They were mild and bland in children; they are now acrid, salt, and fetid, and loaded with a great quantity of earthy matter. This circumstance, of the superabundance of earthy matter, is evident in the gouty concretions in the joints of old people, in the frequency of stone, and in the arterial tubes, and even the heart itself, being frequently converted into real bone. The rigidity of the whole body, the decrease of the muscular powers, and the diminution of the juices, constitute old age, which sooner or later comes upon all men; sooner if subjected to violent labour, or addicted to pleasure, or fed upon a too scanty or unwholesome diet; but more slowly if they have lived quietly and temperately, or if they have removed from a cold to a moderately warm climate. There are three obvious divisions of human life—a period of youth, including the period before the age of 30; of maturity, from 30 to 50; and of old age, commencing about the period of 50 or 60. David speaks of the age of man being, in his time, only three-score years and ten, or in rare cases four-score years, which may be reckoned the average limit of human existence; nor does it appear that the ancients at all exceeded the moderns in the duration of their lives. Of course we set aside that extraordinary duration of existence which is described in the early part of the Mosaic history, and which was evidently intended as a means of more rapidly peopling the earth. After the period of 50 or 60 years, varying of course in different constitutions, the marks of old age begin to make their appearance. The skin becomes more lean and shrivelled; the hair changes to a grey colour, or baldness occurs; the teeth drop out, and, in consequence of this, the lower parts of the face, about the mouth and jaws, incline inwards; the muscular motions of the body become less free and elastic—this is especially seen in walking, old people generally treading on the whole base of the feet, and hence having a shuffling gait; the blood circulates slowly; the animal heat is diminished; the pulse occasionally intermits, and the whole energies of the animal frame become lessened; the eyesight begins to fail, and dullness gradually comes over all the senses; the memory undergoes a remarkable change, while recent events pass through the mind and make no impression; the occurrences of early life continually suggest themselves, and are minutely called to remembrance. Dr Rush mentions the case of a German woman, residing in America, who had learned the English language after she was 48 years of age, and could speak it fluently, and continued to do so for many years. At the age of 80 she completely forgot every word of the English language, but spoke the tongue of her infancy with fluency. The same author mentions the case of an old man, of 101 years, who declared that he had forgotten every thing he had ever known except his God. Anthony Benezet, another American, made the following remark to a friend who questioned him regarding his memory:—"You can read a good book with pleasure but once; but when I read a good book, I so soon forget the contents of it, that I have the pleasure of reading it over and over, and every time I read it, it is alike new and delightful to me." The digestion of old people is not in general vigorous, although the appetite for food is, as in the case of children, craving, and they are fond of eating frequently. They are also similar to children in the marks which slight contusions or impressions leave on their skins, in their being soon fatigued with excercise, in being as soon refreshed with rest, in their disposition to detail immediately every thing they hear and see, in their general garrulity, and their aptitude to shed tears on slight occasions; lastly, the fear of death is less strong in old age than in early or middle life. Although usually seventy years is the extreme period of human life, yet a small proportion of those born ever reach even this; a few rare instances occur where one hundred years or upwards are attained. The famous Parr lived to the age of 159 years; he married at the age of 120, and, when 130, was able to thrash, and to do every description of farmers' work; he was at last brought from the pure air, and the homely diet of the country, into the family of the Earl of Arundel, in London, where he drank wine, and lived luxuriously. The sudden change of diet and circumstances, however, proved quickly fatal to him. Henry Jenkins, another poor man, lived to the astonishing age of 169 years, and retained his faculties entire. Some time ago, a statement appeared of the ages of the resident pensioners of Greenwich Hospital, which contained at the time 2410 inmates. Of this number, 96 had attained to or passed the age of 86; one only was above 100; 15 were 90 or more; and 80 were eighty or upwards. About 42 of the 96 were of aged families, and in some of this number both parents had been aged. Longevity has in a great number of cases been found to be hereditary. Eighty of the 96 had been married; 79 were in the habit of using tobacco in some form or other, and 48 had drunk freely; 20 were entirely without teeth; 62 had bad, and 14 good teeth. But the oldest man in the house, who was 102, had four new front teeth within the five preceding years. The sight was impaired in about one half, and hearing only in about a fifth part of the number. Old people are not generally inclined for much exercise, nor is it suited to their stiff joints and impaired vigour; for the same reason they cannot endure much cold. Cheerful company, especially the company of the young, is peculiarly grateful to old people. Innocent amusements and recreations are also of great consequence, and the mind should be exercised in some useful or amusing pursuit. Cities, or at all events constant and agreeable society, are favourable to the condition of old age. In lonely secluded country places, the mind sinks prematurely into a total gloom and blank, for want of sufficient stimulus and variety to keep up the vigour of thought and play of ideas. Few deaths occur from what is commonly called old age, or a gradual and simultaneous decay of all the functions. It may be said to happen when the powers gradually decay, first of the voluntary muscles, then of the vital muscles, and lastly, of the heart itself, so that, in an advanced age, life ceases through mere weakness rather than through the oppression of any disease. The heart becomes unable to propel the blood to the extreme parts of the body; the pulse and heat desert the feet and hands, yet the blood continues to be sent from the heart into those arteries nearest to it, and to be carried back from them. Most commonly, however, some one part gives way, and disease gradually coming on, cuts off the lingering flame of existence. Thus the body, after having grown up to maturity, and flourished in its prime, sinks to the earth, and moulders into the dust of which its several parts are composed.

CONCLUSION.

The admirable structure of the body of the human being, its superiority in every respect to that of the lower animals, has frequently afforded a proof of design in the all-wise Creator, and is one of the most striking instances of the impossibility of our formation being the result of blind chance. Paley, after going over a great number of examples of this kind of design in a Creator, goes on to state that, in all "instances wherein the mind feels itself in danger of being confounded by variety, it is sure to rest upon a few strong points, or perhaps upon a single instance. Amongst a multitude of proofs, it is *one* that does the business. If we observe in any argument (he continues) that hardly two minds fix upon the same instance, the diversity of choice shows the strength of the argument, because it shows the number and competition of the examples. There is no subject in which the tendency to dwell upon select or single topics is so usual, because there is no subject, of which, in its full extent, the latitude is so great, as that of natural history applied to the proof of an intelligent Creator. For my part, I take my stand in human anatomy; and the examples of mechanism I should be apt to draw out from the copious catalogue which it supplies, are, the pivot upon which the head turns, the ligament within the socket of the hip-joint, the pulley or trochlear muscles of the eye, the epiglottis, the bandages which tie down the tendons of the wrist and instep, the slit or perforated muscles at the hands and feet, the knitting of the intestines to the mesentery, the course of the chyle into the blood, and the constitution of the sexes as extended throughout the whole of the animal creation. To these instances, the reader's memory will go back, as they are severally set forth in their places; there is not one of the number which I do not think decisive; not one which is not strictly mechanical; *nor* have I read or heard of any solution of these appearances, which, in the smallest degree, shakes the conclusion that we build upon them.

The works of nature want only to be contemplated. When contemplated, they have every thing in them which can astonish by their greatness: for, of the vast scale of operation through which our discoveries carry us, at one end we see an intelligent Power arranging planetary systems, fixing, for instance, the trajectory of *Saturn*, or constructing a ring of two hundred thousand miles diameter, to surround his body, and be suspended like a magnificent arch over the heads of his inhabitants; and, at the other, bending a hooked tooth, concerting and providing an appropriate mechanism for the clasping and reclasping of the filaments of the feather of the humming-bird. We have proof, not only of both these works proceeding from an intelligent agent, but of their proceeding from the same agent: for, in the first place, we can trace an identity of plan, a connection of system, from Saturn to our own globe; and when arrived upon our globe, we can, in the second place, pursue the connection through all the organised, especially the animated, bodies which it supports. We can observe marks of a common relation, as well to one another as to the elements of which their habitation is composed. Therefore one mind hath planned, or at least hath prescribed, a general plan for all these productions. One Being has been concerned in all.

Under this stupendous Being we live. Our happiness, our existence, is in his hands. All we expect must come from him. Nor ought we to feel our situation insecure. In every nature, and in every portion of nature, which we can descry, we find attention bestowed upon even the minutest parts."

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THE STORY OF THE FRENCH REVOLUTION.

INTRODUCTION.

It is humbly conceived that a clear and impartial account of the French revolution ought to be in the hands of every individual in this country; for there is no man, be his station and his opinions what they may, who is not liable to receive a lesson from its events. The possessor of power is taught, by the French revolution, to use what he possesses in a rational and humane spirit. The advocate for ancient institutions is taught to beware lest bigotry be mingled with his views, and reform be postponed so long that revolution becomes the only alternative. The subject of power is taught, on the other hand, that, in seeking to avoid certain evils, he is not perfectly sure to avoid others, and that it is safer for himself, as well as for those above him, that he prosecutes the business of political improvement in a spirit of moderation, and with a regard not merely to his own particular desires, but to the general tendencies and capabilities of the nation of which he forms a part.

CAUSES OF THE REVOLUTION.

France, it is hardly necessary to remind the reader, was, previous to 1789, one of many states in Europe which owned the absolute sway of one sovereign. The king, it is true, was required, by the idea of a supposed constitution, to take the advice of the people (as represented by what was called the Tiers Etat, or Third Estate) before imposing new taxes; but as he never did so, or had not done so for upwards of a century, this part of the system is hardly worth mentioning. In addition to the evil of obeying a despotic prince, whose measures were sometimes dictated by favourites of the basest kind, the clergy, a body of about 130,000 persons, and the noblesse, or nobility, who were 200,000 in number, possessed various invidious privileges and powers, being, for one thing, completely exempt from all taxation, so that the public burdens fell exclusively upon the industrious classes of the community. The people were also heavily oppressed by the farmers-general, a set of people who paid the court a certain sum for being allowed to collect the revenues, and who had frequently recourse to the most unjustifiable means of raising the money. The peasants were also oppressed in various ways: they were liable to be called out to work upon the roads for a certain time every year, at any distance from their homes, and at any season their taskmasters chose; while they paid, in most cases, a perpetual tribute for their freedom to their feudal lords. Nor were the grounds of inferiors ever secure from the trespasses of the nobles, who pursued at pleasure their sports through them, trampling down vineyards or crops of corn or hay without remorse, and without any species of redress on the part of the injured. But perhaps the most odious part of the whole system of things was the exclusive nature of the order called the Noblesse: this body was already considered as completely formed; no man, be his worth or talent what they might, could ever rise to take his place in it; nor was any man ever permitted to receive so much as a commission in the army, unless he could produce a certificate of the four last generations of his family having belonged to this sacred order. Who, on looking at this catalogue of erroneous regulations, though comprising but a part of the grievances complained of at the beginning of the revolution, can wonder that the enlightened and patriotic of the nation concluded a reform to be necessary to the well-being of their country?—or that the superficial and ignorant, keenly feeling their wrongs, should, without possessing sense or forethought to calculate on consequences, be led into the most cruel excesses, when told, by designing men, that it was necessary in order to the attainment of their political liberty?

The writings of several men of genius, and particularly of Voltaire, had also tended in no small degree to loosen the restraints of religion, and to prepare the minds of the people for throwing off its yoke. These writers attacked, with all their powers of ridicule, the well-known peculiarities of the Roman Catholic doctrines and worship, without paying respect to the Christian religion, which was the foundation of both, and thus overthrew the whole of the sacred fabric. Besides the causes already enumerated for fostering a spirit of revolution, there were still others, the most conspicuous of which was the American war, which had impoverished the treasury, and, as a colleague and patron of revolutionists, placed the despotic monarch in the light of an encourager of insurrection, and of demands for popular rights. This was an enigma; and the endeavours to solve it had no good effect on the nation at large: neither had the consideration of the American principles of republicanism, which, on the return of the French officers after the war, were discussed by them with great enthusiasm. To that country the youth of France had gone as to a theatre of glory, and they returned from it, after a successful struggle with the British armies, imbued with new ideas of government, and an insatiable thirst for liberty.

FIRST MOVEMENTS—MEETING OF THE STATES-GENERAL.

With all the other causes for discontent among the people, the elements of nature seemed to combine their influence, for, in the month of June of the preceding year, the greater part of France was assailed by one of the most terrific storms on record. Thunder and lightning, wind and hail, appeared to contend for the mastery; but the hail, which fell in pieces of incredible size, was the grand agent of devastation, and rendered the destruction of all the fruits of the earth nearly complete. This caused a famine to prevail, and gave but too good an excuse for the clamours with which it was accompanied. Nor was it possible, from the almost bankrupt state of the finances, and from its being unfortunately a time of scarcity throughout all Europe, by any devisable means to find bread even for the immense population of Paris. De Brienne, archbishop of Thoulouse, who was at this epoch minister of finance, after trying in vain to raise the necessary supplies, and meeting with the most determined opposition from all quarters, abandoned his situation, and recommended his majesty to convoke the states-general—a measure which had not been adopted since the year 1614—and to recall M. Necker, in whom, as an able and economic minister of finance, the people had always expressed the greatest confidence. This minister, when returned to office, immediately set about organising the convocation of the three estates, and allowed the tiers etat a double representation, which prepared for the superior orders an inevitable extinction. The states-general met on the 4th of May (1789), at Versailles, in conformity with the wish of the king and Necker, and assembled in a superb hall of the palace. The meeting of the three estates placed his majesty in a new situation. He had consented to this measure from knowing it to be the wish of his people; yet he was entirely deprived of the credit arising from it, which was given to Necker, the idol of the people. He was also much grieved and annoyed by the reports of a deficit in the finances, which was represented as most disastrous in its consequences, and which was unceremoniously attributed by his subjects to the enormous expenditure of the court, while his evil government was also accused of being the primary cause of the famine. Add to these causes for uneasiness, that the tiers etat commenced the sittings with some tumultuous attempts to acquire an ascendancy over the other two estates, and we shall see that all together combined to distress and embarrass him. It is true his authority was as yet undiminished by any act of the assembly, yet every exhibition of it was cavilled at, and attended with difficulty. Whatever he did with a view to conciliate the people, obtained him but an evanescent approbation, which speedily passed away as a transient gleam of sunshine, leaving a gloomy day still more dreary.

The violent proceedings of the tiers etat were encouraged by their Parisian brethren, who were prompted to this by the Duke of Orleans and his faction. Philip Duke of Orleans was presumptive heir to the crown, failing the king's children and brothers; and having formed the dishonourable purpose of supplanting Louis the Sixteenth in the affections of his people, and it is also suspected in the possession of his throne, he affected to treat the meanest of his countrymen as his equals, while he expended a part of his immense revenues in paying for the writing and distribution of multitudes of inflammatory pamphlets, and in an ostentatious display of humanity in the distribution of money, bread, and soup, to the populace. Respecting the infamous character of this man, all who have written a just account of the revolution are agreed. One of his aims was to be appointed by the people lieutenant-general of the kingdom, but in this he never succeeded, from his naturally cowardly disposition, and from being utterly destitute of that energy necessary in a leader at so momentous a crisis. The declarations of the people were at first loud in his favour; and had he possessed the courage, the military talents, and address of Cromwell, he might, like him, have overcome all parties, and succeeded to the power of his murdered sovereign; but when exposed to personal danger, his mean qualities became so conspicuous, that they ruined him in the estimation of his partisans, by convincing them that he was a man unfit either to lead or to rule. Yet as he was possessed of consummate art, he continued for a long time to influence the people by means of his money, and his congenial though sanguinary councils.

ASCENDANCY OF THE TIERS ETAT.

On the second day of the meeting of the states-general, the three orders convened separately. The deputies of the tiers etat amounted to 600, and the nobles and clergy to 300 each; and the question of the greatest consequence which first necessarily underwent investigation, was the commissions of the different members, and their validity. The tiers etat was anxious that the three estates should meet in one common hall, to verify their commissions, and debate immediately on the scarcity of provisions and the state of the finances. To this proposition 114 members of the clergy consented, but the nobles insisted on the verification of their powers in a separate assembly. The tiers etat, well aware, however, of the financial difficulties of the nation, which must soon bring matters to a crisis, paid no attention to this proceeding, and suffered five weeks to elapse without taking any farther steps. During this period of inaction, all was done by the ministry that could be thought of to conciliate this difference, and bring the three estates to act in concert; but nothing could persuade the refractory commons to depart from their resolution, and the disappointed nation, who had expected every thing from this convocation of the states-general, were seized with no small dismay at this unpropitious commencement of its proceedings. The people universally took the part of the commons, while the nobles became every day more unpopular, and were insulted whenever they appeared. All who took their part shared in the opprobrium; and they were even opposed by a number of their own body, with Orleans at their head, and deserted by a part of the clergy. Still the majority of them stood their ground, well knowing, that, if they consented to the terms of the commons, they would be outvoted on every question, and their consequence and power annihilated. The leaders of the tiers etat, who were bold and skilful men, now suddenly shook off their apparent sloth, and, availing themselves of the state of public opinion, seized with a daring hand the reins of government; and after again issuing a summons for the clergy and nobles to join them without effect, they solemnly voted themselves the legislators of their country, with the title of the "National Assembly of France." By this decree, the revolution was constituted. All the acts of this assembly were decidedly expressive of sovereign power, and they determined, in concert with his majesty, to new-model the affairs of the nation, and take into consideration the national debt.

In the midst of their rejoicing at this victory, an event happened which seemed to inspire them with new enthusiasm in the path of opposition. On the 20th June, when the president and members of the assembly repaired to the hall of debate, they found the doors shut, and surrounded by a detachment of guards, who informed them that they could not enter, as his majesty meant to hold a royal sitting on the 22d, for which the hall was then preparing. Surprised at this proceeding, and apprehending that an immediate dissolution of their body was determined upon, they adjourned to a neighbouring tennis-court, and took an oath that nothing should prevent their meetings till they had settled for the country a new constitution. This resolution was universally applauded. They then took possession of the church of St Louis till the decorations of the hall were completed, and on the third day the royal session was held in the ancient form. In this meeting, his majesty presented the outline of a new constitution, containing many important reforms, but retaining the different orders, and the obnoxious right of issuing lettres de cachet; in virtue of which power it had been the custom of the monarchs of France to imprison their subjects without trial, at the suggestion of a concealed enemy, or in compliance with their own arbitrary will, without the friends of the victims either being able to discover the crime of which they were accused, or the place of their confinement. This royal sitting was concluded by the king's desiring the deputies to retire, and resume their places next day. He then withdrew, and was followed by the clergy and nobles; but the commons still continued to sit. When the grand master of the ceremonies repeated the king's order, the Count de Mirabeau started on his feet, and exclaimed, "the commons of France have determined to debate. Tell your master we are here by the power of the people, and will only be expelled by the bayonet." This rallying defiance was greeted with enthusiastic cheers, and they proceeded to business. In this sitting they declared their unanimous determination to adhere to all their former decrees, pronounced the persons of the members inviolable, and agreed that they should continue their sittings. On the 27th, they at length obtained a complete triumph over the clergy and nobles, by the deputies of the two orders returning to the hall at the earnest solicitation of his majesty.

UNPOPULARITY OF THE KING.

It was now that the situation of the nation became truly alarming. The sovereign, to whom the people of France had for so many ages been devoted by a superstitious feeling of idolatry, was now beginning to be assailed by loud clamours of disapprobation. Necker had solicited his dismission; and the fear of being deserted by a minister in whom they placed implicit confidence, was the means of increasing their murmurs. At length he gave them a promise that he would not forsake them, and they were pacified for a short time. Meanwhile, the news of the royal session had created a sensation of disappointment and disgust at Paris, which, joined with the famine now raging there, caused tumultuous agitations among the populace, and inclined them to listen with increased avidity to the incendiaries in the pay of Orleans. Even the military were beginning to be seduced, and on the 23d of June, they refused to fire on a riotous mob. Those who were put in confinement for this offence were directly liberated by the people; and the guards, who were then called in to assist in bringing the populace to order, grounded their arms. For this, however, they were pardoned by the king. It was the advice of the aristocracy that the king should endeavour to overawe the people and the assembly by a strong military force. This measure being violently opposed by Necker, he was dismissed, and thirty regiments were placed round Paris and Versailles, camps were marked out, and Marshal Broglio, a skilful veteran, was appointed their commander.

In the dismissal of Necker, and this movement of the troops, the people thought they perceived the seal of their final ruin. The assembly addressed the king, praying for the removal of the troops, and taking upon themselves the responsibility of keeping order in the city. The answer to this was, that "the monarch was the best judge of the way to employ his troops, and that the assembly could not influence Paris while their presence was necessary at Versailles." This reply was no sooner received than the Marquis de la Fayette moved that the ministry should be responsible to the people for their conduct, that the troops ought to be withdrawn, and that the assembly should persist in all its former decrees. The Marquis de la Fayette was a French nobleman, enthusiastic in his ideas of liberty, and an eager aspirant after fame. He had gone to America, and volunteered his services in its cause even before his king took part with it against England, and it was his example, so much admired by his countrymen, that influenced many of them to devote their talents to the same cause.

ARMING OF THE PEOPLE—THE BASTILE DESTROYED.

But to return to the history of events: As soon as the news of Necker's departure reached Paris, preparations for resisting all authority were made. The inhabitants of the city armed themselves with whatever weapons they could procure, and formed themselves into a national guard, amounting to 100,000 men, of which La Fayette was appointed the commander. A great acquisition was made in the discovery of 30,000 stand of arms, and 20 pieces of cannon, in the Hotel des Invalides, of which this army took possession. The fortress prison of the Bastile had always been an object of jealousy and detestation to the people of Paris, and their first act was one of hostility against it. They summoned the governor, M. de Lannay, to surrender, which not being immediately complied with, they proceeded to take it by storm, and, putting him to death, carried his head in triumph through the streets. Only seven prisoners were found in the Bastile, and the keys were sent to M. Brissot, a man of talent, who had studied the law, and who was destined to cut a figure in a subsequent period of the revolution. Brissot had been but a short time previous to this confined in the dungeons of the Bastile, on a charge of having been a co-operator in a seditious publication, and was now one of the Orleans party, who were most active in the destruction of that prison. The city of Paris was now entirely in the hands of an unruly mob, who waited for no authority to sanction their deeds of violence. Many of the citizens, who had no wish to employ arms either against king or people, were under the necessity of assuming them, that they might not be sacrificed to their fury as suspected persons. It has been much lamented by the friends of the unfortunate Louis, that he did not at this juncture assume the authority with which he was still nominally vested. He was not yet deposed from his throne, and, therefore, still had a right to enforce his royal prerogative. He had still his faithful gardes du corps, and some other regiments, which it is probable would have adhered to him; and by their aid, and that of the nobles and well-affected among the gentry, he might have succeeded in overawing the Parisians, and restoring order. At all events, had his life been the sacrifice, he would have died nobly in the discharge of his kingly duty. He could have taken this course without obstructing that reform which he had pledged himself to support; for there was a wide difference in a monarch resorting to arms, in order to oppress his people, and his having recourse to force only to protect the lives and properties of his peaceable subjects. But indecision, and an unwarlike disposition, were the two great blemishes in this monarch's character, and were the real causes of all his misfortunes. Though able to bear his own personal calamities with fortitude and magnanimity, his amiable nature shrunk from the idea of being the cause of pain to the meanest of his subjects.

FIRST VIOLENCES.

The ministry at this time consisted of Marshal Broglio, minister of war; the Baron de Breteui, minister of finance; M. de la Galozier, comptroller-general; M. de la Port, intendant of the war department; and M. Foulon, intendant of the navy, all in subjection to the king's younger brother, the Count d'Artois, and the other aristocratic leaders. The court party received the news of the capture of the Bastile, and, with it, the astounding intelligence from Marshal Broglio of the revolt of the troops under his command, who had refused to act against Paris. The Count d'Artois, with the members of the ministry, were now become so hateful to the people, that their names were enrolled in a list of bloody proscriptions, and flight becoming their only safeguard, they crossed the frontiers with all speed. The king now again entered the national assembly, entirely divested of all pomp, and intimated that he had commanded the removal of the obnoxious troops. This condescension created general applause; shouts of attachment again rent the air, and his majesty was conducted back to the palace by the whole of the assembly. The queen, with the dauphin in her arms, stood in a balcony to receive them, and the most extravagant joy prevailed.

The city of Paris was now governed by 120 municipal officers, who assembled frequently, and made laws for themselves; while the citizens, having acquired a taste for meeting together, formed clubs, at which much intrigue and party spirit prevailed. We have informed our readers that the late minister escaped with the Count d'Artois; but M. Foulon, intendant of the navy, was an exception to this general emigration. He returned to his estate in the country, but was soon dragged to Paris by his own vassals, charged with the crime of having said that he would "make the people of Paris eat hay." To atone for this, a bundle of hay was placed on his back, and after being paraded with it through the streets, he was hanged on a lamp-post without trial, while his son-in-law, attempting to avoid the same fate, was cut to pieces, and the heads of both exhibited by the mob, who were now become familiar with butcheries.

RETURN OF NECKER—PRIVILEGES OF THE NOBILITY AND CLERGY GIVEN UP.

Orders were once more sent for the return of Necker, which, being accompanied by the entreaties of the assembly, he immediately obeyed. His exile had been regarded as a public calamity, and his return was celebrated as a triumph. On the day following his arrival, he addressed the municipality of Paris from a balcony of the Hotel de Ville, where he urged the people to grant an amnesty for the past, and reconciliation for the future. This speech was hailed with seeming transport, but it was by those who had no power to realize the blessings it sought to obtain. The subject was, however, agitated in the assembly, and it was decreed that it was the duty of that body to maintain justice in all cases. The meeting of the assembly, on the 14th of August, was rendered memorable by the proposal of the Count de Noailles and the Duke d'Aguillon, that taxes should only be levied in proportion to the means of the contributors, that no order of the state should be exempt from public burdens, and that feudal claims should be redeemed at a fair valuation; those claims, however, which consisted of personal service in the vassal, to be abolished without compensation, being contrary to the rights of man. The noblemen who made these proposals were possessed of extensive estates, which, of course, enhanced the value of their intended sacrifice, and set an example, which seemed for the time to create an emulation which knew no bounds of reason, the members vieing with each other in a frenzied eagerness to renounce their rights, and strip themselves of every privilege or distinction. At the same time, this mania of generosity was made an instrument of destruction to the clergy, by requiring them to submit to an act which deprived them entirely of their revenues. During this sitting of the assembly, many laws were made, reformed, or abrogated, all in unison with the wishes of the people; and, as a sequel to the whole, it was decreed that a solemn *Te Deum* should be performed, a medal struck in commemoration of that, and a deputation sent to his majesty, to inform him that they had bestowed on him the title of "Restorer of Gallic Liberty." Thus in this sitting was the power of the people rendered complete, by the entire spoliation of the clergy, who still, in common with their monarch and the nobles, retained their nominal dignity, without riches or a shadow of influence.

RESTRAINT ON THE KING'S PERSON.

A short peace followed these popular acts; and a new ministry was formed, who declared the revenue to be in the most miserable state; nor could M. Necker, though he exerted his utmost powers, procure a loan to more than half the amount of what was required. In this emergency, many people made voluntary gifts of their plate and jewels, and the royal plate was sent to the mint. The next question which agitated the assembly and the minds of the people, was, whether the king should be allowed the privilege of a veto, that is, a right to forbid or reject any particular act which had obtained the sanction of the assembly; but, to prevent farther discord, his majesty declared, in a message to the assembly, that he was content to possess a suspensive veto. He also gave his sanction to the past decrees of that body, but expressed his doubts if some of them would answer the purposes for which they were framed. The debates on the veto had given rise to much irritation in the minds of the people, and every thing again bore the stamp of a speedy approach to some important crisis, which was hurried on by a report that it was intended to convey the king to Metz. The place of the French guards, who had revolted from their allegiance to the monarch, had been filled from that time by the national guard of Versailles, which, in concert with the gardes du corps, composed entirely of gentlemen, were the protectors of the royal family; but, on the report of the king's intended flight, they requested, at the instigation of the disaffected at Paris, to be allowed to resume their attendance on his person, for the purpose of watching his movements. The most violent of the revolutionists eagerly seconded the people in bringing about this desired object, having in view the farther intention of conveying the king and the national assembly to Paris, where they would be under the influence of their own authority. The Count de Staing, who commanded the national guard of Versailles, which, together with the Swiss guard and the gardes du corps, were then all the troops stationed at that place, being aware of the state of matters at Paris, requested an additional regiment to assist in protecting the royal family; and accordingly the regiment of Flanders was immediately added to the force commanded by him. On the arrival of this new regiment, the gardes du corps, in compliance with a usual custom, invited their officers to dinner, where the officers of the national guard of Versailles, and of the Swiss guards, were also present. The entertainment was given in the opera hall of the palace. To this scene of festivity, their majesties, taking with them the dauphin, repaired, at a time when, after many loyal toasts having been drunk, the company were already excited by wine. The royal presence gave rise to unbounded enthusiasm. Songs and music became vehicles of the most loyal devotion; and the ladies who attended the queen assisted in decorating the officers with the white cockade. But this imprudent and transitory triumph of the royal family was, alas! the last they were ever doomed to witness, and proved the immediate cause of inevitable ruin to their every remaining hope.

MARCH OF THE MOB TO VERSAILLES—OCT. 5, 1789.

The circumstances connected with this military entertainment were reported, with all the exaggerations of malice, to the starving mob of Paris, who, inflamed with envy and indignation at the very idea of a costly and sumptuous banquet having been given in the palace of their king while his people were driven to the extremities of famine, determined to demand bread at Versailles. The first insurgent party which put this determination in practice was composed of women, and some desperate and worthless men who assumed the female attire. This mob was headed by a man named Stanislaus Maillard, who had played a conspicuous part at the taking of the Bastile. They set out, vociferating, "To Versailles! to Versailles!" This riotous movement was opposed by Fayette to the extent of his power; but it was in vain that he ordered or remonstrated, for the only answer he received from his soldiers was, that they "could not turn their bayonets against women." This army of amazons, already intoxicated with brandy, were addressed from time to time by the armed brigands who accompanied them, and who inflamed them to a pitch of the utmost fury against the queen and the gardes du corps, representing them as the principal delinquents in the affair of the banquet, and whose assassination they by all means advised. The remaining populace of Paris caught the infection from those who had departed from Versailles, and determined to follow. The guards, commanded by Fayette, and the other military force of the city, insisted on his leading them to the same point of attraction. All Paris had risen, and in this dilemma Fayette applied to the assembly of the commune for directions, and received orders to comply with the wishes of the people, who in reality could not have been restrained by any authority. He therefore put himself at the head of the national guard, and marched for Versailles. Meanwhile, some hours in advance of him, the female army, which now amounted to 6000, having augmented as it proceeded, reached Versailles.

DISTRESS OF THE ROYAL FAMILY.

The king was hunting when apprised of the approach of this singular force, and he returned to the palace immediately, where the officer in command asked for orders. "What!" said his majesty, with a smile, "against women?" And all the precaution thought necessary was to shut the iron gates of the palace, and draw out the military. When the women arrived at Versailles, their commander Maillard took fifty of them with him into the hall of the assembly, where the members were sitting, and began a harangue, in which he told the president that the people had resolved to execute justice on traitors; that they must have bread; that they had come to demand it; and that the gardes du corps must be punished, unless they consented to wear the national cockade. This address was accompanied by the beating of drums, and all those confused and tumultuous sounds which arise from a brutal and infuriated multitude. To get rid of this noisy rabble, a deputation was sent from the assembly, accompanied by twelve of the women, who were courteously received by the king, and on whom his humane regrets at the state of want which they represented, had such an effect as to change their threats into shouts of "Vive le Roi," with which they joined their companions on the outside of the palace. The popular fury seemed now for a short space to slumber, but such a state of inaction was not consistent with the hopes or designs of those who had first set it in motion, and it was suggested that the delegates had been bribed in the palace to give a favourable report of their reception. This was enough. The mob had already observed that they were in the good graces of the national guard of Versailles, and also of the regiment of Flanders, who would not act against them. The gardes du corps were then the only foe they had to encounter, and, satisfied that they were kept in check by the fear of producing a general attack, the outward avenues of the palace were quickly occupied by a multitude of the women. Meantime, the gardes du corps were placed in the court of the palace, in front of the national guard and regiment of Flanders, while the space between them was filled up by the women, and by the armed brigands who had accompanied them from Paris. In this unnatural state of contact, a fray arose, in which, it is said, an officer of the Versailles guards struck one of the Parisians with his sabre, and in return had a shot fired at him, which it suited the purpose of the mob to say came from one of the gardes du corps. This was sufficient to fasten a stigma upon that body as the aggressors, and the national guard immediately took part with the people against the gardes du corps, two of whom were wounded, and another narrowly escaped. His majesty was urged to flight, but determined on waiting the arrival of La Fayette with his civic troops. The gloom of approaching night came on, accompanied by torrents of rain, and the utmost confusion and uproar prevailed, when La Fayette made his appearance, followed by the Parisian army, and others, amounting in all to 30,000, and, in a short time, his exertions, and the good conduct of his soldiers, seemed to restore some degree of order. La Fayette visited the palace, and re-assured the king and its inhabitants, by explaining the measures he had adopted for their security, and, before he left them, advised their retiring to rest, which they did at two o'clock in the morning, after a night of the most cruel agitation and alarm. But though they lay down in bed, it may be supposed they were unable to find repose while the palace was still surrounded by a threatening mob, who were increasing their ferocity by intoxication. The concourse of people was so great, that multitudes could not obtain shelter, and all the avenues to Versailles presented, during that horrible night, the most novel and extraordinary spectacles. Thousands sat in separate groups around huge bonfires, which cracked and blazed, and threw the red glare of their flames on the ferocious and wild countenances of a savage people, who were eating and drinking, singing, shouting, and cursing, while a shot was now and then fired, and a bloody threat uttered in attestation of their still keeping in mind that their main errand to Versailles was not yet accomplished. Towards morning, a band of the most desperate again approached the palace, and while prowling round it like wild beasts in search of prey, they unfortunately discovered a door that was neither fastened nor guarded. Only one hundred gardes du corps remained within the palace as its protection, while it was surrounded outwardly by the French guards, whom Fayette, in his late audience with the king, had succeeded in persuading him to reinstate in their former duty. The mob, finding an open entrance, and knowing how slenderly the palace was guarded within, very soon announced, by dreadful shouts, that they had succeeded in penetrating to its interior. Crowds now ran up the grand staircase, uttering the most vehement threats and abuse against the queen, whom they accused in the grossest language of being an enemy to the wishes of the people, and of having, by her extravagance and evil councils, brought the nation to its present state of poverty. The gardes du corps advanced to meet them in the galleries, and, by thus bearing the first shock of their onset, gave their unfortunate queen time to escape. This she did by starting from her bed, and flying through a secret passage to the apartments of the king, while the clamours that demanded her head still rung in her ears. But in spite of the appalling situation in which her majesty was placed, she still maintained the courage which was never known to forsake her, and which, on trying occasions, so frequently, during the latter disastrous period of her life, showed itself in the most exalted acts of heroism. She had now no sooner reached the king's apartment, than she sent for her children, and then dressed herself hastily in such habiliments as it became her to wear when she showed herself to the people, a course which she was determined to adopt.

The secret passage between the apartments of their majesties remained undiscovered when the mob forced their way to the bed-chamber of the queen, and they were thus prevented from following her. Their disappointment, however, only tended to increase their rage, and they now endeavoured to force their way to the king. During the brief space since the palace was entered, several murders had been committed; and the gardes du corps, apprehensive for the life of the king, had barricaded the entrances to the part of the palace now occupied by him, which they determined to defend with the last drop of their blood. It has been a matter much disputed, whether La Fayette, on this memorable night, allowed the palace to be so ill guarded from treachery to his royal master, or from a disbelief in the evil intentions of the mob. Candour must certainly acquit him of any sinister motive, when he is judged by his previous character; though it must still remain matter of regret that he should have yielded to fatigue, and sought repose, while his exertions were so necessary to prevent the disasters which were the consequence of his absence from his troops, whose hatred to the gardes du corps was the principal cause that the insurrection was not suppressed in time to prevent all the evils to which it gave rise. La Fayette, however, roused from his slumbers, at last arrived at the palace, just as the mob had beaten in the barricades of the king's apartment. He was accompanied by the grenadiers of the national guard, whom he earnestly enjoined to save the gardes du corps. In this he was obeyed, and the insurgents were driven from the palace just as they were beginning to pillage it. The gardes du corps, to save their brethren, many of whom were on the outside of the palace, assumed the national cockade, and showed themselves at the windows, at the same time taking off their bandoleers, and throwing them down to the people, who, satisfied for the time by this concession, answered it by repeated cries of "Viva le nation!—Vive le roi!—Vive le gardes du corps!"

ROYAL FAMILY REMOVE TO PARIS.

While these shouts were resounding, the gardes du corps who were among the multitude were caressed and embraced by them, and the others invited to descend from the palace, and participate with them in those acts of kindness which they thought it prudent to do. Amid the manifestations of joy which now prevailed, there was suddenly a loud demand made for the appearance of the queen, which was immediately complied with, and she entered the balcony with her two children. Voices among the crowd were heard to vociferate, "No children, no children!" This heroic woman, not intimidated by the sanguinary intention against her implied in this cry, immediately dismissed the children, and stood alone before a cruel multitude thirsting for her blood, with her hands crossed upon her bosom. Her beauty, her magnanimity, and her majestic dignity, struck her intended assassins with astonishment and awe. They forgot that the arms were in their hands which could, in one moment, terminate that life they had so lately sworn to sacrifice; and, instead of remaining the object of their implacable hatred, the queen became for the moment the idol of their admiration, and they hailed her with a general shout of "Vive la reine." The Duke of Orleans, who was all this time busy among the mob, and had been even seen to point the way to the queen's apartment at the time of its attack, now entered the palace as a friend, to congratulate their majesties, while his emissaries were exciting the people to insist on the removal of the king to Paris; and, accordingly, the next cry which arose from them was, "To Paris, to Paris!" La Fayette's advice to the king was to yield immediate obedience to it; and his majesty expressed to the crowd his willingness to accede to the wishes of his people, provided he was to be accompanied by the queen and his children. "Yes, yes," was the reply. "I also demand safety for my gardes du corps." This was also granted. Fayette then made the military under his command seal this compact by a general discharge of artillery, and a volley of fire-arms.

The assembly was now sitting, and, when informed of the intention of the king to depart for Paris, Mirabeau moved that the national assembly of France was, during that session, inseparable from his majesty. It had been the earnest wish of Mirabeau and his party to remove the assembly to the capital, from the greater facility it afforded them of working on the minds of the people; but the present resolution carried the appearance of an attachment to the person of the king, and it was unanimously agreed to even by the moderate and more conscientious members. There were four parties in the national assembly at this time. The leaders of one were Mounier and Malonet; of the other, Mirabeau and the Abbé Sieyes. The former were the moderates. Mounier was enlightened, consistent, and firm; and it was his long-cherished wish to model the constitution of France after that of England. Malonet was honest, and always guided by conscience, but not so well qualified to judge or act as his colleague, from his having accustomed himself to trust in the self-evidence of truth, without troubling himself to bring conviction home to others. Mirabeau possessed splendid abilities, but his character was so immoral, that, before the breaking out of the revolution, he had lost that place in society to which his high rank and extraordinary talents entitled him; and he was now devoting all his efforts to raise himself, not only into notice, but to attain the highest possible distinctions, which his irresistible eloquence bade fair to accomplish. Mirabeau professed to be a friend to limited monarchy, while, at the same time, he aided and encouraged the republican party. The Abbé Sieyes was scrupulous in allowing his wish of equalization to be known. The third, or republican party, of which Fayette and Baillie—the latter of whom was then mayor of Paris—were members, wished for that form of government which was established in America; and though they still retained a partiality for the person of their amiable and unfortunate king, it was consistent with their principles that he should be divested of every attribute of royalty. Before we attempt to give a sketch of the fourth faction, it will be necessary to say something of the club called Jacobin, from its being held in the hall of the Jacobin friars. This was a society formed at first by able but violent men, whose ideas of liberty were so extravagant, that they imagined it would be cheaply purchased at any sacrifice of lives or principles; and, thus united, they became a common centre for all those throughout the nation who held the same opinions, and were open enemies to the plan of constitutional government. These men, however, were so profligate in their manners, and so brutish in their feelings, that they were held in detestation by all those who had not thrown off a regard for the decencies of life. The Jacobins were the avowed friends and courters of the lowest order of the people, whose habits they affected, and whom they stirred up to spurn at laws and every species of order. It was the purpose of these men to make shipwreck of the state, that they might individually be enriched by her plunder. It was among these persons, who formed the fourth faction in the national assembly, that the partisans and emissaries of Orleans were found.

Let us now again follow the course of events: Upon passing the decree which was to remove the assembly to Paris, it was determined that a hundred of the deputies should accompany his majesty. Mirabeau offered himself as one, and complained bitterly when he found his name excluded from the list by the president, Mounier, who was always jealous of him as a concealed enemy to the constitution. The king, the queen, the princess Elizabeth, the two royal children, and two of the members of the assembly, were put into one coach, which was followed by the carriages of the deputies; while a detachment of brigands, as an advanced guard, carried in triumph the heads of two of the gardes du corps, fixed upon spears. The fishwomen, and a number of the most abandoned of their sex, forming a sort of bacchanalian procession between them and the royal carriage, escorted as captives the gardes du corps, whose military accoutrements they bore aloft in their hands, and who, dejected and wan from bodily fatigue and anxiety for their royal master, were pushed and dragged along, many of them with their dress soiled and torn, and without hats. Waggons of flour and corn from Versailles were accompanied by women bearing large branches of poplar, while they vociferated to each passer-by, that "bread would be no longer scarce at Paris, as they were conveying thither the baker and his wife, and the little journeyman." The carriages were followed by the cannon, on which women were mounted, and by three regiments; while the rear consisted of the stragglers from the Parisian mob. It was remarked that the queen sat amid this motley and disgraceful procession with unshrinking firmness and apparent tranquillity of mind, though nothing was omitted during the journey, which lasted six hours, or at their entrance into the city, which could tend to degrade or to hurt the feelings of royalty. One of the representatives of the commune arrived in advance at Paris to communicate the intelligence of what had passed at Versailles, and presently a mob appeared, with the bearer of the heads of the two murdered gardes du corps, which they had in cruel mockery caused a hair-dresser to friss and powder. On the approach of his majesty, M. Baillie, the mayor, went, as is customary, to receive him at the barrier, where he is said to have insulted the fallen monarch, by hailing with triumph the splendid day which restored him to his capital, and remarking, as he presented him with its keys, that these were the very same received by Henry the Fourth when he entered Paris as the reconqueror of his people, but that in the present instance the people had reconquered the king. His majesty and the royal party were then conducted to the Hotel de Ville, where their sufferings were protracted by a long speech from Baillie, in which he assured the monarch that the love of his good people of Paris was founded on his having adopted the constitution so much approved of by them. The king replied to this, by saying that it was always with pleasure and confidence that he found himself among his good people of Paris; and this farce then being terminated, the royal family were permitted to take possession of the old palace of the Thuilleries. This building had been abandoned by royalty for more than a century. All about it was antique and desolate; the apartments were not in a habitable state, and, of course, there was no preparation for its present unexpected guests; but still it was a relief to its persecuted inhabitants to be left in it for a time in quiet. No cries of gratulation or loyalty from the people accompanied them to this new abode, where their forebodings from what they had already suffered must have been sufficiently gloomy.

CHARACTER OF THE KING.

It is not to be doubted that Louis the Sixteenth was a conscientious and benevolent man, who really had the happiness of his people at heart; but his fatal destiny made him monarch of a great people at a crisis when the most splendid military and political talents were necessary to meet and guide the prevailing spirit of the times, and when perhaps they would hardly have sufficed to cure the long-accumulated distempers of the state, or avert the evils which were destined to descend on his own devoted head. Of these high qualities Louis was entirely destitute. How, then, could he possibly expect to escape from the sad fate that at once involved him and the nation in misery? And yet it is probable, that, during his whole existence, he had never once contemplated the most distant probability of ever witnessing the spectacles which now every where met his eyes, of his kind, light-hearted, obsequious, and adoring people becoming sanguinary, insolent, and dictatorial. He was, therefore, unprepared for this singular change, and undecided how to meet it.

CONDITION OF THE NATIONAL ASSEMBLY.

The removal of the king to Paris was a grand triumph to the popular party, but the nobles considered it as a final blow to their hopes of ever recovering their ascendancy; while Mounier and the conscientious members of his party abandoned all idea of obtaining a free constitution, whose laws should assure the free and unbiassed deliberations of its representatives. The assembly had been removed to Paris by an armed force, and this they considered as the first step in depriving them of their liberty. And, in truth, the revolution now changed its object—liberty was no longer the mark at which it aimed. The deputies of the people were now placed under the surveillance and control of the Jacobins, who soon began to assume an ascendancy over the moderate party. Mounier, the president, and Lally Tolendal, one of the supporters of his party, a respectable man and eloquent orator, indignant at the scenes of discord, murder, and tumult they had lately witnessed, and foreseeing a continuation of these enormities, abandoned their seats in the assembly on the 9th of October, and emigrated from their country. The good Malouet, supported by M. de Clermont Tonnerre, who was at the same time possessed of just thought and shining talents, were left at the head of the moderate party, but were quite unable to stem the torrent poured in upon them by the Jacobins; and there were often at that period no debates save between those of opposite opinions. The Duke of Orleans was, meanwhile, so generally acknowledged by all parties to have acted a double part in the late transactions at Versailles, that he was waited on by La Fayette, who insisted on his leaving France; and, alarmed by this demand, he accordingly took his immediate departure for England. The king was now literally a prisoner in his palace, which was strictly guarded, while he was, partly on their own account, obliged to disband his faithful gardes du corps.

FRAMING OF THE NEW CONSTITUTION—FEB. 1790.

The national assembly, once more settled down to business, proceeded to attempt the formation of a free constitution. But laws, in which the varied interests of so populous a nation were concerned, could not be made without much murmuring. One of the first steps toward the new constitution, was the confiscation of the whole of the church lands for the benefit of the national finances. It was in vain that the clergy remonstrated on the injustice of this decree: they were, after some fruitless endeavours, obliged to submit. All distinctions of the ancient names and divisions of the French provinces were obliterated on a motion of the Abbé Sieyes, and the territory divided into 83 departments, subdivided into 600 districts, and these again divided into 48,000 communities or municipalities. This measure was evidently contrived for the purpose of getting quit of old recollections, and calculated for introducing that levelling principle of equality of which Sieyes was the supporter. All titles of honour, all distinctions of the different orders of society, and all armorial bearings, were abolished. A decree was also passed, suspending the parliaments of the kingdom from their accustomed functions; and the dissolution of those privileged bodies which had been so long looked upon as the only successful opposers of despotism, was little regarded. The freedom of the press and toleration in religion were guaranteed; but while liberty of conscience seemed thus to be allowed, a civil constitution was imposed on the French Roman Catholic clergy, declaring them independent of the see of Rome, and bestowing the nomination of their bishops on the authorities of the departments; and to this law, priest and prelate were required to adhere by an oath. But, to the everlasting credit of the clergy, there were few who thus consented to outrage their consciences by giving up an article of their faith, and those few became despised and contemned by all parties. The next event of importance was that of the king's making his appearance in the national assembly, to declare it to be his wish that it should be universally known that the monarch and the representatives of the nation were united in purpose, and that he and his queen would imbue the mind of his son with feelings of approbation towards that change of government which had been found necessary.

The framers of the new constitution had been careful to render it in all essentials a republic, while certain functions of the king still constituted him as its head, though without a vestige of real power; while every attempt in his favour made by the more moderate part of the assembly, was put down by the Jacobins. About this time an event happened which tended to inflame the minds of the people to a violent pitch. The court expenditure had never yet been made public, but an account of it was kept in what was called the red book. This book was in the possession of M. Necker, and a sight of it was obtained by a member of the assembly, under promise of secrecy, which was so far from being kept, that, in a few days, there were copies of it in every bookseller's shop. This publication disclosed some court secrets; and the people were especially exasperated at learning by it, that, during the administration of M. Calonne, the king's brothers had received above two millions sterling, in addition to their stated allowance. This, together with a catalogue of what they deemed extravagant expenses of their majesties, irritated the lower class, particularly against the queen, who, for a long time past, had the misfortune to be an object of hatred to the most of her subjects. The reluctance of Necker to make this book public, and his indignation at having been deceived by the deputy, created a violent prejudice against him, and he began, along with the other ministers, to lose his popularity. And now again affairs were verging on a state of anarchy and confusion. Partly to please the multitude, and to give a sanction to all the proceedings since the commencement of the revolution, it was decreed that an anniversary of the taking of the Bastile should be held. For this purpose, the 14th of July was to be celebrated by a meeting between the king and people, called the federation, in the Champ de Mars, to take an oath of fidelity to the new constitution; and to be present at this fete, the Duke of Orleans returned to Paris. Here an altar was raised, at which the civic oath was administered. The assemblage consisted of the electors of Paris, the representatives of the commons, the administrators of the municipality, and parties from the troops of France, and from those of the departments. The king first took the oath, then the president of the national assembly. Fayette was on this day the object of popular idolatry. Necker's popularity had been for some time on the wane, and he now gave in his resignation, and quitted France unregretted by any party.

DEATH OF MIRABEAU.

At this time all Paris was thrown into affliction by the death of Mirabeau, who expired after a few days' illness. The national assembly put on mourning, and decreed him unprecedented honours. He was the first person interred in the magnificent Pantheon consecrated to great men, in the name of a grateful nation. His body was, however, some time afterwards removed, on its being discovered that he had not been inaccessible to bribery. In fact, at the time of his death, he was, in consequence of being richly bribed by the royalist party, labouring seriously and artfully in the work of re-establishing royal authority, and had pledged himself to assist his majesty in escaping to Metz, where a sincerely attached subject of the king, the Marquis de Bouillé, was governor. This course appeared to their majesties the only one left for them to adopt, and, provided it could be accomplished, it seemed to hold out a hope, that, when at a distance from Paris, all their faithful subjects would assemble around them.

FLIGHT OF THE ROYAL FAMILY.

Some time previous to this, the king had, in order to ascertain what degree of restraint it was thought proper to put upon his motions, attempted to remove for a time to St Cloud. No sooner, however, had he and his family entered their carriages, than they were prevented from proceeding by the populace and the national guard, who were the troops then stationed at the palace, and who declared that they should not leave Paris. Nor was it possible for Fayette, by means either of commands, entreaties, or threats, to change the determination of the guards, which so disgusted and enraged him that he resigned his command, though, on the repentance and at the earnest entreaties of his soldiers, he assumed it again. Thus, more than ever convinced that they were considered as prisoners, they determined on making their escape; and having made secret preparations for their departure, the king, the queen, and the two royal children, left the palace in disguise, on the night of the 20th of June (1791), entered the carriage which waited for them on the Boullevard, and took the road for Montmédy. When it was made known in the morning that they had fled, without their route being known, the rage and vexation of the multitude knew no bounds. Fayette and his guards, and the mayor, Baillie, were accused by the people of being accomplices in the flight of the king, in which they fancied that they beheld the invasion of France, the triumph of the emigrants, and the return of despotism. The assembly, however, seemed to take it more coolly, for there it was rather matter of rejoicing to the republicans and anarchists. One of these parties saw in it the deposition of the king; and the other, a stimulus to the commission of outrage, from its probable influence in delaying the return of order. The sincere constitutionalists alone regretted it; while at the same time this regret chiefly arose from the necessity that their constitution, as it was framed, had need for a monarch at its head. All the measures which were necessary, however, to meet this emergency, were immediately taken. Messengers were dispatched, in all directions, to intercept the royal fugitives. The constitutionalists, with Fayette at their head, were determined not to abandon a form of government which it had cost the most talented statesmen of their country so much trouble to form. They succeeded in calming the people for the present by a proclamation; assumed the executive power; made known their pacific disposition towards all the potentates of Europe, by means of the foreign minister; sent to all the troops to receive their oath of fidelity in their own name, instead of the king's. Thus the national assembly was in a few hours invested with all the rights of the sovereign, and the government went on without impediment—a dangerous lesson for the interests of royalty. Meanwhile, the royal party were pursuing their journey with all possible speed, and, after many narrow escapes, arrived at St Menehould, where they were furnished by M. de Bouillé with an escort, under the pretence of guarding money to pay the troops. But while they halted for a short time at this place, the king was recognised by the postmaster, who had been formerly a dragoon, and who immediately mounted a horse, and reached Varennes, which was the next stage, before they had time to come up. Here he informed the municipality of the approach of the king, when he was arrested, after a journey of 156 miles, and when nearly arrived at the frontiers. The royal deserters were immediately brought back to Paris by a deputation from the assembly. Thus ended an ill-arranged and ill-fated attempt, which had no good effect at a future period, and which immediately caused the emigration of many more of the nobles and clergy.

EFFECTS OF THE REVOLUTION OUT OF FRANCE.

In the mean time, these extraordinary proceedings of the French nation were exciting much interest in other countries, and had various effects upon the minds of men. In Britain, and other monarchical countries even less open to liberal impressions, a large portion of the community, comprising many of the most active and powerful intellects, beheld the French revolution as a grand example for the regeneration of other nations, and began to press accordingly upon their own respective governments. These governments, along with the privileged classes and clergy, and a vast body of respectable supporters, regarded this great event as one which threatened all existing institutions, and was likely to produce more immediate evil than eventual good. A party, if we may so express ourselves, was formed beyond the limits of France, which proposed, in co-operation with the emigrant royalists, to do whatever might seem proper in order to stay the violent progress of the revolution, and protect the person of the sovereign. About the time of the king's flight, a treaty took place at Pilnitz, in Saxony, between the Emperor Leopold and the King of Prussia, when they agreed, in a secret convention, at the solicitation of the Count d'Artois, to furnish each 12,000 troops on the frontiers of the Rhine, as soon as they could be got in readiness, with a view to support an army of the emigrants, and to manifest, unequivocally, the effectual protection they were determined to afford to the cause of the monarch of France, while they demanded the concurrence of the other European powers. These proceedings stirred up still worse elements in the minds of the French nation. They suspected their monarch, even while he was accepting the constitution, and doing every thing that they required, of a secret alliance with the anti-revolution party out of the country; and he eventually fell a sacrifice to the alarm and indignation which arose in consequence of the interference of that party.

During a short time after the return of the king from Varennes, all was tolerably quiet in the national assembly; but this calm was succeeded by a trial of power between the constitutionalists and the republican and Jacobinical leaders, on the subject of dethroning the king; and a meeting took place in the Champ de Mars, where a petition to this effect was laid on the same altar at which the civic oath had been taken, in order to obtain signatures. The better, however, to prepare the minds of the multitude for this act, which was to seal the fate of their monarch, it was thought necessary by the Jacobins to inflame them, by accusing two men who were sitting under the altar, which was raised on a scaffolding, of a design to blow up the patriots. These poor wretches were instantly murdered, and their heads, as usual, paraded on pikes. The civil authorities interposed, but to no effect; and martial law being proclaimed, Fayette appeared with his troops, who, with himself, were stoned and abused, which was returned by a volley that laid more than a hundred men dead on the field. The contest was given up, and the Jacobin instigators slunk away, imprecating curses on those who had caused their defeat, and swearing a deep revenge.

THE LEGISLATIVE NATIONAL ASSEMBLY.

An act was next passed in the assembly, that, after the constitution having been presented to the king, and accepted by him, if he should retract, that he should then be considered as having abdicated, and henceforward be merely allowed the privileges of a common citizen. The constitution, with its new restrictions on the power of the king, was now again offered to him, which he signed in the assembly, and took the oath of fidelity. The constitution being now finally settled, the national or constituent assembly dissolved itself, and gave place to a "Legislative National Assembly," to which the members of the former had, by their own decree, rendered themselves incapable of being elected. It necessarily followed, that those who formed the new legislative body were possessed of less political knowledge, which made them more liable to venture on rash expedients. In addition to this, it was composed of constitutional members, who averred that all further revolutionary laws were unnecessary, the established constitution being now perfected; while these were violently opposed by the republicans, who, of course, sought to exterminate monarchy, and by the Jacobins, who were determined on establishing that reign of terror which afterwards they too fatally accomplished, and in which, as their own natural element of rapine and violence, they alone expected to thrive. At the head of the republican party was Brissot, from whom it generally took its name, its members being called Brissotines, though sometimes styled Girondists, from many of its partisans coming from the department of Gironde. The other, or Jacobin party, was called the Mountain, from their occupying the highest seats in the hall of assembly, and was headed by Robespierre and Danton, those names at which humanity shudders. Marat also, and many other desperate and profligate characters, ranked under these sanguinary leaders. These wretches were, however, used by the republican party as their sleuth-hounds, to run down those who could not be conquered in the regular way, until the republic should be established, when they fancied they could dismiss them to their kennels as no longer useful—idle dreams, from which they were to be too soon roughly awakened.

WAR COMMENCED WITH FOREIGN COUNTRIES.

Just after the meeting of this new assembly, France experienced a sensation of apprehension lest innovations should be made on its newly acquired liberty by Sweden and Russia, who, it was said, had determined to restore the old government, though the Prussians and Germans still continued to temporise. Nor did the pacific answers received from the different foreign courts, on their being informed that Louis had accepted the constitution, avail much in allaying this apprehension; for their answers bore an air of reserve, which seemed merely calculated to avoid a present rupture, while the French emigrants continued to aver that all Europe was arming to defend the cause of their king. The assembly was in consequence inundated with addresses in disapprobation of the court and its party. At this time, the period of M. Baillie's mayoralty being elapsed, M. Petion, a violent republican and Jacobin member, was elected in his place. On the 1st of March 1792, the death of the Emperor Leopold took place, and shortly after it, the assassination of the king of Sweden by one of his own subjects. Francis King of Hungary, who succeeded to the dominions of his brother the Emperor Leopold, openly avowed his determination of waging war against France, unless certain terms were submitted to by the king and legislative assembly. These demands were refused, and accompanied by a declaration of war on the part of France; and it was the miserable task of Louis thus to send a defiance to his queen's brother, and to both of his own, who had taken up arms along with the most faithfully attached part of his subjects, in order to restore to him what they considered as his rights.

MILITARY OPERATIONS.

The limits of this paper do not admit of our going deeply into the account of military proceedings; we shall therefore only give such a slight sketch of them as may enable our readers in some measure to understand the motions of the French armies. France began its hostile movements by an attack on the Austrian Netherlands, which at first proved unsuccessful, by the defeat of the troops commanded by M. Dillon, and those under several other leaders. The Austrians were, however, compelled by Fayette and his division to abandon the field. Meantime, on the 30th of October, it was decreed, that, if the king's eldest brother did not return to France within two months, he should be deprived of his right of regency. A decision was also made with regard to the clergy, that if those who had refused the civic oath persisted in their determination, they should be deprived of the money allowed them for subsistence; and on any religious dissensions arising in their communes, they should be made answerable for them. His majesty sanctioned the decree against his brother, but used his only remaining privilege of putting his veto on the other. All expedients were fallen upon to create suspicions of the king, and to render him an object of aversion to the people, in which Marat was the principal agent. This man was the son of a Swiss schoolmaster, and had practised for some years in Paris, as a physician, or rather as a quack. He had become obnoxious to the national assembly at an early period of its sittings, by publishing a pamphlet, in which he suggested the diabolical advice of hanging up 800 of their members on the trees of the Thuilleries. For this offence he was committed to prison, but was soon set at liberty, owing to some illegality in the form of commitment. His ambition never seemed to rise above that of becoming the leader of a disorderly and sanguinary rabble. Among the reports to which the incendiaries gave rise, that of the existence of what they termed an Austrian committee was boldly averred—that is, a party in the cabinet who favoured the enemies of France—and also, that it was the fixed intention of the king to escape. These reports were believed by the people, who were kept by them in a constant state of alarm. The Brissotine faction became also alarmed, though the cause was somewhat different. They felt certain that a struggle for power was approaching, between them and the Jacobins; and being aware that the latter had multitudes of the lowest order of the citizens at their command, who, armed with pikes, would constitute a force not to be resisted, they formed the plan of furnishing by ballot 20,000 men, to be armed, and trained under the walls of Paris. This scheme was highly displeasing to the people of the city, as they considered such a force as dangerous to the capital, and looked on the national guard as quite equal to its defence. They therefore petitioned the king and the assembly against it, and obtained the support of the king, who was jealous of the measure as entered into by the Brissotines to bring about a republican government.

INCREASED DANGER OF THE KING.

Dumouriez, minister of war, advised Louis not to thwart the assembly with regard to the troops from the departments, lest he should become suspected of wishing the capital to be left open to the advance of the enemy. The king, however, was not to be persuaded, and determined to oppose his veto to this measure. There was also another point of contest between the king and the ministry: a decree was passed in the assembly, that all priests who refused to subscribe the oath to the constitution should be liable to exile. This was against the conscience of his majesty, and he expressed his firm resolve to put his veto on it also. On these subjects, Roland, one of the ministers, remonstrated with the king, in a letter conceived in such a spirit of disrespect and harshness, that Louis dismissed him, and two others of the ministers who were his abettors. To retain Dumouriez, he was obliged to withdraw his negative with regard to the troops from the departments, but still stood firm in respect to the priests. Dumouriez continued, however, to press his majesty on this subject, and to threaten to abandon his office in case of refusal. This had still no effect, and, resigning his place, he was sent by the assembly to become a leader in the French army.

INSURRECTION OF THE 20TH JUNE.

Louis was now charged with all the crimes and misfortunes of the revolution, and left alone to encounter the evils which were incessantly heaped upon his head. The Brissotines and the Jacobins were unanimous in their determination of depriving him of his monarchical title, for little else was now left him; and an intended insurrection was openly announced by those who had been for some time providing the rabble with pikes and other arms; and on the 20th June (1792) it took place. Multitudes of armed people, headed by two men named St Huruge and Santerre, assembled in the streets, and, having collected all their force to the number of 40,000, appeared at the door of the national assembly, and, having entered it, continued to pass through for a space of two hours, exhibiting the sanguinary mottoes of their flags, and displaying their destructive weapons, among which were scythes, hay-forks, &c. They next surrounded the Thuilleries, and, having forced an entrance, proceeded to the apartment where the king and his sister the Princess Elizabeth were, with a few of the national guards who had rallied round their sovereign, and who now hurried him into the recess of a window. Here the king's sister remained with him for the space of five hours, crushed and heated by the crowds that incessantly poured in to heap every species of insult on the unfortunate monarch; among which, they compelled him to assume the red cap of liberty. At length the mayor, Petion, and also a deputation from the national assembly, arrived, who at once, as by magic, cleared the palace and its precincts of its extraordinary visitors, proving that those who could so easily dispel such a numerous mob, could with the same facility have prevented them from assembling. Highly offended and indignant at the scene of violence and insult which had passed in his palace, the king next day remonstrated against it in strong terms to the assembly. Petitions from the more peaceable citizens were also presented, praying that the leaders of the insurgents might be brought to punishment. Fayette, also, arriving unexpectedly in Paris from the head of his army, declared at the bar of the assembly that he had been addressed by his troops to express their dissatisfaction, that, while they were shedding their blood to maintain the constitution, it should be suffered by the authorities of Paris to be outraged and trampled upon with impunity. The energy with which Fayette addressed the assembly, in denouncing the rapid progress of faction, and demanding that a strict investigation should be made into the cause of the late outrage, and its instigators brought to justice, seemed at first to create some sensation of shame in the assembly; and some indications, accordingly, appeared of redress being granted, which, however, passed off without effect. Fayette then ordered a review of the national guards, but they did not assemble; and he next waited on his majesty, and proposed to him, as his only remaining prospect of safety, that he should again attempt an escape, in which he offered to assist him. From the queen's prejudice against Fayette, this assistance was refused, and he left Paris to join the army. The directory of the department of Paris, scandalized at the late outrage, now took upon them to declare against the mayor, and, imputing to him the blame, suspended him from his office, which he again assumed almost immediately, though his sentence had been confirmed by the king—Petion having appealed to the assembly, and carried his point by means of his friends the Jacobins. Afraid lest Fayette, whom they had so much insulted, should march his army upon Paris, and compel an adherence to the constitutional laws, or perhaps join with the foreign invaders in the king's cause, the Brissotines looked to the arrival of the troops from the departments as a fit body to strengthen their party, instead of the Jacobins, whom they found they could no longer trust as tools in the work of republicanism. These troops when they arrived at Paris showed themselves at once ignorant and overbearing, by assuming to themselves all the authority arising from their fancied consequence as armed representatives of their country. They paraded in numerous parties the garden of the Thuilleries; and if any of the royal family appeared, they insulted them in the most brutal language. A young man named Barbaroux, one of the most enthusiastic lovers of liberty, brought to Paris also a battalion of men from his native city of Marseilles. These Marseillois were received at Paris, by order of the Brissotines and Jacobins, in the most fraternal manner, by all the force they could muster; and both were destined to form an insurrection, whose business it was to be to secure the municipal authorities, to occupy the posts of the city, and to encamp in the garden of the Thuillaries; by which means it was intended to intimidate the king into an act of abdication. This plan, however, failed, through the cowardice of Santerre, who was designed to be their leader; though violence was soon again resorted to by the Brissotines, in which they were aided by a manifesto of the Duke of Brunswick, declaring the intended invasion of France, with the intention of restoring the ancient government, and threatening the legislative assembly, the national guard, all who held civil offices, and, in short, all Paris, with the most bloody vengeance. This was construed by the people into an incontrovertible proof that the king was secretly hostile to the constitution, and his deposition was resolved on by the violent party, not only on account of what they called his treachery, but as an act of proud defiance to the author of the manifesto and his allies.

The country was now declared to be in danger, and Paris assumed all the appearances of a city just about to undergo a siege. Amid these hurried and alarming movements, the king was accused in the assembly of holding intercourse with the enemies of France, and his forfeiture of the crown demanded. This motion brought on the final struggle between the constitutionalists and their opponents; and some extraordinary attack on royalty was so openly avowed and so generally credited, that the king is reported to have said, in full assurance that his days were now numbered, "I have no longer any thing to do with earth—

I must turn all my thoughts on heaven." He however recalled his Swiss guards, to the amount of a thousand, from distant barracks, and, with this slender preparation for the approaching crisis, he awaited his fate.

INSURRECTION OF AUGUST 10—THE KING DEPOSED.

On the morning of the 10th of August, or rather little after midnight on the 9th, the dreadful tocsin sounded its foreboding peal in the ears of the affrighted citizens, and was soon joined in its terrific notes by all the bells in Paris. Drums beat to arms, and the adverse parties assembled all their forces. Those on the part of royalty were small, and soon collected; they consisted of the before-mentioned Swiss guards, who occupied posts around the palace; about four hundred grenadiers, in whom confidence was reposed; and fifteen hundred gentlemen, including military officers, all enthusiastically devoted to the king, and who, with the grenadiers, were stationed within the palace, but so ill armed, that rapiers, hangers, and pistols, were their only weapons. Mandat, the commander of the national guards, did indeed select sixteen battalions of his troops, which made a show of protecting the king; most of these were ill-disposed towards him, especially the artillery, and the rest remained to be determined by events whether they should act as friends or enemies. Petion gave an order to Mandat, who was a faithful royalist, if attacked, to repel force by force, and who did his utmost to dispose of his force effectively. While thus employed, he received several messages from the municipality to attend them for orders, and unsuspiciously repairing to their hall, which he unexpectedly found filled with Jacobins, he was arrested as having formed a design to massacre the people, and, as he passed down stairs on his way to prison, met his death by a pistol shot. The palace was soon completely beset by its assailants, who occupied the Pont Royale, in the vicinity of the Thuilleries, and placed fifty pieces of cannon on the opposite side of the river. About eight o'clock in the morning, Rœderer, the procureur-general-syndic, informed his majesty that the national guard was not to be depended on; that, from the overpowering force coming against him, nothing was to be expected but the murder of himself and family; and that the only way to prevent this fatal catastrophe was to take refuge with them in the legislative assembly. The queen, who was present, penetrating at once the motive of this advice, and indignant at the thought of appearing as petitioners for protection in the assembly, the great majority of whose members had always shown themselves so inimical to the royal interests, exclaimed, with energy, "Nail me rather to these walls than remove me from the palace." But there was no alternative for Louis but to accept this offer, or place himself at the head of the guards; and he did not hesitate to prefer the former, and overcame the scruples of his consort, by reminding her that this measure would place the children in safety. The king, queen, the two children, and the Princess Elizabeth, went on foot, escorted by three hundred Swiss, to the hall of the assembly, and arrived safely there, though not without encountering many perils and much insult. The appearance of the king in the assembly was a real victory gained by the conspirators against his crown. His majesty addressed the members, and said, "Among you I believe myself in safety, and I have come to prevent the commission of a great crime." It was moved by a member of the Mountain, that the debates could not proceed in presence of the king; and he was removed, with his family, to a small box or closet behind the president's chair, usually appropriated to the reporters of a public journal. They had, however, hardly seated themselves, when the attack of artillery began on the palace, and the king dispatched an order to the Swiss guard to lay down their arms; but his order arrived too late. He had forgotten, in the agitation of the moment when he left the palace, to order it to be surrendered, and the consequences of this neglect were most disastrous. The palace was forced, the greater part of the Swiss, and his other faithful adherents, cut to pieces, and even the lowest menial found in the palace put to death. As soon as the intelligence of the capture of the palace arrived, the suspension of the king was immediately decreed in a tumultuous sitting, where the deputies were mixed with bands of ferocious men, fresh from the carnage at the palace, and reeking with the blood of their victims, and with a ragged rabble of men, women, and children. During this last day of the ill-fated Louis's kingly dignity, he sustained innumerable insults with a calmness truly astonishing. At one o'clock in the morning, the king and his family were removed to the neighbouring convent of the Thuilleries, after having remained fourteen hours listening to debates in which they were treated with the greatest indignity. The plate, jewels, and money found in the palace, were brought and delivered up to the assembly; and one man, who appeared, from his dress, of the most indigent description, entered with a hatful of gold, and threw it down before the president. In fact, many of the poor deluded people seriously believed, that, in joining the insurgents in order to put down the constitution, they were acting a meritorious and heroic part, and therefore wished to avoid casting a stain on their proceedings by the imputation of theft.

INVASION OF FRANCE.

The news of the fatal events of the 10th August no sooner reached the ears of La Fayette, who was then at Sedan, than he addressed his army in favour of the king and constitution; but, finding them ill affected to the cause, he abandoned them, and with three of his staff attempted to leave France, but was made prisoner by a party of Prussians on the frontier, and thrown into a dungeon, from which he did not make his escape till 1794. Dumouriez recognised the decrees of the assembly in the separate army commanded by him, and in return was appointed by them commander-in-chief. The combined armies of Austria and Prussia entered France. The Duke of Brunswick's army consisted of 50,000 men, and, together with the Hessians, the Austrians, and French emigrants, amounted to 90,000; while Dumouriez had only 17,000 collected near the point from which the enemy was approaching. The allied army at first proved successful; and the intelligence of their having taken two garrisoned towns, and their approach towards Paris, spread general alarm and consternation. Meanwhile, the unfortunate monarch and his family had been removed to the Temple. The place so called was a small division of Paris, enclosed by gates of its own, within which debtors were accustomed to find refuge, the thronged state of its inhabitants rendering it peculiarly dirty, unhealthy, and dismal. In one of the angles of the enclosure was situated the palace of the grand prior of the order of the templars. It was built between a narrow court and a small garden, isolated from the main building; and its numerous turrets arose—which were called the great tower—a hundred and fifty feet in height, and consisting of four arched stories besides the ground floor, the circumference of which was only thirty feet within the walls. This tower was particularly gloomy within, from the immense thickness of the walls, and the impediments opposed to any view from its windows, by the iron bars and wooden outside lattices. It was surrounded by a deep moat; the staircase leading to the apartments was divided by six iron doors, provided with massy bolts; and it was guarded by three hundred men.

MASSACRE OF ROYALISTS.

On the alarm of the approach of the allies, the heads of the commune, or common council, who were now Robespierre, Danton, and Marat, summoned the populace by means of alarm guns, and enrolled them to march against the enemy. It was then proposed by those infuriated men that the domestic foes of the state should be destroyed before the foreign ones were attacked; and the force assembled marched to the place where the Swiss officers had been confined since the 10th of August, and, bringing them forth, along with numbers of nonconforming priests, and multitudes of suspected persons, with whom the prisons of Paris were then crammed, after having given them a mock trial, they were butchered in the most horrible manner, by the axes, pikes, and sabres of the mob, consisting of men and women, who, wading in blood, and covered with the same sanguinary tide, performed their dreadful office with transports of delight. Numbers of ladies were thus murdered; among whom, the innocent Princess de Lamballe, whose only fault was a sincere attachment to the queen, was literally cut in pieces, and her head—which still retained its uncommon beauty, and from which its fair ringlets hung in long tresses—fixed on a spear, and carried to the Temple, in order to be presented to the unfortunate cause of her accusation. This carnage lasted four days, and it is computed that not less than 4000 suffered. Nor did its frenzied contrivers intend that the massacre should stop there; for they had laid a plan to make it universal throughout France, in which they were, however, frustrated, from the people of the provinces being less excited than those of the capital, and less inured to blood. Disappointed in this, however, they caused about sixty royalists of distinction to be brought from Orleans and murdered at Versailles. Will it be believed that the legislative assembly was silent during these butcheries? But so it was; and not till the 16th of September was there any notice taken of them, when it was decreed that in future the communes should be answerable with their own lives for the security of their prisoners. The Duke of Orleans, who, we have said, returned to Paris at the federation, was believed to have been a prime instigator of these enormities; for though all despised him personally, yet his money was capable of being used as a powerful engine.

FORMATION OF THE NATIONAL CONVENTION.

The legislative assembly now ceased to act, and members from it and the constituent assembly were chosen, with others, to form the "NATIONAL CONVENTION." Robespierre, Danton, and Marat, were among the members, and occupied the place of leaders in the Jacobin party of the representatives of Paris, which, consisting of twenty, had not among that number above four or five who had not assisted at the late massacre. One of the first motions moved in the convention was for a decree to remove the king and the seat of government to the other side of the Loire, and to draw the army of Dumouriez round Paris; but this was overruled by Danton, who strenuously resisted the measure, and prevailed on the convention to reinforce that general. Danton, by this success, gained an ascendancy among the members, and was enabled to encourage and contrive with impunity many of those subsequent events of blood which have given his name so dreadful a distinction.

THE INVADERS OF FRANCE WORSTED.

Meantime, Dumouriez, who had received a reinforcement of federates from the provinces, was endeavouring to protract the march of the enemy till he could form a junction with the army of General Kellerman, consisting of 20,000 men, and Bonrnaville, from Flanders, with 13,000, together with new levies which he expected from Chalons. Before he could, however, accomplish this, he was attacked by the Duke of Brunswick, for two successive days, with little effect, and on the third the Prussians forced him to retreat. On the fourth day, Dumouriez encamped at St Menehould, and fortified it, where Bournaville's army joined him. The Prussians now attacked the army of Kellerman, who had 400 killed and 800 wounded, the loss of the Prussians amounting to a much greater number; and Kellerman, no longer opposed, formed a junction with Dumouriez. The Duke of Brunswick encamped his army within a short distance of his enemy, but it soon began to experience great distress for want of provisions, which were supplied to the French in great abundance. Heavy rains began to fall, and the cold, the wet, and the scarcity of food, together with the imprudence of eating in great quantities the grapes of Champagne, brought an epidemic distemper into his camp, which raged to such an extent, that 10,000 men were unfit for duty. Still the duke possessed an army much more numerous than that of Dumouriez, without attempting to attack his camp, or to force him to a battle. The secret of this conduct, which so much surprised his adversaries, was, that he had entered France with the idea of meeting but a feeble resistance from an ill-disciplined and ill-provided army, in which contrary factions prevailed, and also with an idea that the people, in general, were inimical to the measures adopted by their rulers. But it only required him to come in contact with their skilful and experienced generals, and to hear the enthusiastic shouts of "Vive le nation," which burst simultaneously from the French ranks at every onset, to convince him that he was in the midst of an able, hostile, and united people; and he foresaw, that, though he should prove successful in a general battle, his army must be weakened, and, in all probability, at length defeated by a reinforcement of the enemy, the strength of which he had no means of calculating. He therefore proposed a truce, and commenced a retreat towards Grandpré.

MONARCHY ABOLISHED.

The Austrians, under the Duke of Saxe Teschen, now laid siege to Lisle, which, after a fortnight's fruitless labour, they were obliged to abandon. War had been declared by France against the king of Sardinia, and the French army were every where victorious. They took possession of Saxony, of Nice, and the countries round it—of Spires, from whence they drove the Austrians, taking 3000 prisoners—and of Metz and Frankfort. In short, the revolutionists were triumphant, and the immediate consequence was an unanimous decree, that royalty should be eternally abolished in France; and this decree was, by the influence of the Jacobins, received with unbounded approbation in Paris, and throughout the provinces, where a thousand of their clubs were established. At the same time all titles, save that of citizen, were annulled; and it was decreed that the public acts should be dated from the year of the French republic.

TRIAL OF THE KING DETERMINED ON.

The Mountainists, having now triumphed in so far over the Brissotines, scrupled not to adopt any plan which afforded the smallest prospect of ruining their opponents; and they therefore brought forward, without delay, the question of how the deposed monarch was to be disposed of. The opposite party wished to save his life, and this of itself would have been sufficient to determine his unfortunate destiny. The Brissotines felt their weakness, and submitted to their enemies, because they knew any violent opposition would prove ineffectual—though they made a faint show of support, on the side of the king, to the last. A committee was appointed by the convention to make inquiry into the delinquencies of the king, and innumerable accusations were the consequence. In these charges against Louis, not even a show of truth or probability was attended to; and after torturing every event during his reign to which blame could be attached, into voluntary acts of his own, the whole was summed up by an absurd assertion that he had harboured an intention of massacring the whole convention, protected as it was by the national guard, and by all the other troops and people of Paris. Self-evident as these monstrous falsehoods were, the convention decreed that Louis should be brought to their bar to answer for them, and stand his trial for life. Robespierre exclaimed, "Summon him to the bar, and let us demand a reckoning for his crimes!"

At the time that the decrees were passing in the convention, which, one by one, led to the final unhappy fate of the royal family, they were subjected, in the gloomy and wretched apartments of the Temple, to every indignity, and treated with a malignant harshness, in order to account for which it is only necessary to say, that they were completely in the power of the communes of Paris, who, swayed in all their actions and opinions by their leaders, took pleasure in treating their distinguished prisoners with every refinement of cruelty. And this being the object kept in view by these individuals, it was of course their study to place such men only round their victims whose hearts never knew the touch of pity, and who could look, unmoved, on the meekness of the monarch, who never manifested, by word or sign, a spirit of revenge against those whose sole delight it was to wound his feelings, and add contumely to his misfortunes; and who beheld, without compassion or admiration, the pious, the pure, the noble-minded and disinterested Princess Elizabeth, devoting her every thought and action to alleviate the misery of the little band of sufferers. Surely she had done nothing to merit the hatred and contempt which she shared. And though the heroic, but, perhaps, not guiltless Marie Antoinette, whose unsubdued spirit was less resigned, refused to truckle to her persecutors, by exhibiting an appearance of what she did not feel, yet less brutal jailors would have respected this sincerity, and been moved by the strong attachment of the wife, and the yearning feelings of the mother, which were always so conspicuous in her. It was for the enjoyment of the domestic circle, and for its ornament, that the amiable Louis had been formed, and not for the ruler of a mighty nation, at a juncture when firmness of purpose was necessary, and great skill and talent would have been required to reform the state without revolutionising it, and to reconcile neighbouring potentates to the change. But we have said that the convention had determined to act at once as his accusers and judges, and he was accordingly summoned to appear at its bar on the 11th of December 1792.

TRIAL OF THE KING.

On the morning of that day, the king had retired, as was his usual custom, with his little son, to impart to him instruction, and to foster those talents which, even at the early age of seven years, were conspicuous to his paternal eye. But it was now resolved that he should be separated from this fondly cherished child; and he was torn from his arms, at the same time that it was announced to him that he was about to receive a visit from Chambon, the new mayor of Paris. Two hours, however, interposed between this intimation and his arrival, during which period the king, who heard the noise of the trampling of horses, and the sound of wheels incessantly increasing round his prison, was left to all the horrors of an impression that had fastened on his mind, that he was to be immediately murdered. When the mayor at length appeared, and read to him the decree of the convention, ordering him to their bar, his majesty's first remark was, "I could have wished not to have been deprived of the society of my son during the two hours I have been expecting you, but it is of a piece with the usage I have experienced for four months."

The king proceeded in Chambon's coach to the convention, which had now established itself in the palace of the Thuilleries, as it befitted the monarch of the people. The procession which accompanied the king consisted of three field-pieces, which moved in front, with a detachment of horse, while a body of 600 foot formed a line three deep on each side of his carriage, and the rear was brought up by three more field-pieces, and an escort of fusileers. At one o'clock it reached the Thuilleries, and Santerre appeared in the convention, and said, "Louis Capet" awaits the orders of the assembly. This announcement was followed by a deep silence; even the most tumultuous and lawless occupiers of the galleries became still as death, and every eye was turned on the door through which the king was to enter. Presently he made his appearance, with an air of majestic dignity. His misfortunes had overcast his features with an expression of the most touching melancholy, but it was unmingled alike with fear or with contempt for the tribunal before which he stood. This impressive silence was broken by Barrere, the president, who desired him to seat himself in an arm-chair provided for the purpose, and then informed him why he was brought before the convention. His majesty then listened attentively to a long string of charges brought against him, on which he was separately interrogated, many of them accusing him of the most cruel tyranny, and the most consummate hypocrisy. He answered to them, though shortly, with the utmost precision and frankness, and never seemed in the slightest degree to lose his self-possession, excepting twice, when accused of having distributed money to the poor for the purpose of acquiring popularity, and enslaving the nation, and when taxed with causing the bloodshed on the 10th of August. To the first charge he replied with animation, "I never knew pleasure equal to the power of relieving distress;" and to the second, he answered with deep emotion, "It was not I." All the written documents brought forward against him were then shown to him, most of which he decidedly disavowed any knowledge of. His majesty was then asked if he had any further defence to make. "I request," said he, "to have a copy of the accusation, and of the charges on which it is founded, and to be allowed counsel of my own." He was then informed that his two first requests were already decreed, and that he should in due time be informed of their determination respecting the other.

The king was then desired to withdraw, and was conveyed back to the Temple in the same way in which he was brought from it. His majesty had no sooner left the convention, than all was tumult and uproar. The leaders of the Mountain demanded that the king's execution should take place that very night. This was opposed, however, by a large majority, who insisted on indulging him with the nomination of counsel in his defence. His majesty being informed of this, Trouchet and Target were immediately named by him. The former accepted the office, but the latter, shrinking from the implied danger, refused the task. But M. Lamoignon Malesherbes, a man eighty years of age, in spite of his infirmities, and all personal risk, offered his services, which his king gratefully accepted. This old man had been twice nominated by the king, in the day of his prosperity, to be a member of his council, and he now magnanimously claimed a right to a similar office when it was attended with danger. Many of the Parisians were now softened, and in some measure convinced, by this zeal of Malesherbes—who was universally acknowledged to be a man of the most unstained probity, as well as of the soundest sense and respectable talents—and began to take some interest in the person of their sovereign; and De Seye, another lawyer of genius, added, by permission, his name to those of the king's counsel, from whom he was doomed to receive no effectual aid. Nor indeed did he expect it; and, therefore, his short remaining time was much occupied in preparing for that state "where the wicked cease from troubling, and the weary are at rest."

CONDEMNATION OF THE KING.

On the king's return from the convention, he was not allowed the society of his family, and his respectable and faithful valet, Clery, was the only person, save his counsel, allowed to approach him, from whom he could derive the smallest degree of consolation. Before his majesty's second appearance in the convention, he commanded his counsel to abstain from every effort to excite the passions of their audience in his favour, and to adhere exclusively to sound deductions from the evidence. The king left the Temple, on his second summons to the assembly, about nine in the morning, and was conveyed, as before, in the coach of the mayor. De Seye began the king's well-known defence, which he read without interruption. This defence was an able appeal, in the first instance, to the rights which had been allowed him as a constitutional king, and, should these at the present moment be disallowed, to that justice to which he was entitled as a private citizen; while he treated it as an absurd chimera, that Louis could, with the slender force under his command, ever for a moment have thought of turning their arms against the convention. When De Seye concluded his defence, the king added a few words, expressive of his conviction that he addressed the members for the last time, and solemnly avowing the clearness of his conscience with regard to any intended injury to his people. When the king withdrew, a long and fierce debate took place, on the motion of Manuel, to adjourn for three days, that the king's defence might be printed, and sent to the departments. On the contrary, it was insisted upon that judgment should be pronounced without separating. Such contradictory opinions inflamed the violence of the contending parties, and the Jacobins becoming perfectly infuriated, expelled Manuel. Vergniaut, one of the most able of the Brissotines, pled in vain, in a strain of almost unrivalled eloquence, that the fate of the king should be decided by the people. He even went so far as to reproach the Jacobins as the contrivers of the past massacres, and to prophesy the horrors that would ensue if ever Paris was given up to their rule—a prediction that was more than verified when that event did take place, and the reign of terror began. His representations were, however, now totally disregarded, and a final appeal was demanded on the question of the king's sentence, while the ferocious emissaries of the Jacobins surrounded the hall of convention on every side, and inspired the members with terror by uttering loud threats of vengeance if the sentence was not death. They swore, if he was acquitted, to go instantly to the Temple, and, having murdered him and his family, to inflict the same fate on all who had favoured him. This was sufficient, and the votes were immediately taken. When it came to the turn of the Duke of Orleans, the strong interest which pervaded the whole convention at that moment when they were sealing the fate of their sovereign, appeared much deepened: every eye was fixed on him; and when he pronounced the word "Death," a simultaneous shock seemed to be felt throughout the assembly. When the voting was finished, it appeared that there was a majority of fifty-three for the king's execution. At this juncture, Dumouriez arrived in Paris, with the intention of saving the king, if possible. He had gained a victory in the battle of Jemappe, by which he had secured the conquest of Flanders or Belgium, and, presuming on this, he expected to find his influence greater than it proved; but being, like his predecessor La Fayette, foiled in his attempt, he, like him, withdrew also to his army, and left the king to his fate. In fact, no one now seemed to intermeddle in the matter, so completely were the more moderate members of the convention overawed by the immense and sanguinary power of the Jacobins, whose overwhelming and increasing influence was soon to teach them that they were to derive no benefit to themselves from their tame and dastardly submission. When his majesty was informed by Garat, the minister of justice, of his sentence, he remained calm and composed, and delivered to him a paper containing a list of requests, which was read in the convention. It commenced with craving three days' respite; it then went on to beg that he might be allowed to see a person he should name; that he should be freed from the harassing watchfulness of the commune; that he should be permitted to communicate in private with his family; that they might after his death be allowed to retire whithersoever they pleased; and that those persons who were dependent on him might not be abandoned to poverty. The delay of the sentence was refused, which, when reported to the king, he said, "Well, I must submit." He was, however, gratified by an accession to his wishes respecting his family and dependents; for what would have been his feelings in his dying moments, could he have anticipated the horrors in store for them! The Abbé Edgeworth, who nobly braved all personal danger, was permitted to attend his majesty, and, accompanied by Garat, went to the Temple, where, after being narrowly searched, and treated in the most insulting manner by the guards, he was introduced to the presence of the king, at whose feet he fell, and bathed his hand with his tears. This manifestation of attachment, to which he had been lately so little accustomed, melted the unfortunate monarch also into tears. He read over to the abbé his last will, so full of religion, of affection, and of justice, in which his mind is pourtrayed in so lively a manner, but a copy of which we have not room here to insert. He then conversed on various topics, inquired for his friends, and forgave his enemies, among whom he particularized the Duke of Orleans. After this, he rose to make his last visit to his family, in order that, when this heart-rending trial was over, he might fix all his thoughts on heaven.

THE KING EXECUTED—JAN. 21, 1793.

This interview lasted an hour and, in its commencement, gave hopes which had long been strangers to the bosoms of the affectionate circle, who, seeing him enter their apartment without the usual restraints, and being ignorant of the fate to which he was doomed, believed that this was the dawn of a brighter day. He was without guards—he was comparatively at liberty—and it must be so. But they again looked upon him, and there was no joy in his countenance; he was also silent—he embraced them with convulsive clasps—his firmness gave way, and the tears he could no longer repress burst forth. They anticipated their misfortune, and their cries became so frantic, that they were heard beyond the precincts of the Temple. When his majesty was obliged to leave them, he could scarcely separate himself from their clinging embraces. He gave them hopes of another meeting; but the last expressive look he threw upon them told another tale, and laid his wife and his sister senseless at his feet. He returned to the Abbé Edgeworth. "Alas," he said, "why do I love with so much tenderness, and why am I so tenderly beloved?" Strong emotion overcame him, and he sighed deeply, and wept for a few minutes, before entering on religious subjects with the abbé. He then prepared himself by confession, and was granted the request to have the sacrament administered to him the next morning. The abbé, seeing that the king was much exhausted, prevailed on him to lie down, and, though certain that he had not many hours to live, he slept tranquilly. At five in the morning, he rose, dressed himself, heard mass, and partook of the sacrament with the deepest feeling of devotion and trust in God. At about eight o'clock, the commissioners of the commune came to announce that the hour of execution was fast approaching. The king descended the stairs with a firm step and placid countenance to the carriage which waited for him. Silence reigned among the crowd, and he proceeded with the Abbé Edgeworth, and guarded by 1200 men. His majesty continued to read a book of devotion with great fervour, till he arrived at the guillotine, which stood in the Place Louis Quinze. He ascended the platform, and addressed a few words to the people, in which he solemnly protested his innocence, and prayed for and forgave his enemies. He was still speaking, when the ferocious Santerre caused the drums to drown his voice, and, in a few moments more, his head was severed from his body. A request was made by a faithful attendant, to be allowed to bury him at Sens, where the royal family were interred; but this was refused, and the monster Legendre moved that it should be cut into eighty-four pieces, one sent to each department, and the heart to the convention. The body was, however, thrown into a hole in the churchyard of St Mary Magdalen, which was filled with quick-lime, and guarded till it was consumed, when pains were taken to obliterate all marks of where he had been laid, by levelling the ground.—Thus perished Louis the Sixteenth, by a sentence unanimously pronounced unjust and infamous by all Europe, and which finds no parallel in history. Benevolence seems to have been the paramount quality of this monarch, from which his abhorrence of being implicated in the shedding of blood arose, and which at last caused his own to flow on a scaffold.

DESERTION OF DUMOURIEZ.

Having arrived at this epoch, our remaining details must be still more contracted, while we give an account of some of the leading events which took place in France, till the time arrived when a greater degree of tranquillity was restored to the nation.

A short time before the death of Louis, Dumouriez, as we have related, gained the battle of Jemappe, and became the conqueror of the Flemish provinces. These provinces were immediately taken possession of by the convention, who treated their inhabitants with every indignity, pillaging and tyrannising over them without remorse. This conduct was indignantly resented by Dumouriez, who had passed his word for their good treatment, and who, putting an implicit but rash faith in the subordination of his troops, and their attachment to his person, resolved to oppose the measures of the convention, and make a stand in favour of the king, in which we have seen that he failed. But though disappointed at the time, he did not abandon his intention of reducing within bounds the power of the convention, and the course of the revolution. Meantime, he obeyed orders for making an attack on Holland, which, from the manner of disposing his troops, was unsuccessful. In short, the French forces were so entirely defeated in their attacks on various places, that Dumouriez was suspected of treachery, and commissioners were sent from the convention to inquire into his conduct. These persons craftily insinuated that they had come to advise with him on a counter-revolution. Deceived by this false pretence, and being, from the confidence he placed in his army in general, no way slack in expressing his opinions on the subject, he at once made known to them his determination of putting an end to the reign of the convention, and re-establishing the constitution, with a king at its head. The convention, informed of his designs, summoned him to appear before it. He had, however, too great a respect for his head to attend on this summons, and disobeyed. Four deputies were again sent with orders to arrest him at the head of his army, but Dumouriez took them into custody, and sent them to the Austrian army as hostages for the safety of the French royal family, and presently followed them with only 700 cavalry and 800 infantry, the rest of his army preferring to retain their allegiance to the convention, who set a price on the head of their general. Of the troops which passed into the Austrian army with Dumouriez, the greater part deserted from him, and after residing in Germany for some years, he came to England, where he remained till his death, which took place a short time after the restoration in 1814.

COMPLETE TRIUMPH OF THE JACOBINS.

The Mountainists accused the Brissotines of a participation in the conspiracy of Dumouriez. Feeling that it was a fortunate moment to rid themselves of all opponents, Robespeirre attacked them violently in the convention, and Marat in the Jacobin club, and it was proposed to bring them to trial, or rather to decide on their heinous crime without attending to a form of trial. Failing in this measure, the Jacobins had recourse to their old mode of warfare, and prepared an insurrection to attack them while in the hall of the convention, on a certain day. Warned, however, of this, the Brissotine party did not appear, but procured a body of federates, consisting of 400, from Brest, which sufficed, though a weak number, to keep the murderers in check for a time. Fear prevented the Brissotines from imputing this plot against them to the opposite party, and they affected to believe it the contrivance of the nobles and priests. Encouraged by this pusillanimity, Robespierre impeached by name, in a short time afterwards, the leaders of the Brissotines, as implicated in Dumouriez's crime. He was, however, in his turn denounced with the Jacobins, against whom it now seemed the intention of the opposite party to make a stand. They nominated a commission of twelve members, composed partly of their own party, and partly of neutrals (who formed a part of the convention called the *Plain*, which we have never mentioned from its being occupied by the neutrals), to watch the citizens disposed to anarchy, in which employment they showed much energy, by arresting and committing to prison one of the most furious ringleaders of the late insurrections. But this bold step was not followed up; and taking advantage of this want of decision, the convention was surrounded by a mob, who compelled the recal of the commission of twelve, and the liberation of the man they had imprisoned. This concession showed plainly that the power of the Brissotines was at an end, and that a mob could at any time command them; and the Jacobins determined to be rid of them by a final stroke. On this occasion, during a sitting of the convention, it was surrounded by an armed force of 2000 federates instructed for the occasion, who brought in their train artillery, with grape-shot and shells, and who, with the multitude on the outside of the building, vociferated a demand for the death or banishment of twenty-two of the Brissotines, who were pointed out as accomplices of Dumouriez, including in this list the ministers. After experiencing great terror, and during a degree of confusion, where debate was impossible, it was, however, determined to increase the number of the proscribed to thirty, most of whom were arrested; while those of the party who escaped were scattered in the provinces, where they endured all manner of hardships, and were many of them at last put to death. Meantime, sentence of death was executed on twenty-two of the imprisoned deputies, who were guillotined.

FATE OF THE ROYAL FAMILY.

The unfortunate queen was now, too, to suffer the same fate as her husband. She was separated from her family and sent to the prison of the Conciergerie, where she spent her time in tears and prayer, till, on the 10th of October, she was dragged to execution in an open cart, amid the most cruel insults, and guillotined in the same place where Louis suffered. The pious Princess Elisabeth was also doomed to the guillotine, and met her death with the most saint-like resignation, on the 20th of May (1794). Of the dauphin, it is almost impossible to relate the dreadful end, without a shudder of horror. This poor innocent child was delivered to the keeping of one of the most atrocious and blood-thirsty villains in Paris, with an order not to *murder* him, but to *get rid* of him, which this monster accomplished by slow degrees, and by means of hardships, ill usage, and starvation, till he found refuge in an early grave. And last of all, we shall mention the princess royal, who was exchanged with the Austrians for La Fayette, and some other distinguished prisoners.

Let us also mention here, that a few days after the death of the queen, the same fate overtook the infamous Duke of Orleans, who had assumed for some time past the absurd appellation of Citizen Egalité. Neither this assumption of a name so much to the taste of the Parisian mob, nor his many other disgraceful acts of conciliation, availed him at last; and after being tried as a conspirator against the government at Marseilles, he was acquitted, but sent to Paris, where he shared the fate so common at the period, and was brought deservedly under the axe of the guillotine, amid the execrations of all parties.

ASSASSINATION OF MARAT.

It was now that Marat, glutting his sanguinary appetite with the blood of proscribed royalists, became such an object of detestation to a young maiden, named Charlotte Corday, residing at Caen, that she formed the extraordinary resolution of putting an end to him and his enormities. She accordingly journeyed to Paris; and demanding, at his own house, to see him, she was ushered into an apartment where he was taking a bath. After some conversation about the refugees in Normandy, Marat remarked, that, within the space of a few days, they should all lose their lives by the guillotine. These words were the signal for his own death, for at that instant the young woman drew a knife from under her robe, and plunged it to the haft in his heart. She was instantly seized, tried, and condemned to death. Her answers on her trial were all given in the most heroic spirit. She professed to have considered deeply, before its perpetration, all the consequences of the deed she meditated, and to glory in having killed one execrable monster, to save the lives of many thousands of her unhappy countrymen. It is related as a singular circumstance, that, at her execution, she was not insulted by the mob. Charlotte Corday was beautiful and young, dignified and modest; and these advantages, together with her having evidently acted in this deed of self-devotion from a principle of love to her country, was probably the reason that she was treated with comparative respect. After the death of Marat, Robespierre and Danton were the principal leaders of the Jacobins, and began their career by a public renunciation of all religion, and the denial of a Supreme Being; and marriage being declared only a civil contract, to be entered into and abandoned at will, these enactments led to the abolition of all domestic virtue, and paved the way for the bloody acts which were to follow.

ENGLAND PROVOKES WAR WITH FRANCE.

It now became the determination of England to require of the convention an explanation of a sort of manifesto which had been published by it some time before, declaring, "that they would give assistance to any nation that wished to recover its liberty;" as also why the Scheldt had been opened contrary to a former agreement. To these questions the convention refused to reply, and immediately decreed a war against England; upon which an auxiliary army was sent to Holland, with the Duke of York as its commander-in-chief. France was at this time waging an unsuccessful war against various antagonists, while an unheard-of system of terror was carried on in her interior, where a mere charge or suspicion was sufficient to deprive any one of life and goods. The effects of this were dreadful. There was no appeal from the horrid court, designated the revolutionary tribunal, in which the suspected person appeared; and it became so crowded with unhappy people in this predicament, that it was necessary to divide it into four sections, in each of which the work of death went on with equal vigour. And here it was that Danton, who had incurred the hatred of Robespierre, was condemned to perish by the guillotine, in company with many more whose names were equally infamous, although all were condemned on false charges.

FATE OF ROBESPIERRE.

Robespierre now became an object of universal dread; there was no one hardy enough to attempt even to contradict him. At that time it is said that "fifty were put to death each day as regular task-work." In the midst of this work of destruction, he proposed to acknowledge the existence of a Supreme Being by a public act, the details of which are shocking to the Christian ear. But his many murders began to stir a spirit of resentment in the inhabitants; and, though still supported by the Jacobin club, he had his enemies also among the Mountainist party, who feared for themselves the fate of Danton. Robespierre saw with some alarm that he was losing his popularity, even among the most ferocious of the people, and he began to affect sentiments bordering on the puritanism of Cromwell's time; and in this spirit he framed a law, in which so many crimes were stated as being subject to the penalty of death, that it was thought no one could be exempt from impeachment. This decree gave especial alarm to the convention, as they observed that no mention was made of their personal inviolability; but that, on the most frivolous pretence, Robespierre could transfer them, without ceremony, from their seats in the assembly to the guillotine. But from this moment secret revenge was vowed against him by his old associates of the Mountain. In these circumstances, he sought comfort and courage from his still staunch friends in the Jacobin club, where he was encouraged to denounce his enemies in the convention. After a considerable delay, he determined on this course; and once more took his seat there, and stormed against a thousand abuses in the different departments conducted by the separate members; but, being foiled in this attempt by the general voice, he again withdrew, to carry his complaints to the Jacobin club. Meantime, a list of proscribed members, said to be copied from one in the handwriting of Robespierre, was handed about, and a league was formed against the common enemy, whose fall it was believed was now at hand. On the first visit he again paid to the convention, he was received with every hostile indication, and, after a most furious meeting, the result which followed was the arrest and imprisonment of this blood-thirsty man, and a few of his no less sanguinary associates. They were not suffered to live many hours after, but perished on that scaffold which had been so long the scene of their own unhappy triumphs.

RESTORATION OF ORDER.

After the execution of Robespierre, the government set themselves vigorously to the task of freeing the convention entirely from the dominion of the Jacobins, and by condemning some to death, and others to banishment, effected their purpose in spite of one of the most desperate mobs which had ever been raised in Paris, and which violently assailed the convention. The firmness, however, with which they were attacked in return by the national guards, restored order, and society began to recover its confidence, and some portion of its usual tone; and very soon the natural character of the nation, with an elasticity peculiarly belonging to it, once more exhibited its usual vivacity.

MILITARY TRIUMPHS OF THE FRENCH REPUBLIC.

The last time we mentioned the armies of France, that of the north was thrown into utter confusion by the defection of Dumouriez, while it still remained in the neighbourhood of a large body of the enemy; while the most active operations were determined on by the allies, which consisted of every European nation, excepting Switzerland, Sweden, Denmark, and Turkey. Thus the republic was menaced by foes on all its frontiers. But in 1705, when we now again notice the state of the French armies, the tide of fortune had turned in their favour, and they were victorious on all sides. England had been, after great loss, forced to leave the continent; the Duke of Brunswick had made peace with France; the Prussians, Russians, and Austrians, all owned her superiority, by being no longer able to give her effectual molestation. Much of this triumphant success is to be accounted for by the numerous levies raised to reinforce the armies, and the determined spirit of resistance to any attempt against the republic manifested by the people, while it seemed as if, for some wise purpose, Providence itself assisted the French arms. The further triumphs of this gallant nation—the subjection of the republic by one extraordinary spirit, who became a more arbitrary ruler than any of its kings—and the final restoration of the Bourbon family by the arms of combined Europe—are events which cannot be treated of in the present sheet,, but may be taken up at some future time. We must in the mean time entreat the pardon of our readers, if, in describing the sanguinary excesses into which the revolutionisers of France were plunged, any one should think that we have used language—not too strong perhaps to be applied to such violations of humanity, but not sufficiently tempered with a reference to the imminent fear which the revolutionists had reason to entertain lest a reaction might be produced by foreign arms, and a worse fate befall themselves. In so limited a sketch as the present, it is difficult to advert on all occasions to motives and to palliating circumstances; but we are ready to allow that he who judges of the French reign of terror without a consideration of the irresistible principle of self-defence, and some allowance at the same time for a free-spirited nation just let loose from the most odious bonds, not only does injustice to his fellow-creatures, but commits a solecism in philosophy.

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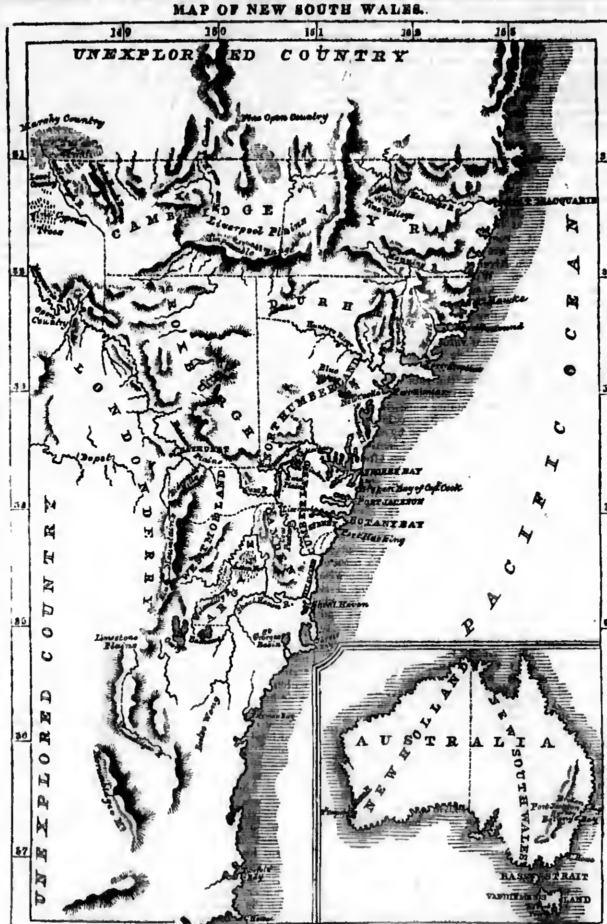
EMIGRATION TO NEW SOUTH WALES.

AUSTRALIA, or New Holland, is an immensely large island, situated in the Pacific or Indian Ocean, at nearly a similar distance from the south pole that Great Britain is from the north, and is thus with relation to us at the opposite extremity of the globe.* It is by far the largest island in the world, and is indeed entitled to the name and character of a continent, being in length from east to west nearly 2000 miles, and in breadth from north to south 1700. It lies between 9° and 38° of south latitude, and 112° and 153° east longitude. New Holland was discovered by the Dutch in 1616, and it was by them it was so called. The Dutch, however, having done little more than merely point out the island, it was afterwards visited and more minutely explored by several English navigators, and amongst these by the celebrated Captain Cook, who bestowed upon its eastern coast the name of New South Wales. Its distance from Great Britain is about 16,000 miles by ship's course. The circumstance of its being situated at the opposite end of the globe, has the effect of reversing the seasons in their relation to ours. Their winter is our May, June, and July; their summer our November, December, and January. Its being situated so much farther east than we are, again affects the relations of time with regard to day and night. The sun rises there ten hours sooner than with us; and thus, when it is five o'clock in the morning in New South Wales, it is about seven o'clock of the previous evening in London. As these changes, however, come gradually upon the voyager to these lands, he is unconscious of their taking place, and is only made aware of that which has occurred in the position of the seasons by the names of the months. Van Dieman's Land, another Australian colony, which we intend to describe in a subsequent sheet, lies to the south of New Holland, from which it is separated by Bass's Strait, a narrow channel of the sea.

MAP OF NEW SOUTH WALES.



GENERAL DESCRIPTION.

The general appearance of New South Wales from the sea is very far from being inviting, presenting immediately on the coast a continuous front of bold cliffs and mural precipices, unbroken for many miles together; behind these, again, and running generally parallel with them, at an average distance of about 40 miles, rises a chain of rocky, precipitous, and almost impassable mountains, extending along the whole eastern coast. These are called the "Blue Mountains." This unpromising appearance of the shores of New South Wales is not removed upon your landing. For five or six miles interiorly the land continues barren and rocky, presenting little other signs of vegetation than a few thinly scattered stunted shrubs and dwarf underwood. At this distance, however, inward, a marked change begins to take place: the soil improves, and begins now to be encumbered with tall and stately trees, which soon again thicken into a dense but magnificent forest, indicating, indeed, a more luxuriant soil than that passed, but scarcely less discouraging to the settler. Still progressing inwards, however, from six to nine miles farther, another change takes place. You have cleared the forest, and the promised land lies before you; improving now with every step you advance; now presenting an endless variety of hill and dale, covered with the most luxuriant vegetation; now extensive plains, resembling the finest parks in England—a resemblance which is made the more striking from their being similarly interspersed with magnificent trees, just numerous enough to add beauty to the land, without encumbering it. This scene, which is bounded interiorly by the Blue Mountains already spoken of, is, with few and not very important exceptions, that which the whole of the eastern coast of New Holland exhibits, and, as a general description, is agreed to by all who have spoken of it. The colonized portion of New South Wales is divided into ten counties or districts: these are, Ayr, Cumberland, Cambden, Argyle, Westmoreland, Northumberland, Durham, Cambridge, Roxburgh, and Londonderry. The first seven of these counties lie between the Blue Mountains and the sea; the three last interiorly beyond them. Ayr, Durham, Northumberland, Cumberland, and Cambden, have all of them the coast for their eastern boundaries; thence stretching each of them more or less inward. The other four counties are entirely inland. This disposition the reader will at once perceive, by referring to the map. Taking the coast line, we begin with the county of

AYR.

the most northerly of the range of counties, bounded by the sea on the east. Its length, from east to west, is about 120 miles, stretching inward; and its breadth, or line of coast from north to south, about 65 to 70. This county is remarkable for the vast proportion of high, rocky, barren, and mountainous land which it presents; it is also, in general, so thickly timbered as to give the greater part of it the appearance of one immense forest. The quantity of cultivatable land, therefore, in this district, is comparatively exceedingly small; and though there are some good tracts occasionally to be met with, it is not, on the whole, by any means a desirable quarter of the colony to settle in. The climate, too, has been found to be highly unfavourable to wheat; and the hills are bleak, poor, and brushy, and not well adapted for grazing. Port Macquarrie, one of the penal settlements of the colony, is in this county.

DURHAM.

The limits of this district are not yet properly defined. On the map it is laid down as extending on the coast from Farquhar's Inlet to Port Hunter,

* The authorities from which this sheet has been chiefly compiled, and to which we refer the reader for further information, are, "A Description of the Colony of New South Wales," by W. C. Wentworth. Whittaker, London.—"Present State of Australia," by Robert Dawson, Esq. Elder and Co., London.—"Two Years in New South Wales," by P. Cunningham, surgeon, R.N. Colburn, London.—"Authentic Information Relative to New South Wales and New Zealand," by James Busby, Esq.—Observations on the Colonies of New South Wales and Van Dieman's Land," by John Henderson. Baptist Mission Press, Calcutta.

a distance of about 75 miles, and stretching about 100 miles exteriorly. There is, however, but a small portion of this located, as it is called, that is, possessed by settlers; the general appearance of this district, so far as it has been explored, like the greater number of the other districts, is exceedingly varied, often presenting the most beautiful scenery, and equally often the reverse: on the whole, it does not seem to be by any means rich in suitable localities for the agricultural emigrant. Notwithstanding, however, this unfavourable character when generally spoken of, it yet contains some of the finest lands in New South Wales; these are to be found in the neighbourhood of the Hunter and Patterson rivers, on the south and south-east side of the county, as laid down in the map. The fertile vallies and soft green undulating hills of this part of the country are spoken rapturously of by all who have seen them; they are, however, of course, all already located, and not an acre worth taking can here be had, except by purchase from the present proprietors. In this district is situated the large and commodious harbour of Port Stephen, and the township of Maitland, the capital of the district, consisting of upwards of 700 souls. The next district pursuing the line of coast is

NORTHUMBERLAND,

lying between Port Hunter and Broken Bay, a distance of about 55 miles, and extending inland about 80 miles. This county possesses the usual proportions of grazing land, barren tracts, and fertile regions, but, like every other part of New South Wales, is greatly deficient in good roads. The best lands here, though it possesses many other beautiful and desirable localities, are to be found in the neighbourhood of Patterson River, which divides it from the county of Durham. Within this county is situated the town of Newcastle, so called from the abundant supply of coal which it affords; the whole surrounding country, as well as a line of coast extending from 60 to 70 miles on either side of it, presenting evidence of its abounding with that valuable mineral. A considerable trade in this article is carried on between this port and Sidney, the metropolis of New South Wales, where it is sold at the rate of 20s. to 21s. per ton, the price at the pit mouth being 5s. to 6s., and the freight 15s., the distance somewhat less than 100 miles. The coal mines at Newcastle are in the hands of government, and are worked by convicts, or, as they are called in the colony, *second* sentence men, being those who have committed offences after reaching their first destination; men, in short, who are banished not to, but from, Botany Bay. The New South Wales coals are said to be of good quality, burning well, but generally small and dirty. Notwithstanding the abundance of coal, however, wood is preferred in the colony for burning, perhaps in some measure owing to the circumstance of their fire-places being exclusively fitted for the latter. The town of Newcastle itself, besides its collieries, is not otherwise remarkable than as being a government station, as it possesses only about 200 free inhabitants. It contains, however, a church, barracks, storehouses, and jail, with a small depôt of military. About 25 to 30 miles south of Newcastle, and still within the county of Northumberland, there is another bay or harbour, bearing the whimsical name of "Reid's Mistake," and which we notice chiefly on account of that whimsicality, and of the circumstance which gave rise to it. A worthy skipper of the name of Reid had been dispatched from Sidney for Newcastle, to procure a cargo of coals. Not being so well acquainted with the coast of New South Wales as with that of Fife, he entered the harbour which now so flatteringly perpetuates his name, found abundance of coals, loaded his ship, and returned with flying colours to Sidney, never dreaming all the while but he had been at Newcastle. The "mistake" was soon discovered, and poor Reid's blunder put in a fair way of being handed down to a remote posterity.

CUMBERLAND.

Following out the line of coast as originally proposed, we now come to the county of Cumberland, which has a coast line stretching southward of about 56 miles, viz., from Broken Bay to Coal Cliffs, about 18 miles south of Port Hacking, and running inland about 40 miles. This county, though one of the smallest, and in point of fertility of soil one of the worst in New South Wales, is nevertheless the most important of the whole, from its containing the principal towns in the colony, and amongst these Sidney, the capital. In this county also is situated the celebrated Botany Bay, a name associated in this country with every thing that is infamous. This celebrity it has acquired, however, merely from the circumstance of its having been one of the first penal settlements, or receptacle for banished convicts, which was established in New South Wales. There are many places in that country to which they are now sent as well as Botany Bay; indeed, thousands of them never see the latter place at all, being sent to stations at a great distance from it. The towns in this county are Sidney—the metropolis, as we have already said, of New South Wales—Paramatta, Windsor, and Liverpool. Sidney is situated about seven miles inwards from the head of Port Jackson, one of the noblest harbours in the world. It is built upon two necks of land, with a valley between called Sydney Cove, possessing a depth of water which enables vessels of the greatest burthen to come close to the land. Thirty or forty years ago, the ground on which Sidney stands was a barren desolate wild, covered with wood, and tenanted only by savages and the beasts of the forest. It is now occupied by a large and thriving town, with a population of upwards of 10,000 souls, and where are to be found more than all the conveniences and luxuries of a British town of the same extent—regular and handsome markets, public seminaries, banks, extensive warehouses, hotels, distilleries, breweries, steam-engines, stage-coaches for different parts of the colony, four newspapers, the Sidney Herald, the Sidney Monitor, the Sidney Gazette, and the Australian, equally respectable looking periodicals with any published in this country; and, in short, every thing, as we have already said, of which a British town of similar size can boast.

Next to Sidney in importance, though much inferior to it, is Paramatta, situated at the head of the narrow inlet of the sea in which Port Jackson terminates above Sidney. Between the latter place and the former, a distance of about 16 miles, there is frequent and regular communication both by land and water; two coaches, one morning and evening, and two passage-boats, daily plying between the two places, the fare of the former 4s. inside and 2s. outside. Nothing can exceed the beauty of the scenery which presents itself on all sides as you proceed to Paramatta by water, the sea generally smooth as glass, or but gently rippled by a slight breeze; innumerable little promontories covered with wood to the water's edge, stretching into the sea, and forming a corresponding number of beautiful little bays and inlets in endless succession and variety. Paramatta contains about from 2000 to 3000 inhabitants. The greater part of the houses here are built of brick or white freestone, and being for the most part unconnected with each other, cover a greater extent of ground altogether than its population would seem to warrant. The situation of Paramatta is exceedingly delightful. It lies in a spacious hollow, covered with the richest verdure, and surrounded by hills of a moderate height. Here, too, are churches, hotels, taverns, seminaries, &c., and all the other appendages of a considerable country town, with a military and convict barracks, jail, government house, and the female factory, an establishment for the reception of incorrigible female convicts. Many of the private houses are of elegant construction, with parks and gardens attached; the place altogether thus forming rather an assemblage of cottages than a town: the streets, however, are regularly laid out, running north and south-east and west. Pursuing an inland course for about 21 miles, the traveller next arrives at Windsor, containing a population of about 1000. From Paramatta to this little town a coach runs three times a-week. Windsor, which, in the description of its buildings, much resembles Paramatta, is built upon a hill close by the river Hawkesbury, which forms the north and the north-western boundary of the county, and which, after a circuitous route of about 140 miles, discharges itself into Broken Bay. Windsor also contains a government house, and a very handsome one, with extensive gardens, &c.; two churches, a jail, court-house, military and convict barracks, taverns, inns, shops, &c. The lands in the neighbourhood of Windsor are exceedingly fertile, but this advantage is more than counterbalanced by its extreme liability to inundation from the Hawkesbury, which has been known to rise to the almost incredible height of 93 feet above its ordinary level. Inundations of 70 and 80 feet are of frequent occurrence, and the consequences to settlers within its reach are often fatal to their lives, and always ruinous to their circumstances. The town itself, which is built on an eminence of about 100 feet above the level of the river, has hitherto escaped these tremendous overflowings; but as it seems to be but a matter of a few feet, at best their safety does not seem very securely established. Of course, no new settler would, or at least no settler ought to establish himself within the reach of this fearful calamity, by which in one moment he may not only lose the fruits of many a year of toil and labour, but also his life. It may be readily conceived what an extent of country must be laid under water by these inundations, when they rise in the channel of the river to a perpendicular height of 70 or 80 feet. The cause assigned, and with good reason, for these great and sudden rises of the Hawkesbury at Windsor, is its near vicinity to the Blue Mountains, which, as we have already said, run parallel to the coast at an average distance of 40 miles, and from which the former is but a few miles distant, and is thus immediately under the influence of the mountain torrents, which run through various channels into the river. Next to Windsor in importance is Liverpool, at the distance of about 18 to 20 miles from Sidney, in a south-west direction. Between these two places a stage-coach runs three times a-week. Liverpool is situated on the banks of George's River, which discharges itself into Botany Bay. It contains about 1000 inhabitants; possesses a church, two or three good inns, stores, court-house, jail, and the usual accompaniments of a town in New South Wales, a convict and military barracks. The soil around Liverpool is of a very indifferent quality; but as the town occupies a central situation between Sidney and some fertile districts in the counties south and west of it, it is, notwithstanding, a place of considerable bustle and of rising importance. George's River, on which it is situated, and which is about half the size of the Hawkesbury, is navigable for boats of about 20 tons burthen as high up as the town. Recurring again to the coast line, we come to the county of

CAMDEN,

extending south from Coal Cliffs to Shoal Haven, a distance of about 35 to 40 miles, and stretching interiorly north about 60 miles, with an average breadth of about 20 miles. There are not yet any towns in this county. It possesses, however, an average quantity of fertile land, but is greatly deficient in water; the very limited supply which it possesses chiefly proceeding from branches of the Cow Pasture and Wingecarabee rivers. This important desideratum—the want of water—operates, as might be expected, greatly against the prosperity of the district, since, without it, its fertile plains can have no temptation for the settler. Nor is this deficiency of water confined to the mere shortness of the supply necessary for the irrigation of the soil, but to human existence. Cunningham, one of the authorities referred to at the bottom of the first page of this sheet, relates, that he "travelled for 12 miles once along one of the main roads (in this county) in the height of summer, yet could only obtain one solitary drink of hot muddy water throughout all that distance." Cambden, though not remarkable for its extent of cultivatable land, possesses, perhaps, a larger proportion of pasture land than any in the colony, and this of an acknowledged superiority in point of quality. The most flourishing local district in this county is the Illawarra, situated at the foot of a mountain of that name, a few miles inland from the sea-coast, and one of the most beautiful and fertile localities in the whole colony. Leaving now the sea-coast, we take the range of inland counties: these we have already described all lying between them and the sea. The first in this order is

ARGYLE.

This county is about 60 miles in length, and of an average breadth of about 25 to 30. About the one-half of it is indented, as it were, between the county of Cambden on the coast, or eastern side, and the county of Westmoreland interiorly. This is one of the finest districts in New South Wales, producing wheat and other agricultural commodities of the first quality, and in the greatest abundance. Large tracts, too, of the best pasture land are here every where to be met with, and, from its geographical position, its climate is of the most delightful kind, highly favourable not only to the rearing of every description of cattle, but rendering it capable of producing, in great perfection, all the fruits and vegetables of Europe.

All these advantages, however, have been hitherto counteracted to a great extent by the want of good roads, and more particularly by the want of one to Sidney, the great mart for all colonial produce. One serious effect of the absence of roads in this beautiful and delightful district, has been to prevent the raising of a greater quantity of grain than was necessary for the mere consumpt of the grower, who, having no means of bringing a superfluity to market, is without any inducement to produce it. This evil, however, is likely to be soon remedied, if indeed not already done, as we perceive, by a Sidney newspaper of 28th June 1832, that the landholders and others of the county had received a favourable reply to an address on the subject, which they presented to the governor on the occasion of his making an excursion into the southern districts of the colony—his excellency promising them that a road to Sidney would be completed without delay. When this shall be done, and some good interior roads besides constructed, the county of Argyle cannot fail to become one of the wealthiest and most important districts in the colony. Adjoining Argyle, and now proceeding northward interiorly, we come to the county of

WESTMORELAND,

stretching from north to south about 80 miles, and averaging in breadth about 40. This is the most mountainous district in the settled portion of New South Wales; and although none of these are of any great height (the highest not much exceeding 3000 feet), yet they are so numerous, extensive, and withal so barren, that but a very small portion of cultivatable land is left. It is not, however, without some fertile spots, and some excellent grazing districts. Amongst the best of these is an extensive flat called Emu Plains; but the general character of the country is highly unfavourable to the agriculturist. There being little more deserving of particular notice in this county, we proceed to the adjoining county of

LONDONDERRY,

situated behind the Blue Mountains, and bounded on the north and east by the counties of Westmoreland and Roxburgh, and thence stretching south and west interiorly, but without any definite limits being yet assigned to it in that direction. This county presents an irregular and varied surface. It is, however, comparatively lightly timbered, and generally easily accessible; but, although particularly adapted for grazing, it presents but a small portion for the plough, and that consisting merely of occasional patches on the banks of rivers and streams. As a grazing district, however, it is not inferior to the best in the colony, and, in this point of view, is an exceedingly desirable place for the settler, who will the less regret its general unfitness for agricultural purposes, that its distance from a market, and the almost impassable tract of mountainous country which intervenes between it and Sidney, renders live stock the only description of property which could be made available to any extent. Proceeding northward, we next enter the county of

ROXBURGH,

separated from the sea by the counties of Northumberland and Durham, and lying beyond the Blue Mountains. The county of Roxburgh is about 100 miles in length, north and south, and about 70 miles of average breadth, from east to west. Here there is also a great proportion of hilly and barren land; but it possesses one tract in particular of remarkable beauty and fertility, called Bathurst Plains, consisting of many thousand acres of the finest pasturage. These are now covered with the flocks and herds of settlers to an immense amount, this territory alone furnishing the greater proportion of the whole quantity of wool exported from the colony. It has also acquired great reputation for its dairy produce, and is considered, with regard to its cheese, as the Cheshire of New South Wales. Settlers here, however, labour under the same disadvantage with all those in the interior districts, viz. the being far distant from any market. This, however, materially affects the agriculturist only, and not the grazier, whose property can transfer itself. The rich territory of Bathurst Plains was discovered only a few years since, and was then considered, as it still is, a discovery of the highest importance to the colony. Nearly the whole of the available lands in the counties near the sea, occupying the space between the barren range of mountains and the coast, having been already located, or in the possession of settlers, there was none left for the thousands that were yearly arriving in the colony.

On the discovery of these fertile plains, therefore, the superabundant emigrant population which had been pent up, as it were, on the narrow stripe between the mountains and the sea, left that territory, and, crossing the mountains with their flocks and herds, poured down upon this new land of promise, spreading themselves and their flocks far and wide over its rich domains.

The climate at Bathurst, from its great height above the level of the sea (about 2000 feet), is considerably colder than in the eastern districts near the coast, and on this account none of the tropical productions, which thrive so well in the latter, can be grown there to any perfection. In the midst of these fine lands is a thriving town of the same name, viz. Bathurst Town. Here there are several institutions, bespeaking the wealth and intelligence of the surrounding settlers. Amongst these are an academy, literary society, and public library. Proceeding still northerly, we arrive at the county of

CAMBRIDGE,

separated from the sea by the county of Aye, and with the latter forming the northern boundary of the colonized portion of New South Wales, on its eastern coast. This county is about the same extent with the latter, viz. about 120 miles in length, or from east to west, and about 65 miles in breadth, or from north to south. Like Roxburgh, this county also presents us with one tract in particular of valuable land. This is called Liverpool Plains, and is situated beyond a range of lofty mountains, running east and west. Although of a very inferior description of land to Bathurst Plains, these are, notwithstanding, well adapted for grazing cattle and horses; but from their being subject to inundation in the rainy season, the best portion of them being under water during that period, they are neither adapted for agricultural purposes nor for the rearing of sheep. The Liverpool plains are about 40 miles in extent, each way. There are few settlements in this county besides those on the plains just named, although it possesses some very eligible lands; but they are remote, and of limited extent.

SUMMARY.

We have now run over all the counties which compose, with the exception of two or three remote settlements, the whole of the colonized portion of New South Wales; and on glancing at the map it will be perceived how very small a part that is of New Holland, occupying, of a coast line on the east of nearly 2000 miles in extent, only about 340, and stretching interiorly, at the broadest part, into a region of similar extent not more than the same distance; whilst, at its narrowest point, it proceeds no farther inward than 80 to 90 miles: the whole forming a triangle, with its base on the coast, stretching inward, and its apex southerly; the sea-coast and the interior line constituting its two sides: the whole space within forming little more than a mere point as compared with the vast extent of territory which lies beyond it. Little is yet known of the interior of this extensive region—so little, indeed, that when individual research has stumbled on a fertile tract some 150 miles inland, it is reckoned and called a discovery, as in the case of the Bathurst Plains, which are not at a greater distance in a straight line interiorly from the coast than that just named. The continued pressure, however, of emigrant population pouring into the districts adjoining the sea, will necessarily, in the course of time, extend the British settlements inwards; and with such a boundless territory behind, it is not easy to say when or where this extension will stop, since there is no reason to conclude that the country yet unexplored is in any respect inferior to that already occupied.

The general character of the settled part of the country, and probably of the greater part of New Holland, is that of a land better adapted for the rearing of cattle than for agricultural purposes, there being, throughout, a much larger proportion of grazing than arable surface. The next general feature is its hilliness; high, rocky, and barren ground pervading, to a greater or lesser extent, every district in the colony, contributing more to the beauty of its scenery than to its utility for human purposes. Its last prevailing characteristic is its woodiness, the extent and frequency of its forests giving a decided character to the whole colony.

These are the prominent and leading features of the country on the eastern coast of New Holland. Its natural and factitious wants are water and roads, of both of which it is exceedingly deficient; the former, whether in the shape of rivers, lakes, or springs, bearing no proportion at all, either in extent or number, to the great expanse of territory over which they are spread. It is not improbable, however, that, as the colony progresses, this natural defect may be in some measure overcome by mechanical skill—by the digging of wells, cutting canals, &c.

The formation of roads, again, will necessarily and naturally follow, as one of the first consequences of increasing prosperity. Although New South Wales certainly does present all those characteristics of which we have spoken, yet they are only general; the exceptions on a nearer inspection are both numerous and important. Its pasture land is more extensive than that adapted for the plough, but it nevertheless possesses many districts of great fertility, capable of producing an unlimited amount not only of every species of grain cultivated for human use, but of all the productions of the tropics—the cotton plant, oranges, lemons, grapes, tobacco, &c., and every other vegetable native of the most favoured climes. Mountains and high barren grounds prevail, but there are yet plains of many miles in extent, and large tracts of gently undulating hills, clothed in the richest verdure. Its woods are frequent and extensive, but there are large portions of the country in which there are not above twenty to thirty trees on an acre, and which, standing thus widely apart in the midst of the most beautiful plains, or on the faces of low and gently sloping eminences, impart a character of surpassing beauty to the scene, giving it altogether the appearance of an English domain in the highest state of natural perfection. From the hilly and woody character of the country, too, it presents throughout its whole extent, in numberless places, scenery of a highly romantic and picturesque description, equalling in beauty the finest in Scotland.

CLIMATE AND PRODUCTIONS.

The climate of New South Wales, confining ourselves of course to the settled portion of that country, although varying considerably in different districts, is altogether highly agreeable and salubrious, and is particularly favourable to children; scarcely any of those diseases to which they are so subject here, and which yearly carry off so many thousands, being at all known there. Neither is it less favourable to all the other stages of human existence. In summer, the heat is not more oppressive than in England, and in winter the cold is much less severe, snow rarely falling but in the remote inland districts, which are situated at a great height above the level of the sea; and even there, excepting on the highest peaks of the hills, it lies but for a short time. In the lower districts where it is hotter, the air is tempered by a cool and delightful sea breeze, which blows steadily and regularly throughout the day, and is succeeded at night by an equally steady and grateful breeze from the land; in short, altogether the climate of New South Wales is one of the most delightful and healthful on the face of the globe. The bright and sunny skies of Italy are here rivalled, and all the luxuries of the tropics produced, without the intolerable warmth of these sultry regions. We have already pointed out two or three contrarieties between New South Wales and Great Britain; another is to be found in the temperature of the different winds, that from the south being there the coldest, and that from the north the warmest. This naturally arises from its geographical position, from its being situated about as near to the south pole as we are to the north. The degree of cold, and accumulations of ice and snow, being equally great in both of these extremities of the earth, it follows that the winds from the south must be there the coldest.

As might be expected from its genial climate, New South Wales is remarkable for the variety and beauty of its natural vegetable productions; the most gorgeous flowers and shrubs growing wild, and in the greatest profusion, every where delighting the eye. Its trees are tall and stately, often reaching to the height of a hundred feet; and thus in comparison reducing to absolute dwarfishness the trees of Great Britain. They are, however, inferior to the last in point of beauty, as they throw out much fewer boughs, and these short and stunted; they are, too, without the luxuriant foliage of the latter; and being all evergreens, none of them casting their leaves annually as ours do, they constantly present one dull dark uniform appearance, the prevailing complexion of all the forest scenery of the colony. The woods, therefore, in this part of the world, are entirely without the beautiful and ever varying tints and hues which mark the different seasons in this and most other countries. The natural grasses are on the whole rather rank than luxuriant, growing to the height of several feet, and thus presenting an appearance of vegetation which does not in reality exist; the settler being at first often surprised at the bareness of the ground when this long grass has been cropped. The better districts, however, present immense tracts of the richest and most luxuriant pasturage. Amongst the foremost of the animal productions of New South Wales is the kangaroo, a harmless, inoffensive quadruped. These animals furnish the principal part of the food of the natives, and are reckoned excellent eating by the colonists, who find much amusement in hunting them. There are no beasts of prey here, neither lions, tigers, leopards, hyænas, nor any other description of animals dangerous to man, excepting a few of the serpent tribe, and accidents from these are of as rare occurrence as in England. Besides the kangaroo, there is a species of animal called a flying-fox; it is a sort of bat of immense size, and most hideous appearance, but perfectly harmless; here also are native dogs, native cats, and opossums and squirrels, in abundance. Of birds there is a greater variety than any other country can produce, and many of these of the most beautiful and varied plumage; amongst these are parrots, a very numerous class.

The principal mineral productions of the country, so far as these are yet known, are coal, ironstone, limestone, potter's clay of the finest quality, whinstone, granite, slate, &c. The three first—of one of which, viz. coal, we have already elsewhere spoken—are to be found in inexhaustible quantities. Some metallic ores have also been found, consisting of lead, tin, and copper; but as these have not yet attracted any attention, little can be said regarding them.

ABORIGINES, OR NATIVE INHABITANTS.

These are now very inconsiderable in numbers. They lead the usual wandering life of savages, roaming throughout the interior in small tribes, each claiming as head-quarters a respective territory. They are jet black in complexion, and in general tall and thin in their persons, with large heads, large lips, and wide mouths, and are altogether the reverse of beautiful, according to our ideas of that quality. They have been considered, although the opinion is not completely borne out by experience, as amongst the lowest of all known savages in the scale of intellect. There is certainly less mechanical genius amongst them—fewer contrivances to improve the original condition of man than are to be found amongst the natives of any other quarter of the globe. Their only arms are a rude spear, or rather pointed pole, which, however, they throw with great force and precision; and a short club, called by themselves a waddie. Their huts are of the poorest description, and they wear no sort of covering whatever on their bodies. The very opposite instances of their general conduct with regard to the colonists, leave it a difficult matter to decide whether they ought to be considered as a harmless or a mischievous race. For the mischief they have done to the settlers, they have in general had sufficient provocation; and the murders they have committed—not a few in number—have been for the most part perpetrated in a spirit of retaliation for similar crimes committed by the whites. All attempts to civilize them, and to induce them to abandon their wandering life, have hitherto been next thing to ineffectual; and with the exception of a few in the neighbourhood of Sidney, and some other of the colonial towns, whom this contiguity has, in some degree, forced into a half-domesticated state, they still wander about in roving tribes throughout the interior, to the no small danger frequently, even to this day, of the more remote settlers, whose establishments they are very apt to visit, and that with no friendly purpose. On the whole, however, they are by no means formidable, the bare sight of a musket instantly putting them to flight, though in considerable numbers. Cannibalism is said to exist amongst some of the tribes; indeed, proofs of this horrible propensity, too strong to leave the matter in doubt, have been frequently discovered.

In some of the counties, however, and in several of the towns, particularly Sidney, many natives are found employed in various descriptions of labour, for their own benefit and that of their employers, the whites. Those of them who have much intercourse with the colonists are said to become most amusingly polite in their manners, bowing and scraping after the very best modes by which these courtesies are practised.

COLONIAL GOVERNMENT AND POPULATION.

The internal policy of New South Wales was, until within the last year or two, conducted by a governor and council composed of military officers, the governor himself always belonging to that profession. The courts there, therefore, had more the appearance of courts-martial than of judicial tribunals. This state of matters was the natural result of the original character of the colony, which was first intended merely as a place of banishment for convicts—a class which required to be dealt with in the most prompt and summary manner when they made themselves again amenable to the law. The government of New South Wales is now carried on by a governor, a legislative and executive council; both of the two last, as well as the governor, are appointed by the ministry at home. The legislative council is composed principally of persons holding official situations, and these chiefly residing in the government towns. The executive council, again, is composed of persons filling the high-

est government appointments. There are, besides, a class of functionaries called police magistrates, distributed throughout the colony, with salaries of L.400 per annum each. These take especial cognisance of offences committed by convicts, whom they have a power to punish by flogging or condemning to work in irons.

Sidney is the chief seat of the colonial government, comprehending the supreme court, and the heads of all the civil and military establishments of the country. These are all maintained by the home government, at an expense, including the charges for the convict population, of L.120,000 per annum. Being a colony of Great Britain, the laws by which New South Wales is governed are the same in their leading features with those of England, differing only in instances where such difference was found necessary to adapt them to the peculiarities of the country.

The population of the white colony, including the convicts, who amount to about 15,000 or 16,000 in number, is estimated at 40,000—an amount of population but little proportioned to the vast extent of territory which it occupies.

SOCIETY.

The title of this department of our sketch will be very apt, we dare say, to produce a smile on the countenances of those of our readers who have not hitherto thought of New South Wales but as a receptacle for the expatriated thieves of England, and who have, therefore, accustomed themselves to look upon it as a land especially and exclusively appropriated to crime and immorality, contaminated and disgraced throughout all its relations, a sink of impurity, and not to be thought of as a place of abode for any honest man. In truth, nothing can be more absurd than the ideas generally entertained of New South Wales on this particular head. These ideas have arisen, of course, from the circumstance of its being a penal settlement, one of the places to which convicts are sent. As this, therefore, we conceive, is presumed, however erroneously, to give a tone and character to the society of the colony, and to render that country a dangerous one to live in, we cannot do better, in an attempt to remove these impressions, than to give a short history of the convict after his arrival at New South Wales. On reaching Port Jackson, whither he is generally sent, the convict is, in the first place, instantly marched under a proper guard to barracks established for his reception. He is immediately afterwards either handed over to a government superintendant of works, to be employed in the formation of roads, bridges, &c., or he is assigned to a settler to assist him in clearing lands, or any other manual labour he may have to perform. Neither in the one case nor the other is his work made oppressive, and in both he is well fed, though kept under the strictest surveillance. When disposed of to the settler, he is provided by the latter with the means of erecting a hut to himself, the first employment to which he is put, if no such accommodation is already on the settler's station. The allowance of food—for he receives no wages but at the option of his master—which the latter is bound to afford him, is 11 lb. of flour, a peck of wheat, 7 lb. of beef, 4 lb. of salt pork, 1 lb. sugar, 2 oz. of tea, and 2 oz. of tobacco, weekly. The settler is farther obliged to supply him with two full suits of clothes annually, bedding, blankets, and the necessary culinary implements to prepare his food. The hours during which he is required to work are from six in the morning until six at night, with the allowance of an hour for breakfast and another for dinner. When a convict conducts himself with propriety for a certain length of time, and which is proportioned to the term of his sentance, he is entitled to claim from the colonial government what is called a ticket of leave, a sort of warrant or licence, which enables him to live where he pleases, and to employ himself in any legal way he may choose. This, of course, is recalled if he commits any new offence; and many advertisements are from time to time to be seen in the Sidney newspapers intimating such recall, and naming the individuals. Though, while he conducts himself with propriety, the convict's peculiar condition in society is not obtruded upon him by any peculiar treatment, yet the slightest departure from this brings him immediately within the reach of the colonial laws. If refractory, or even merely insolent to the settler, his master, he may be taken before a magistrate, and either flogged, or sentenced to work for a certain period on a short allowance of food in what are called the government chain-gangs, composed of convicts who have offended a second time, and are, as a punishment, worked in fetters. On the expiry of his original term of banishment, the convict becomes, in colonial phrase, an emancipist, and is then his own master. Many of these, now altogether a large body in the colony, acquire extensive properties, and become in their turn employers of convicts, and even dispensers of the law. Many of them, too, though less fortunate, become useful, and even respectable members of the community, if one circumstance in their lives could be forgotten; and it is not more politic than just that it should, seeing that, besides their having paid the full price of their transgressions, and having thereby established a right to demand their restoration to that society which has itself offered and received that price, it does not by any means necessarily follow that he who has done wrong once will do wrong again; neither must the commission of a single crime be held as an indubitable proof of a naturally vicious or depraved disposition. Any objections, however, which prejudice may still urge against the emancipist, cannot, without a violation of every religious and moral principle, be applied to their descendants—a fine, manly, and by all accounts an exceedingly amiable race, now springing up in the colony, remarkable for the sobriety of their habits, their industry, honesty, and general kindliness of disposition. Strongly attached to their country, and evidently anxious to efface, by their own good conduct, the recollection of the guilt of their unfortunate parents, they are every day becoming a more and more interesting and important class in our Australian population. In the facetious nomenclature of New South Wales, the class of which we have been speaking is called currency, in contradistinction to those born in the mother country, who are again called sterling. Currency lads and currency lasses is therefore the language in which they are spoken of. From what we have said, it will be seen that the emigrant is in no other way brought into contact with the convict than as master and servant. The line of demarcation between them is distinct; there is no jostling, and there need be no offensive association; the laws keep the convict strictly within his province, and it will be the fault of the settler himself if he permits him to step out of it. With regard to the emancipist, it is different: he is his own master, as well as the emigrant; and, so far as honesty goes, strange as it may seem, although easily accounted for, he will find fully as much of it amongst that class as amongst his brethren the free settlers; and this is not paying the latter an equivocal compliment either; for where principle might be wanting, a desire to redeem their forfeited reputation induces those of the emancipists who have really a desire to do well, to act generally with the most scrupulous honesty; and be it recollected, besides, that the offences for which many of them have been banished, have not been of a nature at all affecting their integrity. With this class, however, the emigrant has it always in his power to mingle just as much or as little as he pleases, since he will find, in almost every part of the colony near townships or settlements, abundance of such society as he may enter without any sacrifice of feeling. In Sidney, where the best and the worst is to be found, there are many hundreds of families, not only of the highest respectability, but nothing short of what is called fashion, enjoying all the elegancies of refined life, exchanging its courtesies, and cultivating its amusements and pleasures: splendid equipages are to be seen rolling along its streets; its public dancing and assembly rooms blazing with light, and filled, as our newspapers would say, with "beauty and fashion;" music parties and theatricals filling up the measure of the happiness of a Sidney life. Next to Sidney, Bathurst has probably the highest pretensions to a superiority in the general character of its society. Besides its literary institutions, it boasts an association called the Bathurst Hunt, composed of all the sporting gentlemen who reside in the district; these wear a uniform, and are, as a body, no way inferior to any similar society in England.

TRADE AND REVENUES.

The shortness of the time since this colony became an object of attention to the speculator and emigrant, leaves little reason to expect that its trade should be very extensive. It has scarcely yet emerged from a state of infancy; but it is fast gaining strength; and if no unforeseen circumstances arise to check its prosperity, New South Wales will one day become, if it is not so even now, by far the most important of all the British settlements abroad. Its leading export articles are wool, and seal and whale oils; a great part of the latter is of that valuable kind called sperm oil, produced by a description of whale found in the South Seas only, and which generally brings here double the price of the common whale oil. Here, then, in these articles alone, is a source of immense wealth. From the boundless pasture land of the colony, and the highly favourable nature of the climate, the increase of sheep is without any limits, and the ocean and its products are yet more unbounded. The quantity of wool exported from New South Wales is yearly increasing, and is likely, indeed certain, to go on improving. In the article of oil, which has only very lately become an object of serious consideration to the colonists, the improvement has been equally rapid, there being now 36 vessels, averaging a tonnage of 8700, belonging to and sailing out of Port Jackson alone, exclusively engaged in the whale fishing. The produce of this branch of the colonial trade in the six months preceding the 30th June 1832, amounted to L.49,800. The whole exports of the colony for the same period amounted to L.249,641, and the imports to L.251,229, the former falling short of the latter to the amount only of about L.2000—a proof that the colony is now nearly able to walk alone, and a reasonable ground of hope that it will very soon be in a condition to afford much more than the extent of assistance which it has hitherto required. A still more striking evidence of the increasing prosperity of the colony is to be found in the circumstance of its having in four years, in some instances, nearly, and in others more than doubled the amount of its property in cattle and sheep, and the extent of its cultivated land; and in a few years more it is found to have more than doubled the value of its imports and exports and amount of revenue.

In 1824, the colony was calculated to possess of horned cattle .	120,000
— 1828, . .	263,000
Increase	143,000
— 1824, of sheep . .	350,000
— 1828, . . .	600,000
Increase	250,000
— 1824, the average amount of its exports for one year was .	L.100,000
— 1832, it amounted for a similar period to . .	249,641
Increase	L.149,641
— 1824, its revenue for one half year was	L.25,000
— 1832, for the same space of time it was	68,211
Increase in one half year	L.43,211

All these increases are still progressing onwards, and with yet greater rapidity than the preceding instances evince. Between the corresponding half years of 1831 and 1832, there was a difference in the amount of revenue of not less than L.13,244 in favour of the latter year.

The principal source of colonial revenue is the duties exigible on liquors, and for licences to dealers, &c.; and in this particular, it must be confessed, the picture is rather an astounding one, and presents our brethren at the other end of the world as indeed "jolly companions every one." Out of a half yearly revenue of L.68,211, some odd shillings and pence, L.51,028 has been derived from liquors and licences alone!! The stock in hand of the former on 25th February 1832, was

Rum . .	57,201	gallons.
Brandy .	25,917	—
Gin .	8,421	—
Other spirits .	5,356	—
Total	96,895	gallons.

And of tobacco there was at the same period a stock in hand of 65,111 lb.

The supply of the former thus averages about two and a half gallons to each individual in the colony, males, females, and children, and, confining the distribution to the adults of the first class, would probably not be short of the proportion of eight or nine gallons to each man in the colony. On the days of the 23d and 25th June 1832, there were granted in Sidney alone no fewer than 193 new licences to inn and tavern-keepers and publicans. On the whole, it has been calculated that there is a quantity of liquors consumed in this colony alone, at least ten times greater than in any other part of the globe besides, of similar extent and population. In the June following the February in which the stock of spirits in the colony is given, the quantity of rum had amounted to 136,063 gallons, and the brandy decreased to 19,370.

The production of wool has for some time back been a primary consideration with the settlers, and they have of late begun to pay more attention to the quality than they did formerly, quantity alone having been at one time all they aimed at. From the improvement which has taken place in the breed of sheep, as well as in the mode of preparing the wool for the market, the New South Wales wool has now become an object of much interest to the dealers and woollen manufacturers in England, where it is greatly prized for the peculiar softness of the cloth produced from it, and which, if combined with a little higher degree of fineness—a result that must soon follow the care and attention that is now bestowed on it—would place it on a level with the best growths of other countries, and consequently direct an inexhaustible stream of wealth into the colony; and there are two important considerations at this moment operating to produce this effect. The first of these is the readiness of the market, and the fair remunerating price which the settler obtains for his wool; the next, the necessity which the distance of the extensive interior settlements from Sidney imposes on their occupants, of directing their whole attention to the rearing of cattle and sheep in preference to agricultural productions.

EMIGRATION.

Having now given such an account of New South Wales as our limits will permit, we proceed to speak of it as adapted to the emigrant, and to point out the manner in which he should proceed, and the hopes he ought to entertain in the contemplation of his making it the place of his abode. This we propose to accomplish by first enumerating the different classes most suitable to emigrate to that colony, and then treating of each separately, and under their different heads. The persons, then, most suitable to emigrate to New South Wales, are of five descriptions: farmers or those who have some knowledge of farming, farm-servants, mechanics, labourers, and unmarried females. The first of these may include, as all to be said under this head will apply equally to, any person, who, having a small spare capital—an indispensable requisite, however—and who, although without any previous knowledge of agricultural affairs, may be desirous of emigrating with the view of turning farmer. A previous acquaintance with husbandry, and treatment of sheep and cattle, would certainly be a very great advantage to any one going out to settle as an agriculturist and grazier; but thousands are thriving in these pursuits in all our colonies who had little or no knowledge of them before they left Britain. Proceeding on the plan we have laid down, we begin with the

FARMER AND GRAZIER.

Although New South Wales presents, perhaps, one of the most eligible quarters of the globe to which the farmer, oppressed by high rents and low prices of agricultural produce in this country, can go, he must not think that, with all its vast extent of fine lands, pastoral and agricultural, its delightful climate, and the general abundance of all the necessaries of life which it produces, that he will therefore have nothing to do on landing on these favoured shores but sit down and enjoy himself; much less must he think, that, though it requires capital, less or more, to commence farmer with any reasonable prospect of success here, that none will be required there. Both privation and hard work, and considerable expenditure besides, will be demanded of him before he reaches a state of comfort and independence. These submitted to, however, for a time, he will soon find himself in as comfortable and happy circumstances—so far as regards exterior things—as perhaps the lot of man will admit. Above all things, however, he must not think of going out without a capital, less or more, but of course the more the better. L.200 or L.300 free on landing there will do very well; L.500 or L.600 a great deal better; and L.1000 or L.1200 will secure him, with proper management, certain and speedy success. In short, the first sum is the lowest which he should think of emigrating with; and although there need be no limits to the extent, yet the latter sum is ample. Let him not remain here until he is entirely ruined, but set off at once, while he has yet any thing left. If he be already penniless, let him not think of emigrating unless he can find a friend who will assist him. As there are many industrious and respectable persons, however, who cannot command a sum equal to the amount of the lowest of these we have named, it has been recommended, and has been found from experience to answer well, that individuals possessing but small capital, say from L.50 to L.100 or L.150, should unite their funds, regulating the numbers of the association so formed by the amount which each contributes—say three or four, if each possesses L.150, five or six if L.100, and eight or nine if L.50; lower than this in amount of money, or higher in point of numbers, it would not be advisable to go. If these united heart and hand, as well as purse, in the work before them, there is little doubt that they would soon place themselves in exceedingly comfortable and independent circumstances—such circumstances as are unattainable in this country with ten times the capital.

Land, of course, will be the object of the farmer, or the person intending to turn farmer, on going out; and it therefore forms the most important part of this department of our subject. As might be expected, all the good lands in the neighbourhood of Sidney and the other markets are already located, that is, in the possession of settlers; but there are abundance of these from two acres up to two thousand, and beyond, always on sale, or to be had on lease, varying in value with soil and situation; and, speaking generally, this is by far the most advisable way for the emigrant to become possessed of land. All the labour and expense of clearing and preparing new land is avoided; an eligible situation, near a market or some point of embarkation, is secured—a consideration of the last importance; and the vexatious delays and troubles of all sorts, which but too often accompany the purchasing of crown or unlocated lands, is escaped, to say nothing of the difficulties and fatigue which the intending settler encounters in roaming through the country in search of a suitable location. The purchasing of improved land of course presumes the possession of capital, but, as we have said, less or more of this is necessary in any event; and such lands as we speak of, if not in the immediate vicinity of Sidney, or of any other town or township, may be had at about 10s. to 12s. per acre. As the system of agriculture in New South Wales does not materially differ from that pursued in this country, an intending purchaser, or renter of land there, though but newly arrived, if previously acquainted with agricultural affairs, will have no difficulty in perceiving, on a personal inspection, whether or not the property which he intends to purchase or rent be properly furnished with all the necessary buildings and erections of a farming establishment. Let him, however, look carefully to this, for all the barns, sheds, cart-houses, &c. necessary here, are necessary there also. It would not be advisable in the newly arrived emigrant to enter into any *private* bargain with any individual regarding the purchase or renting of land; let him rather attend the public sales and auctions of private property, which are almost every day advertised in the Sidney newspapers; he will then have the advantage of all the information which competition can afford, and that is nearly all that need be desired. If he sees an anxiety to purchase amongst the old hands, who may be presumed to be good judges of the value of the subject exposed to sale, he may believe it is worth looking to. If they bid L.1 per acre, he cannot be far wrong in bidding a trifle more, provided always that his previous personal inspection of the property, and the information he may have been able to acquire regarding it from *disinterested* persons—(take care of this)—concur in rendering it advisable.

The next, or rather the only other mode of acquiring land in New South Wales, and that which is most general, is by purchasing or renting it from the government. The latter does not now (since the year 1831) *grant* any lands as it formerly did. The lands which the government have to dispose of are called crown lands, and include all the land in the colony not already possessed by private individuals. On this part of the subject we cannot do better than place before the reader the government regulations, which, after premising that no land shall in future be disposed of in New South Wales or Van Dieman's Land otherwise than by public sale, and that a division of the whole territory into counties, hundreds, and parishes, is in progress, proceed to enact, that

"All the lands in the colony, not hitherto granted, and not appropriated for public purposes, will be put up to sale. The price will, of course, depend upon the quality of the land and its local situation; but no land will be sold below the rate of 5s. per acre.

"All persons proposing to purchase lands not advertised for sale must transmit a written application to the governor in a certain prescribed form, which will be delivered at the surveyor-general's office to all persons applying, on payment of the requisite fee of 2s. 6d.

"Those persons who are desirous of purchasing will be allowed to select, within certain defined limits, such portions of land as they may wish to acquire in that manner. These portions of land will be advertised for sale for three calendar months, and will then be sold to the highest bidder, provided that such bidding shall at least amount to 5s. per acre.

"A deposit of 10 per cent. upon the whole value of the purchase must be paid down at the time of sale, and the remainder must be paid within one calendar month from the day of sale, previous to which the purchaser will not be put in possession of the land, and, in case of payment not being made within the prescribed period, the sale will be considered void, and the deposit forfeited.

"On payment of the money, a grant will be made in fee-simple to the purchaser at the nominal quit-rent of a pepper-corn. Previous to the delivery of such grant, a fee of L.40 will be payable to the colonial secretary for preparing the grant, and another fee of five shillings to the registrar of the supreme court for enrolling it.

"The land will generally be put up to sale in lots of one square mile, or 640 acres; but smaller lots than 640 acres may, under particular circumstances, be purchased, on making application to the governor in writing, with full explanations of the reasons for which the parties wish to purchase a smaller quantity.

"The crown reserves to itself the right of making and constructing such roads and bridges as may be necessary for public purposes in all lands purchased as above, and also to such indigenous timber, stone, and other materials, the produce of the land, as may be required for making and keeping the said roads and bridges in repair, and for any other public works. The crown farther reserves to itself all mines of precious metals."

It will be perceived, that, by these regulations, a capital of at least L.160 (640 acres at 5s.) for the purchase of land alone is in general cases required; but smaller lots are very easily obtained, and the former is thus little more than a nominal restriction. Besides procuring lands from government by purchase, these may be also had on yearly leases, or as tenants at will, to any extent, at 3s. 1½d. per 100 acres; but this is not an advisable way of occupying land, for you are sure to be turned out of it, sooner or later, according to the advantages it may possess (and if it have none, it is not worth even the small sum asked for it), by some intending purchaser coming forward and making an offer for it to the government, unless, indeed, you can yourself out-bid him, for it can be sold only by public sale. As all the good lands in the colony, in the district lying between the Blue Mountains and the sea, are already located, new comers, unless they have the means of purchasing private lands, or are contented with inferior soils, will have to look for their location on the other or interior side of these mountains. Thus being thrown at a great distance from the market, their views ought to be confined almost entirely to the rearing of sheep and cattle, particularly the former, raising as much grain only as will serve for their own private use. Particular circumstances may alter this relation of matters, but in general, and at the present moment, these are the views that ought to be entertained; nor need the settler regret this, since wool is one of the most profitable and saleable commodities which he could bring to market. The London sales of this article, the produce of New South Wales and Van Dieman's Land, averaged, in 1832, about 1s. 3d. to 1s. 5d. per lb., while Merino ewes, according to the Sidney Monitor, may be bought in the colony for 10s. each, and milch cows for L.5. Let the intending settler, therefore, as he values his future success, pay his utmost attention to this department of the pursuits which will engage him in his adopted country; and to enable him to do so with an increased certainty of a good result, we give the following

"DIRECTIONS FOR THE MANAGEMENT OF WOOL," BY MR WALTER BUCHANAN, ADDRESSED TO THE AUSTRALIAN WOOL-GROWERS,

premising that the want of attention to such proceedings, regarding the management of that article, as these directions point out, has hitherto operated most seriously to the disadvantage of the Australian wool-growers. The intending settler will also observe, from these directions, the necessity of locating as nearly as possible to a supply of water for washing his wool.

Washing.—"It is of great importance that the fleece should be well washed, that the wool may be brought to market with as bright a colour as possible. Every convenience, and a very plentiful supply of pure water, should therefore be provided, a running stream being most desirable. The preferable mode of washing is that which is performed before shearing, according to the German manner. Some growers have tried the plan of washing after the fleeces have been shorn and sorted, and, as is supposed, to have used tepid water, following the French and Spanish method; but this has not been approved of by the buyers generally, and particularly by those who buy for combing purposes.

The breaking of the fleece and washing after shearing, gives the wool more the appearance of Spanish than of German wool, and consequently reduces it to a lower standard of comparison. It is well known that the sheep of those German flocks that are best washed, are, after that operation, driven into some shed, strewed with clean litter, or penned up with hurdles, on clean grass; that the utmost care is taken to prevent their exposure to dirt, or whatever else might tend to sully their whiteness; and that they are *not* shown until a sufficient degree of moisture is deposited in the fleece, by perspiration, to impart a soft handle to the wool. It may here be added, that it is very important, if possible, to prevent the sheep from filling their fleeces with grass seeds, broken leaves, and other extraneous substances, which cannot be removed in the operation of washing, and which are productive of labour and expense in every process of manufacturing, in some cases indeed rendering wool almost unsaleable. It may be here observed, that so conscious are the Spaniards of the superiority of the German mode of washing and assorting, that they are making every effort to introduce it.

Assorting and Accommodating.—In order to assimilate the Australian wool as much as possible with the German, in preparing it for market the fleeces should not be broken, but merely divested of the breech and stained locks, and so assorted or arranged that each package may contain fleeces of the same character as to colour, length of staple, fineness of hair, and general quality.

If the washing has been performed at the same time and place, and with an equal degree of care, the colour is likely to be uniform, and it will then only be necessary to attend to the separation of the fleeces as to length, fineness, and general quality: but if a larger grower has flocks of different breeds, and fed on different soils, care should be taken that the fleeces be separated, first as to colour, and then again as to length, fineness, &c.

Packing.—The fleeces, being assorted, as already suggested, should be spread one upon another, the neck of the second fleece being laid upon the tail of the first, and so on alternately, to the extent of eight or ten fleeces, according to their size and weight. When so spread, the two sides should be folded towards the middle, then rolled together, beginning at each end, and meeting in the centre, and the roll or bundle so formed held together by a slight pack-thread. The bagging should be of a close, firm, and tough nature. The material hitherto most generally used has been sail canvass, which very ill resists bad weather on a long voyage, and when received here even in favourable condition, is so dry and crisp, that it will tear like paper: a thicker, twilled, more flexible, and tough material, would be preferable. The size and form of the package may be in length about nine feet, and width four feet, sewed up on the two long sides and at one end, the other end being left open, and the sheet so formed being suspended, with the open end upwards, to receive the bundles, made up as before directed, which are to be put in one at a time, one of the flat sides of the roll or bundle being put downwards, and so on in succession, being well trod down, until sufficiently filled for the mouth to be closed. This is the German mode of packing; but it is doubtful whether smaller packages, of the dimensions that have been hitherto sent from the two colonies, may not be more convenient for so long a voyage. The operation of screwing should be discontinued where it has been practised, as the pressure by the screw, and remaining compressed during the voyage, occasions the wool to be caked and matted together in a manner that is highly prejudicial to its appearance on arrival. The practice also of winding up each fleece separately, and twisting a portion into a band, is productive, in a minor degree, of the same prejudicial effect, and it is to avoid this that the making German bundles of eight or ten fleeces is suggested."

The Australian emigrant agriculturists and graziers, as we have seen, will fall into two classes, as it were—the one, those who purchase improved land, ready made to their hands; and the other, those who locate on new land bought from the government. The latter will be almost exclusively engaged in the rearing of sheep and cattle, for the reasons already given. The former, again, will, in most instances, have more to do with agriculture than grazing. As this, however, as we have elsewhere said, is pursued on a similar system in New South Wales as in England, we need not enter here into any details on the subject, there being nothing at all peculiar in the case of the former. Nor can we, from the usual casualties of seasons, soils, &c., venture to fix any probable rate of produce which the settler might expect his acres to yield. That, however, with the exception of wheat, may be said generally to be equal to that of corresponding lands in England. In the case of wheat, the quality is superior to that of any grown in Europe, but the quantity per acre is below the average rate of England, seldom exceeding 24 bushels per acre.

The following "return," however, from the Sidney Herald, will give an idea of the prices of produce:—

Average wholesale prices of farm produce at Sidney, from 1st to 8th August 1832.

Wheat, best, N. S. Wales,	L.0	5	0	per bush. of 60 lbs.
Do. 2d,	0	4	0	" "
Do. 3d,	0	3	0	" "
Barley, best,	0	3	0	" of 50 lbs.
Maize,	0	2	5	per measurement.
Colonial tobacco, best,	0	1	7	per lb.
Do. 2d quality,	0	1	4	"
Potatoes,	4	10	0	per ton.
Butter, best salted,	3	14	8	per cwt.
Cheese, good,	2	2	0	"
Pork, salted,	1	10	0	"
Bacon,	2	6	8	"
Ham,	3	0	8	"

As the system of agriculture is the same, or nearly the same, with England, so also is the description and rotation of crops, with the exception of tobacco, which thrives well, and is beginning to attract some degree of attention in the colony. The proper management of this crop, however, will be best learnt on the spot. With regard to the intending settler who purchases the unimproved lands of the government, his course is neither so simple nor so easy. On arriving at Sidney, he gets into lodgings, which he will obtain, including bed and board, at a rate varying from ten to twenty shillings per week. Let him, however, remain here as short a time as he possibly can, otherwise he will spend money idly, which, at all times valuable, is now to him not doubly, nor trebly, but incalculably so, as on the few pounds which he now has in his pocket his future success in a great measure depends. Let him not, therefore, spend a single shilling that he can avoid spending. If he intend to purchase improved lands, let him look after these in the market immediately, and proceed, as soon as he can after purchase, to take possession and commence operations. If he intend to buy crown lands, he had better not waste time in searching for a location in the lower districts, for the reason already specified—viz. that all good lands there are already located—but proceed at once into the interior; probably about Bathurst or the county of Argyle, both elsewhere spoken of, are the best points to which he could direct himself, if he find that there are government lands there advertised for sale; and although there should not, he will perceive, by the colonial regulations quoted, that he may, nevertheless, if he discover a spot which he thinks would suit him, and which is not the property of another, procure it to be put up to sale. The greatest drawback, however, in this case, is, that he must wait until the expiry of the period (three months) during which, by the regulations, it must be advertised before being brought to the hammer. But during this time he need not by any means be altogether losing; let him purchase immediately as many ewes as his means will admit, reserving, of course, for other expenses; and these he will get readily quartered with settlers who have more land than they can stock, for one-third of the proceeds of their wool; thus the emigrant getting the other two-thirds is already establishing a source of income, and without trouble; and he may do the same by cattle. Such description of settlers as will readily enter into this arrangement with him are numerous, and will easily be found upon inquiry.

The newly arrived emigrant will of course, of his own judgment, take care to select land as lightly timbered as possible, that the expense and trouble of clearing may be the less.

Leaving his family, if he has one, at Sidney, until he return from his exploratory expedition, the emigrant who is about to look out for a suitable location sets out on horseback, provided with changes of clothes, a blanket to wrap himself in at night, and a light cord with which to secure his horse while he is himself asleep; and if his route be through thinly inhabited districts, he had better be accompanied by a pack-horse, with provisions. His train of assistants ought to be composed of a steady white man and a black native: these, if fortunately chosen, will be exceedingly useful to him in guiding him and in supplying him with various information. Thus equipped and provided, he roams through the country until he falls in with such a location as he thinks will suit him. Having fixed on this—not always easily done—he returns to Sidney, pays his deposit of 10 per cent. on the purchase, or the whole price if he chooses, or in the event of its not being advertised land, presents a written application to the governor, in terms of the colonial regulations before referred to. Providing himself now with cart, plough, and set of harrows—which, by the way, he had better not bring from England, as, though somewhat dearer, he will get them of a description better suited to his purpose in Sidney—he proceeds with his family to the scene of his future labours. There are two or three considerations of importance to the newly arrived settler which may be thrown in here together. Let him take every means in his power to ascertain, before returning again to Sidney, that the land he has fixed upon is not either altogether or in part the property of another. This is not always by any means easily made out, mistakes often occurring, and giving much trouble and annoyance to the new settler, who may, if such a thing happen, find himself compelled to set out on a second expedition. He should endeavour to find out, at Sidney or elsewhere, the surveyor of the district in which he purposes making his search, and make such inquiries of him regarding the point just spoken of, and such others as may seem necessary to him.

The newly arrived settler must not allow himself to be influenced regarding the location he has fixed upon by any thing he may be told by the neighbouring settlers, it being their interest, at least they think it so, to dissuade new comers from establishing themselves in their neighbourhood. Nor must he mind what he hears to the disadvantage of the country whilst at Sidney, from any one of the scores of idle dissipated loungers who hang on there, and who, themselves ruined and disappointed through their own folly, are ever ready to fasten on the stranger, and to entertain him with the most dismal accounts of his adopted land. Let him, we say, avoid these people, and pay no attention to their croakings; but come to the resolution, under the blessing of God, of setting stoutly and manfully to work, and there is no doubt he will speedily find himself in an infinitely better condition than he was at home.

The sheep and cattle which he may have bought previous to his fixing upon land, as before recommended, he must on no account remove from the settler's grounds on which he has placed them, until he has prepared the proper enclosures for their reception at his own location, otherwise they will give him much trouble by straying, and thus consume that time in running after them, and in collecting and keeping them together, which is so necessary for his other numerous and pressing avocations.

New South Wales, besides presenting to the emigrant all the advantages which are to be found in America, affords two peculiar to itself, and these very important ones. The first is to be found in the short distance which he has to travel after landing in search of a location, this seldom exceeding 100 to 140 miles in the former, while in the latter he has often to perform a journey of 1000 for the same purpose. The next is in the seasons. The Canadian has to provide for a long and severe winter, during the greater part of which he is necessarily thrown idle. In New South Wales there is scarcely any winter at all, and the farmer may, consequently, carry on his operations throughout the whole year.

For his labourers the settler has to look to the convicts. These he obtains by a written application to the governor, who will immediately assign him a requisite number to assist him in clearing and preparing his lands. On this subject, which appears somewhat startling, and has, we believe, operated unfavourably on Australian emigration, we beg to lay before our readers the following extract from a series of remarks on emigration to New South Wales, in the Sidney Monitor of 1st August last:—"Convict servants, we admit, are not so good as the servants of England. They are not so skilful, except one in four or five, and in point of industry and good manners not equal, of course, though kept down by a vigorous discipline. But they are more skilful and industrious than slaves, and, in lieu of costing from L.30 to L.50 a-piece, they cost the assignee (employer) only L.1 a-year per head, which poll-rent has not yet been levied upon the assignee, but it is expected it will be laid on very shortly, and for a salutary end.

"The man who feeds and clothes his convicts according to the law, giving them rather the advantage in the adjustment as to quantity and quality of their food and clothing, and who treats them with civility, is as safe on his farm in residing with convicts as he is with freemen."

Settlers, however, if very fastidious on the subject of convicts, *may* employ free labourers; but the comparatively high wages which these demand, and the insolence towards their employers—punishable in a convict, but not in them—in which they are but too apt to indulge, knowing that they can easily find another employer, will soon reconcile him to convict labour.

As our limits will not admit of our entering into further details regarding this department of our subject, we now conclude it with the following judicious remarks from the authority just quoted, viz. the Sidney Monitor:—

"Strangers coming to New South Wales should bring letters to as many persons as they can, provided they be men of character. But let them not expect any thing more from the people here than a kindly feeling towards them. This they will receive. If they meet with hospitality, it will be likely to do them harm. It will tend to raise in them expectations of rank and expense, which will retard their success, and probably ruin them, by inducing them to borrow money on mortgage, &c. &c.

"However respectable men may have been at home, they should have firmness enough to lay all rank aside when they come here. Let them for this purpose, sell all their blue coats and yellow buttons, and silk stockings, and enter the colony in a berragon shooting jacket, waistcoat, and trousers, their wives and children wearing dark stuffs for cheapness in washing and for durability; and however they may be rallied and tempted by their new friends here to put on better attire, let them turn a deaf ear to such allurements. Let them buy nothing in the way of furniture but rush-bottom chairs, and the commonest tables, and bedsteads without posts, which are sold here at 10s. each; and, in short, let them endure the constant reproach of being mean and stingy until their wool, salted beef, butter and cheese, shall have enabled them to dress and furnish their houses according to their taste. By that time, however, they will have learned to see the folly of attempting any thing in New South Wales but to be warm, dry, and well fed. And in lieu of improving their external appearance, they will learn the wisdom of laying out their profits in building barns and stables, in fencing in more paddocks, in buying more milch cows, and fine woolled ewes, and in buying and renting more land in the distant interior to keep them."

FARM SERVANTS AND SHEPHERDS.

Men of this description are invaluable in New South Wales, and much wanted. The amount of wages, however, which they may earn is not easily, or, rather, cannot be stated, as much depends upon the proportion which they may be disposed to take in property, that is, in farm produce, less or more of which is always understood to form part of the farm servant or shepherd's income. The general rate, however, of the wages of this class, may be said to be about L.15 per annum, sometimes as high as L.20, but the lower will be the safer calculation. This, however, is not the money-rate. Part of it, to what amount depends upon bargain, must be taken in property. Besides this fixed rate of wages, however, they have an ample allowance of animal food, flour, &c., generally more than they can consume. Though the net amount of wages, therefore, may appear not very tempting, the latter consideration fully makes up for it, making the condition of the cottar or farm servant there infinitely more comfortable than it is here; besides, his children, if he has any, contribute there much sooner, and to a much greater extent, to the family's comforts than they can do here, work of all kinds being in much greater demand. The boy or the girl either will get their rations of meat, flour, &c., with proportionable wages, as soon as they are able to do any thing; and thus an ample abundance of all the necessaries of life, and these, too, of the best description, may always be found in the cot of the shepherd or farm labourer in New South Wales, presenting a striking contrast to his straitened and impoverished condition at home, where, amongst other privations, animal food rarely crosses the threshold of his door.

MECHANICS.

The demand for mechanical skill in the colony is exceedingly great, and it will probably be many years before either this demand abates, or the remuneration of the emigrant artisan suffers any diminution. In the meantime, at all events, the scarcity of mechanics in New South Wales amounts to an absolute famine, and the eagerness with which they are sought is fully proportioned to this scarcity. If any particular class can be said to be more wanted than another, where all are wanted, the following might be named:—Coopers, ship and house carpenters, cabinetmakers, joiners, wheel-wrights, brick-makers and layers, stone quarriers, cutters, and masons. This selection does not in every instance correspond with that in the circulars or bills issued by emigrant ship-owners and agents, but as it is taken from a newspaper published in Sidney, in August 1832, it is no doubt correct. It has at any rate the advantage of being more recent than the former, none of which that we have seen are dated later than 1831, and even these refer to the rates obtainable in 1830. As our object in this paper is not either to dissuade or to encourage any one to leave their native land, but to state facts as we find them, leaving it entirely to parties to judge for themselves, we feel not only under a restraint, but in particular difficulty, in speaking of the wages which the mechanic may look forward to in New South Wales, the more especially that we find the rates spoken of in one of the Emigrants' Guides to New South Wales," published in this country, characterised by a Sidney newspaper as being "many of them notoriously untrue." There is, however, no occasion to exaggerate. The real and true state of matters there is, we should think, sufficiently tempting to most tradesmen. The wages of mechanics in general, besides the certainty of immediate employment, may be safely stated as ranging from 5s. to 8s. per day; few get at any rate so low, and certainly none lower, than the first; and in some cases, such as that of a very expert workman in any of the trades above named, a sum even beyond the highest may be obtained. Let the intending emigrant, however, calculate on the lowest only, and he will run no risk of disappointment: if he gets more, so much the better, and the chance is, that, if a good tradesman, he will. Nor is the mere amount of wages, much as it is beyond that of this country, the only advantage which Australia holds out to the mechanic. There is, besides, to be coupled with it the extremely moderate price of some of the principal necessaries of life, though certainly *all* of them are not lower than in this country; on the contrary, many of them are much higher, and many of them at least equally high. Animal food, however, and tea and sugar, particularly the two former, are extremely cheap; but it must be observed of the first, that, cheap as it certainly is, there has been something like a deception practised regarding it. In all the bills, circulars, &c. published on the subject of Australian emigration, beef and mutton are stated as selling there at 1½d. per lb.; so it is; but then this is of an inferior description, and, moreover, it means when a whole carcass is bought: the best is 2d. per lb. when the whole carcass is taken, and 3½d. when purchased in smaller quantities. A mechanic is not likely to buy animals by the carcass: the real price, therefore, which he will pay in Sidney, going to the market for a few pounds of beef or mutton, will be 3d. to 3½d. In order, however, to give him and others as correct an idea as possible of what living there may cost, we subjoin the following price current, "compiled for the Sidney Herald, 30th August 1832."

Ale, Eng. per hhd.	6l. 10s a 8l.	Pork, salted	4d a 8d
do. doz.	14s a 18	Bacon, per lb	0 a 7
Colonial, per hhd.	60 a 80	Hams, per do.	9 a 1s
do. doz.	6 a 0	Veal, quarter, per lb	3 a 0d
Beer, Eng. per hhd.	6l. 10s a 8l.	joint, per do.	5 a 0
do. gal.	14s a 18	Milk, per quart	6 a 0d
Colonial, per hhd.	45 a 55	Oil, Sperm. per gal.	4s 9d a 5s 0
do. gal.	2 a 0	Black	3 0 a 0 0
Biscuit, per cwt.	13 a 20	Neat's foot	4 0 a 0 0
Blankets, Col. per pair	18 a 30	Poultry, geese, each	3 0 a 4 0
Blue, per lb	8 a 0	Turkey	4 0 a 0 0
Butter, fresh, per do.	1s 1d a 1s 4d	Fowls, per pair	1 8 a 2 0
salt	0 9 a 1 0	Ducks	2 6 a 3 0
Bread, 2lb loaf	0 3½ a 0 4	Rice, per lb	0 3 a 0 0
Candles, moulds, lb	1 0 a 0 0	Salt, Colonial, cwt	5 0 a 5 6
dips	0 6 a 0 6½	Spirits, rum, p. gal.	8 0 a 10 0
Cattle,		Brandy	12 0 a 0 0
Bullocks, each	2l 10s a 2l 15s	Gin	12 0 a 0 0
Working ditto	3 0 a 4 0	Colonial	7 6 a 0 0
Cows	1 0 a 8 0	Soap, Mackie's, p. lb	0 3 a 0 6
do. in milk	1 10 a 0 10	Aspinall's	0 3½ a 0 0
Calves	6s a 8s	Starch	1 0 a 1 0
Sheep	6 a 8	Straw, oat, per load	18 0 a 20 0
Pigs	7 a 10	Barley	18 0 a 20 0
do. roasting	3 a 4	Sugar, loaf, per lb	0 0 a 0 0
Cheese, English, per lb	2s 3d	Moist	0 3 a 0 4
Colonial	4d a 6d	Tallow, per cwt	32 0 a 37 4
Cloth, Paramatta, per yd.	1s 6d	Rough fat	28 0 a 0 0
Do. broad do.	3 4	Tea, Hyson, per lb	1 8 a 1 10
Coffee, ground, per lb	1 6	Young Hyson	3 0 a 3 6
Eggs, per dozen	6d a 8d	Souchong	1 0 a 0 0
Flax, New Zea. per ton	16l. a 17l.	Pekoe	3 0 a 4 0
Flour, per 100lbs	fine 2ds	Gunpowder	8 0 a 8 0
Barker	14s 12s	Tobacco, Brazil, lb.	0 0 a 2 0
Longford	14 12	Colonial, leaf	0 4 a 0 5½
Dixon	14 12	fig	1 6 a 2 0
Girard	14 12	stalks	0 3 a 0 4
Pickering	13 12	Negrohead	3 6 a 4 3
Gordon	13 10	Segars, Col. p. box	7 0 a 10 0
Green	13 11	Havanah	15 0 a 16 0
Fruit, per dozen,		Chinsura	6 0 a 10 0
Oranges	0s 9d a 1s 6d	Manilla	2l. 15s a 3l.
Lemons	0 4 a 0 0	Snuff, Col. per lb	0 9 a 7 0
Apples	1 6 a 3 0	Vegetables,	
Pears	2 0 a 3 0	Potatoes, per cwt	3 0 a 0 0
Quinces, none	0 4 a 0 6	Cabbages, each	0 1½ a 0 2
Water melons, ea.	0 4 a 0 8	Turnips, bunch	0 1½ a 0 1½
Grain, per bushel,		Carrots, per do.	0 1½ a 0 0
Wheat	4s 6d a 5s 0d	Pumpkins, each	0 0 a 1 0
Maize, do.	2 8 a 0 0	Onions, per bunch	0 2½ a 0 3
Barley	3 0 a 3 6	Cauliflowers, each	0 6 a 0 0
Oats	2 8 a 3 0	Vinegar, Col. p. gal.	2 6 a 3 0
Rye	2 8 a 3 0	Woods,	
Hay, Eng. seed, ton	8l. a 10l. 0s	Cedar, board, p. ft.	0 4 a 0 3
Colonial	6 a 0 10	plank	0 1½ a 0 8½
Hides, per lb	0s 0d a 0s 1½	Blue gum, plank	0 1½ a 0 2
Horns, per 100	8 0 a 0 0	log.	1 0 a 1 1
Leather sole, per lb	0 6 a 0 0½	Firewood, p. load	4 0 a 5 0
Kip	1 0 a 9 0	Treenails, per 100	4 0 a 0 0
Dressed shoe, each	3 0 a 10 0	Wine,	
Meat, beef, per lb	1½d a 2d	Port, per dozen	35s a 40s
joint	3 a 3½	Madeira	35 a 40
salted	3½ a 4	Sherry	35 a 40
Mutton, carcass	1½ a 2	Claret	10 a 60
joint	2½ a 3	Cape, per gallon	4s 6d
Pork, carcass	2½ a 3	Elder	5s 6d
joint	4½ a 5	Wool, per lb	4d a 2s

The expense of the passage out is the most serious drawback in the case of emigration to New South Wales. But the mechanic who has not the means of defraying the whole of this expense may have assistance from government. The following are the regulations on this subject:—

"No one family will be allowed an advance exceeding L.20; and therefore it will be useless for parties who may not possess the remainder of the sum requisite for engaging their passage, to apply to the commissioners (commissioners for emigration, London.) No advance will be made except to persons who are competent workmen in some of the ordinary mechanical arts, as, for instance, blacksmiths, carpenters, &c.; and the advance will be further confined to men who are married, and intend to take their wives with them.

"Every person desirous of receiving the proposed advance must fill up and send back to the secretary to the commissioners the return* hereto annexed. If the information contained in this return shall be considered satisfactory, the applicant will receive notice to that effect. He may then proceed to make his agreement with the owners or masters of ships proceeding to New South Wales or Van Dieman's Land; and as soon as any shipowner or master shall notify to the commissioners for emigration (in a form which will be provided for the purpose), that the emigrant has taken the other necessary steps for engaging his passage, an order will be granted for the payment in the colony of L.20 to the agent or the master of the vessel in which the emigrant may arrive. The emigrant will of course be able to obtain a corresponding deduction from the amount to be paid by himself in this country.

"The order for payment will be entrusted to the master of the vessel in which the emigrant is to proceed, and will consist of a sealed dispatch to the governor, containing the name and description of the party on whose account the money is to be paid; but arrangements will be made by which the delivery of this order to the master will not take place until the emigrant shall have signed the acknowledgment which will be required from him of the debt he will contract with government; for it is the intention of his majesty's government—and it cannot be too clearly understood by all persons who may accept this loan—that repayment of the debt (in such proportions and at such intervals as may not be unsuitable to the circumstances of each emigrant) shall be strictly enforced by means of ample powers which the laws of the colony render available for that purpose.

"Should the number of applications to the commissioners be greater than the funds at their disposal will enable them to comply with, priority of date will form the rule of selection among applications in which there shall appear no other ground of distinction."

From these regulations it will be perceived that no *unmarried* person, or other than a mechanic, need apply for the aid of government; that the emigrant must be accompanied by his wife; that L.20 is the utmost sum which will be advanced in any case (excepting where there are daughters in a family, between the ages of 15 and 30, these being over and above provided for—*See unmarried females*;) and that he must be prepared to show that he has the means of paying the difference of the expense of his passage, which, it will be seen from the article under that head, is about double this sum for two, or man and wife; and, lastly, that the repayment of the loan will be strictly, though not oppressively, enforced after he has become fixed in the colony.

LABOURERS.

The demand for labourers in New South Wales is scarcely less eager than that for mechanics. Exaggerated accounts, however, of the encouragement as to remuneration which these may expect in Australia, have also got abroad. If stout able-bodied men, they are sure of immediate and constant employment; but their wages are not, as is stated by some, L.25 or L.30 a-year, or about 2s. per day, with board and lodging, or 3s. per day without, but 1s. per day, with a ration consisting of 12 lbs. fine flour, 12 lbs. fresh beef, 2 lbs. sugar, ¼ lb. tea, and ½ lb. of soap. In some cases labourers may meet with more advantageous terms, but those stated will be found the most general, at least they are those offered to labourers by advertisement in the Sidney papers in repeated instances, and are likely, therefore, to be near the truth, since the advertisers would not, of course, offer *more* than was necessary, and could not reasonably expect any success from their advertisements if they offered less.

UNMARRIED FEMALES.

The demand for these is not less, or rather it is now greater, than that for mechanics and labourers. Those who have some knowledge of the dairy, however, are preferred, though all are welcome, if not old or decrepid. "Female servants," says the Sidney Monitor, "of all kinds are wanted by the thousand, especially if young. All under 40 years of age," continues the same authority, "if sober and honest, may calculate on husbands, good, bad, and indifferent, within a year of their arrival, should they prefer a married life. If they keep single, they may save money." The wages of good female servants is just now L.15 per annum; these, however, would, of course, fall if the numbers that go out be very great.

To this description of emigrants the government also offers assistance, with this important difference in the terms from those on which it is offered to the mechanic, viz. that the money advanced is not again demanded, but is a free gift. The following are the government regulations on this subject:—

1st, The commissioners (of emigration) will contribute L.8 (it is now raised to L.12) towards the passage of unmarried female emigrants.

2dly, When emigrants of the above description, and between the ages of fifteen and thirty, are members of families which are about to proceed to New South Wales or Van Dieman's Land, they will, on applying to the commissioners for emigration, be furnished with orders payable in the colony for the above-mentioned sum of L.8 (now L.12). This money will be paid at the option of the emigrants, either to the heads of their families or to the captains of the ships in which they are conveyed; but it will be necessary that they should make their option before departing from this country, as the orders will be framed accordingly.

3dly, Females desirous to emigrate to New South Wales or Van Dieman's Land, and not forming part of any family proceeding to those colonies, are required to send in an account of the particulars enumerated in the annexed paper.* If they be between the ages of *eighteen* and thirty, and possess the funds which would be necessary, in addition to the sum allowed them by the commissioners, to complete the price of their passage, they will be admitted as candidates for the bounty of government.

As soon as a sufficient number of such persons shall have signified their wish to emigrate, they will be called upon to pay into the hands of an officer appointed for that purpose, their share of the charge of the passage, and the commissioners will then take up a vessel (into which no other passengers will be admitted) for the conveyance of these emigrants to their destination.

4thly, Should the number of applications to the commissioners be greater than the funds at their disposal will enable them to comply with, the preference will be given, first to females emigrating (as described in paragraph 2) in company with their families, and next to those who are qualified to make themselves useful as servants in a farmer's family. Females who may offer to pay a larger proportion than others of their passage, will also be considered entitled to a preference. In the absence of all other distinctions, priority of application will form the rule of selection.*

MISCELLANEOUS.

There is yet another description of persons who might find it for their advantage to emigrate to New South Wales, but whom we have not classed under the general head of persons suitable to emigrate to that quarter of the world—not, however, because we thought them unsuitable, but because we thought that the idea of emigrating thither was with them, more particularly than any other class, a matter of personal consideration: those whom we mean are officers of the army. The government holds out encouragement to them also to emigrate to Australia; but as the nature and extent of this encouragement will, we presume, of course, have been communicated to them officially, and as the details can interest none else, we need not here enter into them; and, on the other hand, as all that could benefit or interest any of them in the contemplation of emigrating to New South Wales has fallen to be treated of under the different heads of this article, there is nothing that might be reckoned peculiar to their circumstances to be spoken of.

Having now said thus much of those who *are* suitable to emigrate to New South Wales, we may bestow a word or two on those who *are not*:—These are men who have been brought up to no particular business, profession, or trade, and those who have been bred only to the quill, book-keepers and clerks generally being there altogether out of request; as a proof of this, there were no less than fifty applications lately in Sidney, where there is a population of only 10,000, for some small clerkship about the dock-yards. We have been the more induced to add this negative information regarding Australia, that there are many deserving men of both of the descriptions alluded to, who might possibly be tempted to try their fortunes in that new field of enterprise. Such persons, then, as we have spoken of—and we may also name weavers—ought not to think of going out unless with the means and the intention of betaking themselves to agricultural pursuits.

PASSAGE.

The distance from this country to New Holland, as we have already elsewhere said, is about 16,000 miles ship's course, that is, making an allowance for all the variations from a straight line which a ship must necessarily make. The time occupied in this voyage is generally about eighteen weeks, or four months and a half, but, on the whole, may be calculated at five months. It will be seen, on looking at a map of the world, that the course of the ship in which the emigrant embarks for New South Wales is, if she sail from Leith, Liverpool, or London, through the Straits of Dover, across the mouth of the Bay of Biscay; then she passes the opening of the Straits of Gibraltar; then the island of Madeira, where the wine bearing that name is produced; next the Canary Islands; then the Cape de Verd Islands; then crossing the equator or equinoctial line—an ideal boundary describing a circle round the middle of the earth, and dividing it into two equal parts, or into the northern and southern hemispheres—she next rounds the Cape of Good Hope, generally touching there, as well as at some of the islands named; then proceeding in a straight line due east (hitherto she had been sailing almost due south), she crosses the Southern Ocean, and finally rounding the most southerly point of the Australian land, enters Port Jackson on its eastern coast.

The price of a passage out to Sidney, including provisions, is, for a single man in the steerage, about L.23., in the cabin about L.55; for a married couple, somewhat less than the double; and for single females the charge is about L.3 less in the one case, and L.5 in the other. Children are rated according to their ages from sixteen, at three-fourths of the above rates, down to six, at one-fourth; when under twelve months old, no charge is made. Each passenger is allowed half a ton of luggage. They furnish their own bedding, and, in the case of steerage passengers, their own spoons, knives, forks, &c. These are the terms of one respectable ship agent,† and are, we believe, as liberal as those of many of the

* Printed forms of these returns may be had from any of the emigrant ship agents in Leith, Liverpool, London, &c., on application to them (post paid); and they will take the further trouble of negotiating this business for the intending emigrant, on the understanding, of course, however, that he takes his passage by one of their ships.

* As in the case of mechanics, printed forms of such a paper as is here alluded to may be obtained from any of the emigrant ship agents or owners, who will in this, as in the former case, also conduct the negociation with the commissioners for the female emigrant.

* *Note.*—Since the matter of this sheet was written, government has signified that the funds appropriated to the payment of loans and bounties to mechanics and unmarried females are temporarily exhausted. Inquiry must therefore be made by intending emigrants of these classes whether the loans and bounties are again begun to be granted. Masters of vessels and shipowners at the different ports will afford this information.

† Mr John Broadfoot, Leith, whose ship arrangements generally evince a much more than ordinary degree of care for the health and comfort of his passengers. Those for the conveyance of female emigrants are such as may reconcile the most timid to the voyage, and are judiciously calculated, in every respect, for the purposes they intend to serve.

others in the trade, whose terms and conditions differ from each other sometimes considerably. When the passage money, however, is found to be lower than that stated above, it would be well for the intending voyager to see that the difference is not made up by a deficiency in the quantity or quality of his provisions, or that it is not perhaps much more than compensated by some such arrangement, probably, as putting three grown-up persons into one bed, when there are no ordinary ship beds that can with any degree of comfort accommodate more than two. This, though apparently a trifling circumstance, and likely on that account to escape the notice of the passenger until it be too late to remedy it, becomes a serious evil on getting into warmer regions. It is then found exceedingly distressing, and in the last degree uncomfortable. Let the intending emigrant, therefore, look sharply to both of these particulars before finally engaging his passage.

THE SETTLEMENTS AT SWAN RIVER AND KING GEORGE'S SOUND.

SWAN RIVER SETTLEMENT.

This settlement is wholly unconnected with the colony of New South Wales; but being in the same quarter of the world, in the same island, it naturally falls to be spoken of in an article on our Australian possessions. The settlement takes it name, as is obvious, from the river in whose vicinity it is. This river is situated on the south-west coast of New Holland, a little way north of the most extreme southern point, on the west side of the island. Its neighbourhood was first proposed as a place of settlement in the year 1828, when Captain Stirling was appointed lieutenant-governor. The latest accounts of the progress of this little colony are upon the whole favourable, although they do not certainly hold out any very great inducements to any one to go thither.

The difficulties and privations which a new settler has to encounter at his outset in both Van Dieman's Land and New South Wales, are here still more formidable—a necessary consequence of its younger state, and its dependence on foreign supplies. The first impressions of the newly arrived emigrant are exceedingly unfavourable and disheartening. The soil appears, and really is, until you have gone about fifteen to twenty miles inland, extremely poor and barren. At this distance from the coast, however, it greatly improves, exhibiting many beautiful and fertile tracts, and bearing some of the most magnificent trees in the world. Here, also, is the same profusion of those gorgeous flowers which form so remarkable a feature of the natural vegetable productions of New South Wales and Van Dieman's Land. Its animal productions are entirely similar to those of the two former colonies, and it is equally free from any that are dangerous to man. The heat, however, would appear to be more oppressive than in either of the places just named. Whether this arises from a greater intensity in the sun's rays, or from a lighter or more irregular visitation of these cooling breezes which prevail in both New South Wales and Van Dieman's Land, is not explained, but the complaints by the settlers there of the warmth of the climate are frequent, while there are none in this particular from either of the former. The climate, however, is nevertheless exceedingly healthful. Not only have no complaints of any kind whatever, attributable to the country, appeared amongst the colonists, but they are enabled to bear exposures with impunity, which, in most other climates, might be attended with the most serious consequences.

The best land, indeed the only land yet discovered sufficiently near the settlement worth cultivating, is on the banks of the Swan River, and on those of an adjoining river, called the Canning; but even there it rarely extends on either side more than two miles from the stream, and not often so far, and all this land has been already located. There is, however, reason to believe that good tracts of country are to be found in the interior; indeed some have been found: but the young colony has not yet had time to devote to expeditions of discovery, or been able to avail itself of those that have been made. The pressure of emigration, however, and more leisure on the part of those already there, will no doubt very soon extend the dependencies of the settlement, and lead to some valuable acquisitions of country. The land already under cultivation has been found to be very productive, bearing crops of wheat and other grain equal to the best of any other country, but not yet in sufficient abundance to supply the wants of the colony. For grain, and many other articles of agricultural produce, it is still indebted to New South Wales, Van Dieman's Land, and the Cape of Good Hope; but the progress which it has made, and continues to make, bids fair to leave it at no distant date wholly independent of foreign aid.

Live stock of every kind, however, is exceedingly dear; good working bullocks have brought L.21 each; a cow and calf upwards of L.30; very indifferent Cape horses L.28 each; and South Wales sheep 40s. Provisions are also high. Fresh beef, by no means always to be had, is 1s. per lb.; potatoes, yams, and onions, 20s. per 125 lbs. Rice, tea, and sugar, however, are reasonable; the first 2½d. per lb., the second at 1s., and the last 4d. to 5d. The value of articles, however, in an infant colony such as that of Swan River, is so liable to fluctuation, so easily affected by external circumstances, and subject to the control of so many of the latter, that it is not possible to fix it; and it would therefore be unfair to represent those which we have given as ruling prices. Even while we write, a change may have taken place in this particular; and it is certain that a change has taken place within a year or two back in the prices, especially, of live stock, these having fallen considerably, and exhibiting a tendency to fall yet lower, so that they may be now very different from those we have quoted. There are already several thriving little towns in the colony, amongst these Freemantle and Perth; the former, the port, being built at the mouth of the Swan River, and the latter the capital. The site of Perth is represented as happily chosen. It is situated on a picturesque spot on the north bank of the river, about twelve to fifteen miles above Freemantle. A government house is about to be built here, and there are many others, substantially built of both brick and stone, fast rising on all sides. Colonel Hanson, who has lately published an interesting account of the Swan River settlement, speaking of this infant capital, says, "The society of the place is hospitality personified; for though their means are somewhat limited, yet they share them with the kindest good will." The intending emigrant to that quarter, therefore, may look forward to at least a kind reception from his countrymen who are already there; and this is no small matter to a man who has just arrived a stranger in a foreign land, in which he is in all probability to spend the remainder of his life, and where he is just about to engage in an arduous struggle for the support of himself and his family.

Mechanics and labourers, of whom there is a great scarcity in the settlement, receive high wages. Carpenters are represented as getting 10s. a-day, and as much work as they choose to undertake. Labourers 12s. a-week, with board and lodging besides, and a certain prospect of constant employment during their lives.

Although carpenters have been named in speaking of mechanics, all descriptions of artizans necessary in the constructing of houses meet with equal encouragement. While contemplating this high rate of wages, however, the mechanic must not overlook the set-off against it which is to be found in the great expense of living there. Provisions are high; and articles of clothing and other necessaries exorbitantly so, though certainly not nearly to the extent of equalizing expenditure to income, the latter always, with ordinary moderation in living, still greatly exceeding the former.

The description of persons who have gone out to settle in this colony are represented to have been hitherto superior, on the whole, to those who have gone to any other of the British settlements. "Even now," says a correspondent, who dates his letter from Perth, "we can sit down any day at dinner with a party of as gentlemanly and well-connected men as we usually associate with in England." And they already find themselves in a condition to indulge in some of the elegancies and amusements of refined society. Balls are frequently announced at the "Stirling Arms Hotel," an inn in the town of Freemantle.

The natives, who pay frequent visits to the settlers, appear to be exceedingly harmless and inoffensive—mild in their manners, and possessing considerable intelligence. They are of a dark copper colour, and in a state of perfect nudity. On the whole, they seem to be a much more amiable race than those in New South Wales and Van Dieman's Land; and there has not yet been, we believe, any instance of collision between them and the settlers. Their weapons are the same with those of the natives of the former colonies, viz. the spear and waddie. Their talent for imitation and mimicry is very remarkable. They will readily and correctly repeat any English word, or even a whole sentence, after the speaker, though, of course, not comprehending a word of it. When visiting the settlers, the men—for the females never appear—frequently bring their children along with them; but on these occasions they will not intrude themselves into any of the settlers' houses or tents, unless invited, and, after thankfully receiving any thing which may be given them, return peaceably to their woods. They are exceedingly timid, and of this timidity an amusing instance is given by a lady resident at Swan River to her friends in England. "Yesterday," she says, "there were about twenty natives in this place; they observed a horse and cart coming towards them, when they immediately to a man ran off, shouting in the most frantic manner—never before, it appears, having seen a thing of the kind."

One of the greatest drawbacks to the prosperity of the colony has been, and still is, the want of labourers, those taken out by emigrants of capital, having, in too many instances, taken advantage of the readiness with which employment from others was to be obtained, and the dependance which their masters necessarily had on their services, and become careless and inefficient. The former have been, on their part, besides, so indifferent about the characters of those whom they took out, that it was found necessary to appoint a magistracy to protect the persons, property, and rights of the settlers.

Stock of all kinds are said to thrive remarkably well here—a circumstance peculiarly fortunate for the colony, as it is a source of profit sooner available, and with less labour, than that of agriculture, and, therefore, better adapted to its present state; as it is also to all such settlements while only in the first stages of their existence. Where the soil is good, vegetation is represented as being very luxuriant, exhibiting what is a great desideratum in many parts of the neighbouring colonies, that variety in the grasses so essential to the health of cattle. All the European vegetables and tropical fruits which have yet been cultivated in the settlement have also thriven well; and amongst the latter we find the colony producing pine-apple, orange, lemon, and lime trees, vines, fig and coffee trees.

The whole population of the colony has been estimated at 2500, an amount which seems to be considered as amply sufficient in the meantime, until further discoveries of good lands have been made, as there is just now scarcely an acre of available soil but what is already located. Some partial exploratory expeditions have been already undertaken, and the result of these has been in some cases highly favourable, large tracts of fertile country having been fallen in with, particularly in a southerly direction from the settlement; but whether from their having been too remote from it, or too difficult of access, they yet remain unlocated. Dr Wilson, R. N., who explored the country between King George's Sound and Swan River, says, that in this excursion he passed "through a country beautifully diversified by moderately elevated hills, and fertile and verdant vallies, adorned and enriched by streams of the purest water." It would therefore appear to be in this direction, which is south and south-east of Swan River, that desirable new locations are most likely to be found. The country at seventy miles distant from King George's Sound is, he says, "well adapted for either agricultural or pastoral purposes, besides exhibiting, occasionally, some beautiful and highly picturesque scenery." Dr Wilson concludes by saying, that "the area which he walked over, three or four days journey, contained as much, if not more, land fit for every purpose of rural economy, as could be found in any portion of equal extent in New South Wales."

KING GEORGE'S SOUND SETTLEMENT.

There is little in this settlement that can be considered peculiar to itself, as all its natural properties and characteristics are the same with those of Swan River. It adjoins to and is a dependency of the latter, and is situated on the south side of that point or projection of land which places Swan River on the west coast of New Holland. Farmers, labourers, mechanics, and whale fishermen, are greatly wanted here, and are offered the following encouragement, by authority of Governor Stirling, to emigrate thither:—A gaurantee will be given, if desired, to such as wish to secure employment before leaving home, of certain wages, proportioned to their abilities and industry, and regulated by their different trades; these wages assured to be about one half more than what is given in this country. They will be also insured of a supply of provisions at a rate not exceeding a fourth more than the prices of this country. To those who prefer devoting themselves to agricultural pursuits, a grant of land, at the rate of one hundred acres to each family, will be made, free of all charge, with the advantage of fixing the prices of stock, provisions, &c., before starting; thus enabling the emigrant to form a correct idea of the amount of capital which he would require before leaving his native land—a piece of information which is often much too long of coming, sometimes not until it is too late. It is recommended that all who go thither should be married persons, and that they should be accompanied by their wives.

Generally, with regard to these settlements, we may say that a great deal too much has been said in their favour, and not a little too much against them. They appear entirely undeserving of either the encomiums of the one, or the abuse of the other. They are neither particularly desirable places to emigrate to, nor are they the reverse. The emigrant who goes thither encounters the usual amount of difficulties, and, by perseverance and industry, will in course of time, we believe, attain what is now a usual amount of success—a competency as to the means of subsistence, but no money-making.

We cannot conclude this notice of the Swan River, and its dependency King George's Sound, without noticing the very warm and flattering terms in which the present governor, Governor Stirling, is spoken of by the settlers within his jurisdiction. "His excellency," says one correspondent, "I assure you, has no sinecure in pleasing all parties; but, I think, of all the men who endeavour to act impartially, he is the man: upright, well-nerved, the rich and the poor man is the same to him. All private recommendations go for nothing, and he treats the settler who comes with a few hundred pounds with the same affability and condescension as the one who brings L.10,000." Considering how much of the happiness and prosperity of a colony depends upon the character, dispositions, and temper of its chief ruler, a sufficient inducement to emigrate to the settlements of which we have just been speaking, although there was little else, is to be found in the character of their present governor.

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THE HORSE.

EARLY HISTORY OF THE HORSE.

But for the domestication and services of the horse, we should have yet been far behind in civilisation; and, without him, our luxuries would have been greatly limited. By his aid the labour of inland agriculture is much lessened, commercial intercourse is facilitated, and mankind transported with speed to distant parts.

Of all other animals, the form of the horse is the most perfect and elegant, and highly adapts him for speed; while his pliability of physical organisation, and his extreme docility of disposition, render him a willing and obedient servant to man. Daubenton remarks, that of all animals the horse seems the most beautiful; the noble largeness of his form, the glossy smoothness of his skin, the graceful ease of his motions, and the exact symmetry of his shape, have taught us to regard him as the first, and as the most perfectly formed; and yet, what is extraordinary enough, if we examine him internally, his structure will be found the most different from that of man of all other quadrupeds whatsoever. As the ape approaches us the nearest in internal conformation, so the horse is the most remote—a striking proof that there may be oppositions of beauty, and that all grace is not to be referred to one standard.

One of the most striking qualities of the horse is his intrepid courage, and extreme generosity of disposition. He has been used, in all ages since his domestication, in the battle-field, where he has ever been found to face danger, and even the shouting of the combatants, with undaunted boldness, and unshrinking firmness; the hottest cannonading, and the more irritating discharges of musketry, have failed to make him quail. Courage has ever been an attribute of the horse.

We find the following powerful description of the horse in the Book of Job, one of the oldest and best written of the Scriptures. He says, "Hast thou given the horse strength? hast thou clothed his neck with thunder? canst thou make him afraid as a grasshopper?—the glory of his strength is terrible. He paweth in the valley, and rejoiceth in his strength; he goeth on to meet the armed men. He mocketh at fear, and is not affrighted; neither turneth he back from the sword; the quiver rattleth against him—the glittering spear and shield. He swalloweth the ground with fierceness and rage; neither believeth he that it is the sound of the trumpet. He saith among the trumpets ha, ha! and he smelleth the battle afar off, the thunder of the captains, and the shouting."

The period is not known at which the horse was first domesticated. He is mentioned by the oldest writers, and it is probable that his subjugation was nearly coeval with the earliest state of society. The sacred writers tells us, that, 1702 years before the birth of Christ, horses were used. It is said in Genesis, "and Joseph gave them (the Egyptians) bread in exchange for horses." This is the first instance of horses being mentioned in the Scriptures; and from what is stated in the earlier chapters of Genesis, it would seem that the horse was unknown to the Israelites and Egyptians before that time; for in the 12th chapter of Genesis we read, that "Abram had sheep, and oxen, and men-servants, and maid-servants, she-asses, and camels," but nothing is said of horses; we may therefore reasonably conclude that they were unknown. This was 1920 years before the birth of Christ. It would therefore appear that it was a short time prior to the year 1702 before Christ that horses were first introduced into Egypt, but whence, we are not informed; and they seem to have propagated and increased in that country with great rapidity, for in the eleventh chapter of Joshua, and fourth verse, we are told, "they (certain kings opposed to Joshua) went out, they and all their hosts with them, much people, even as the sand that is upon the sea-shore in multitude, with horses and chariots very many." This was 1450 years before the Christian era.

The Scriptures, therefore, clear up the point to within a few years as to the time when horses were introduced into Egypt, which at that period was certainly the most civilised state in the world. At this epoch, Greece, which in after times was destined to astonish the world, slumbered as a barren and unpeopled waste.

It would appear that man first domesticated those animals which supplied him with food, such as the ox, the goat, and the sheep. The camel and ass seem next to have been subjugated, and to have been used as beasts of burthen.

The first breaking of the horse for riding is attributed by some authors to the Lapithæ, a people of Thessaly, and is thus described by Virgil in his third Georgic:—

> "Bold Erichthonius was the first who join'd
> Four horses for the rapid race design'd,
> And o'er the dusty wheels presiding sate:
> The Lapithæ to chariots add the state
> Of bits and bridles; taught the steed to bound,
> To run the ring, and trace the mazy round;
> To stop, to fly, the rules of war to know,
> T' obey the rider, and to dare the foe."

There is great diversity of opinion among authors as to the period when men first began to mount horses, for the purpose of riding. From the writings of Homer, we must conclude that horses were ridden long before his time, for, in a metaphor, in the fifteenth book of the Iliad, he compares the strength of Ajax, bounding from ship to ship, to that of a horseman on a strong steed.

> "Nor fights, like others, fixed to certain stands,
> But looks a moving tower above the bands;
> High on the decks, with vast gigantic stride,
> The godlike hero stalks from side to side.
> Lo, when a horseman, from the watery mead
> (Skilled in the manage of the bounding steed),
> Drives four fair coursers, practised to obey,
> To some great city, through the public way,
> Safe in his art, as side by side they run,
> He shifts his seat, and vaults from one to one;
> And now to this, and now to that he flies;
> Admiring numbers follow with their eyes."

It is quite evident that horses were not used for riding till long after the period that they were harnessed in war chariots. Sir George Ouseley mentions, in his Travels through Persia and various Countries of the East, that he examined all the relics of antiquity to be found among the ruins of Persepolis, from which he drew a conclusion, which is at once interesting, and in some measure confirmatory of the opinion above noticed, that the horse had been gradually subdued. He says, "There are no figures mounted on horseback, although some travellers have mentioned horsemen among these sculptures. One would think that the simple act of mounting on a horse's back would naturally have preceded the use of wheel-carriages and their complicated harness; yet no horsemen are found at Persepolis; and we know Homer's horses are represented in chariots, from which the warriors sometimes descended to combat on foot, but the poet has not described them as fighting on horseback. The absence of mounted figures might authorise an opinion that these sculptures had been executed before the time of Cyrus, whose precepts and example first inspired the Persians with a love of equestrian exercises, of which, before his time, they were wholly ignorant."

Although a general, it is an erroneous opinion, that Arabia was the native country of the horse; as we are warranted in supposing this not to be the case, from what is stated in Second Chronicles, chapter 9th, which informs us that King Solomon obtained gold and silver from that country; and, in the 28th verse, that "they brought unto Solomon horses out of Egypt, and out of all lands." However, Arabia is not expressly mentioned, which certainly would have been the case had horses been natives of that country. Solomon is said to have had "four thousand stalls for horses and chariots, and twelve thousand horsemen;" at which time the price of an Egyptian horse was one hundred and fifty shekels of silver, which amounts to about seventeen pounds two shillings sterling—a much larger price than at the present day, if we make allowance for the difference in the value of money.

ORIGINAL COUNTRY OF THE HORSE.

Left only to conjecture, we can but suppose, from a combination of circumstances, that Asia was the original country of the horse; for there he is found, to the present day, roving in unrestrained freedom, and we are without any historical record of his having been introduced by man into those extensive wilds; and one thing is quite certain, that he was not found either in America or New Holland at the original discovery of those continents.

The great desert tracts around the Sea of Aral and the Caspian Sea have been supposed the native country of the horse; but if this conjecture is correct, he must have widely extended his geographical range, for he is found in a wild state in Asia as far north as the sixtieth degree, and to the utmost southern extremes of that vast continent, and also in many parts of Africa; but we must suppose that those of the former country emigrated as the species multiplied. Even so late as the seventh century of the Christian era, when the Prophet Mahomet attacked the Koreish not far from Mecca, he had but two horses in his train; and although, in the plunder of this horrible campaign, he carried with him in his retreat twenty-four thousand camels, forty thousand sheep, and twenty-four thousand ounces of silver, there is no mention of horses being part of the booty. We are informed that the Arabians had but few horses, and those not at all valued; so that Arabia, where are now the most celebrated coursers in the world, is but comparatively of modern date as a breeding country.

History tells us that in the second century horses were exported from Egypt to Arabia, as presents to their kings; from which we may conjecture that their finest horses were originally the produce of Egyptian steeds, whence they were also exported to Ethiopia, India, Persia, Parthia, Armenia, Scythia, &c.

WARLIKE EQUESTRIAN TRIBES.

The Amazons, a nation of famous women, who, instead of their husbands, ruled the state, and founded an extensive empire in Asia Minor 800 years before the Christian era, were celebrated equestrians, and had a superior breed of horses.

Herodotus, who wrote in the fifth century before Christ, informs us that the Ethiopians had a good breed of horses, and were equestrians. He also tells us that the Indians were accustomed to the use of horses from very remote periods, and that the soldiers of that country who attended Xerxes in his celebrated march against the Grecians, fought on horseback as well as in war-chariots. That historian affirms that the ancient Persian horses were famous for their beauty, vigour, fire, and other qualities, and so celebrated on account of their speed, that the name of a horse in that country is *Asbon*, or *Wind-foot*—a term very expressive of the great speed of the courser. So essential did that people consider the accomplishment of riding, that they taught their children to mount a horse at five years of age. Vegetius, who wrote 386 years before the time of Christ, says that the horses of Persia were famous on account of their excellence for the saddle, being very sure-footed, extremely gentle, and easy and graceful in their motion, which was something between a gallop and an amble; and to those who cultivated the best breed they proved a great source of emolument. They were not, however, able to stand the fatigues of a long journey.

The Huns were a powerful people about 300 years before Christ, and their cavalry frequently consisted of two or three hundred thousand, formidable by the matchless dexterity with which they managed their bows and their horses, by their hardy patience in supporting the inclemency of the weather, and by the incredible speed of their marches, being seldom checked by torrents or precipices, by the deepest rivers or the most lofty mountains. They spread themselves over the face of the country; and, notwithstanding the elaborate tactics of the Chinese, directed in their operations by Kaoti, whose merit had raised him to the throne, were constrained to surrender to the victorious arms of the barbarians, in the year 201 before the Christian era. The Huns, while in the field, slept on horseback, scarcely ever dismounting.

The Parthians, about 150 years before the Christian era, are said to have managed horses with great skill, and were celebrated for their manner of fighting on them. When they happened to be discomfited by their enemies, such was their dexterity that they would turn round in their saddles, in the most rapid flight, and discharge their arrows at their pursuers, and then resume their proper seat. The poets who mention this, say that their flight was in consequence more destructive than their attacks. This mode of fighting, and the astonishing address and dexterity with which it was performed, gave them many advantages over their enemies. The very name of this country is expressive of their fame as riders, "Parthos" signifying *horsemen* in the Chaldee language. Their horses were active, and of an easy pace, owing to the trouble bestowed by that people in training them. They were, besides, very hardy, capable of undergoing great fatigue, and of travelling a great distance without either food or water.

The Armenian breed of horses was equal to that of the Parthians. Nisæa, a district of Armenia, was also celebrated for its breed of horses, which, for their great size and beauty, excelled all others known at that period. The chariot of Xerxes was drawn by horses of this breed in his expedition against Greece.

The Medes and Scythians were also proverbial for the excellence of their horses, which was accounted for, on the supposition that the local situation of their country was favourable on account of its dryness, and the beneficial influence of its pasture. The people of the latter country preferred mares to horses, and considered them more serviceable in war, and consequently rode them instead of horses.

The Sarmatians, both of Asia and Europe, were celebrated for their skill as equestrians, and possessed a very large and excellent breed of horses. They were in the practice of eating the flesh and drinking the blood of horses, mixed with the milk of sheep, as described by Virgil in his third Georgic:—

> "Th' inhabitants of Thracia's hilly ground,
> And Gelons, use it, when for drink and food
> They mix their curdled milk with horses' blood."

The Cappadocian horses have been much praised, both by historians and poets, on account of their stately figures and graceful movements.

The Numidians and Nasamonians, Mauritanians, Massilians, and Libians, were celebrated for their ascendency over the horse; they rode without either saddle or bridle, having only a switch to command and guide them. Their horses possessed great beauty, swiftness, courage, and strength. Hence the descent of the Barb, as the latter was its ancient name. Xenophon, Oppian, and Ælian, highly commended them. They are still much valued. The peasantry of Barbary continue to practise the same mode of governing and ruling their horses.

The colonists who emigrated from Egypt and Phœnicia into Greece, carried with them the horse, long before the siege of Troy. The horses of Thessaly were also famous, and highly valued by all the surrounding nations. Subsequently, the whole Grecian states became celebrated, not only on account of their excellent horses, but also for their superior skill in the management and application of this noble animal.

There can be but little doubt that the Romans acquired the art of horsemanship from the Grecians, and they cultivated it with such zeal and assiduity, that they soon rivalled their teachers. Oppian praised very highly the horses of Etruria. Those of the islands in the Mediterranean were highly prized, more especially the Sardinian and Corsican; and afterwards those of Venice and Agragas, in Sicily, were in great repute. Celpe and Tartessus, in Spain, became in their turn celebrated; and Austria and Boetica, now called Andalusia, acquired great celebrity, which they still preserve.

The ancients had a practice of impressing some mark on their horses—the most general were Σ (*sigma*), Κ (*koppa*), and the head of a bullock; and distinguishing them by these marks, they were called *bucephali*. Some authors have supposed that the celebrated horse of Alexander the Great derived his name from having impressed on him a bull's head; but we are informed by Aulus Gellius, that the appellation was derived from the resemblance of his head to that of a bull. This mode of distinguishing horses by marks was also followed by the Greeks and Romans, who impressed on them the initials of their owner's name.

THE HORSE IN THE MIDDLE AGES.

We are still uncertain as to the original country of the horse; we can therefore only describe him as he exists at the present day, in his state of unrestrained freedom, in the extensive plains of Asia and Africa, where he has been ascertained to inhabit the deserts in a free condition for many centuries.

Some authors have supposed that there were originally two distinct species of horses—one from the eastern deserts, and the other from the low alluvial lands of Europe. Although these two breeds are considerably different, both in bulk and general appearance, yet no specific difference is discoverable in them, either externally or in their anatomical construction. Besides, they breed indiscriminately; and their progeny are not mules, but continue their race; which is sufficient to convince us that they are but one species, altered by local circumstances.

From all that has been written by travellers in Asia and Africa, as well as those of other countries, it is evident that horses of almost every nation vary in a material degree from each other, both in external form and qualities. And we see what is the case in our own island, the small extent of which admits of but little variety of climate. In districts not far from each other, we find breeds differing as much, nay, even more than the Arabian and ordinary European horse. For these extremes we may refer to the large breed of Clydesdale, and the pigmy pony of Mull, and other islands of Scotland.

CONTRAST OF EUROPEAN AND ASIATIC BREEDS.

The European horses which have not been improved by eastern blood are very different indeed from those of Asia, not only in form, but also in the texture and shape of their bones, being usually round and porous, with thick ill-shapen joints—their heads are fleshy and clumsy—their jaws ill formed—their bodies large and bulky—their bellies slack—their chests fleshy—their legs thick, greasy, and liable to various diseases—their tendons are relaxed—and the texture of their hair is coarse and long, with thick and spongy hides—their general proportions are also less symmetrical than of the eastern breeds. These differences, no doubt, arise from the quality of their food, which in most parts of Europe is ill adapted to the nature and construction of their digestive organs. From this cause, their constitution is debilitated, and, in consequence, their movements are rendered sluggish and ungraceful, their ardour and spirit damped, and they seem to lose their natural gentleness of disposition. We find that it is in the dry pastures of Arabia, Persia, and Tartary, that the horse is to be found possessing superior strength and action, and that intelligence, spirit, and generous disposition, for which he has been prized by every nation. The plains of these countries seem peculiarly fitted for his constitution, being sufficiently elevated above the level of the sea to render the pasture dry, aromatic, and wholesome; free from those saline particles, which, although they give lustre to the hair, create that difficulty for the horse to become habituated to any other country whose climate may be essentially different. As a proof of this fact we may remark, that the horses of the Northern Crimea, the country bounded by the Volga and the Kuma, the Black Sea and the Don, seldom thrive until they have pastured a year, at least, in Volognea, Podolia, or the Ukraine. The horses of those, and countries with similar pasturage, are completely free from the strangles and other glandular diseases which are so frequent and fatal to the horses of Europe.

VARIATIONS OWING TO DIFFERENCE OF PASTURE.

These observations are in complete accordance with the opinions of the celebrated Bruce, the Abyssinian traveller, who perhaps had seen a greater variety of horses than any other individual. He says, "at Goree begins that noble race of horses, justly celebrated over the whole world; they are the breed that was introduced here at the Saracen conquest, and have been preserved unmixed to this day: they seem to be a distinct animal from the Arabian horse, such as I have seen in the plains of Arabia Deserta, south of Palmyra and Damascus, where I take the most excellent of the Arabian breed to be; in the tribes of Mowalli and Annecy, which is about the 36th degree of latitude; whilst Dongola, and the dry country near it, seem to be the centre of excellence for this noble animal; so that the bounds within which the horse is at its greatest perfection, seem to be between the 20th and 36th degrees of latitude, and between the 36th degree of longitude east from the meridian of Greenwich to the banks of the Euphrates; for in this extent of country Fahrenheit's thermometer is never below 50 degrees in the night, or in the day below 80 degrees, though it may rise to 120 degrees at noon in the shade, at which point horses are never affected by the heat, but will breed as they do at Halfaid, Goree, and Dongola, where the thermometer rises to these degrees. These countries, from what has been said, must of course be a dry sandy desert, with little water, producing short, or no grass, but only roots, which are blenched like our celery, being always covered with earth, having no marshes or swamps, fat soapy earth, or mould."

Through ages of domestication the horses of Britain seem to preserve their natural predilection for dry pasture, which they invariably prefer to that which is rank—thus proving that dry food must have been his original nutriment.

To food and climate, therefore, must be principally attributed the great diversity in the various races of horses in different countries. In support of this theory, we have only to refer to the wild horses of South America, which were taken to that country by the Spaniards. These are understood to have been principally of the Andalusian breed, which have continued to be the best in Spain since their first introduction by the Moors in the year 710 before Christ. The horses of Andalusia, having directly sprung from Barbs, have retained many of the points of the Moorish breed. This is to be ascribed to the high and dry soil of the province. The South American savannas, where wild herds browse, are high mountain tracts with an arid soil, and the atmosphere is dry and keen.

INTRODUCTION OF ASIATIC BREEDS INTO EUROPE.

The introduction of the Asiatic horse into Europe seems to be involved in as much uncertainty as the native country from which the horse sprung. It seems probable that the wars with the Greeks and the Persians was the means of introducing many of the Asiatic horses into the former country. Xerxes had in his army 80,000 horses, principally stallions, and must have left many behind, which would improve the Grecian breed, while their dry climate would contribute to their being preserved in their original purity. The defeat of Thermopylæ, and the occupation of it by Macedonius, would have a tendency to improve their horses, which would be assisted by their intercourse with the Levant. In all probability, it was at this time that the Asiatic breed was first introduced into the European states.

Horses must have been introduced into Spain by the Carthaginians, after their conquest of that country, which was occupied by them for upwards of two centuries; and to the same cause may be ascribed the excellent breeds of Sicily; from which two points, the eastern breed may have found its way into Europe by the south-west.

We shall now attempt to trace the means by which the horse was introduced into the north of Europe. The Russian Count Rzelwrzski makes the following interesting observation:—"There exists in all indigenous Asiatic horses, under whatever latitude, something peculiar in the expression of their countenance, in their mode of playing their ears, and in all the movements of their body, which evidently shows them to be of one family, and which is to be observed in none of the western horses, with the exception of the English, which have a great deal of Arabian blood. I noticed this in more than 187,000 Asiatic horses, which are brought annually by the Calmucks and Tartars to the celebrated fair of Berdyezoco. In 1814, there were brought to that place 67,000 horses from the great Steppe; and I may safely say, that, during the course of five years' residence in Russian Poland, I must have seen upwards of 240,000 horses of that country."

The Scythian blood must have been communicated to all the horses in the north of Europe, owing to their connection with the Sarmatians, and the commerce of the latter with more westerly nations. Strabo mentions, that a custom existed among the Scythians of mutilating their horses, in order to make them more obedient; and these being transported into the low, moist, and rank pastures of Germany, Lithuania, and Pomerania, as well as to the northern provinces of France, would naturally degenerate, from the nature of their food, as we find that the horses of low and moist countries are invariably of a large and clumsy make.

The moisture of the atmosphere, and the bad pasture, soon make an evident impression on these horses, and rapidly efface the beauty and qualities of the eastern breed, which, however, are less liable to such great changes in the countries lying betwixt Southern Poland to the heights of Kiow, from the chain of the Carpathian mountains, along the banks of the Dniester, owing to the pasture being of a superior quality. It is almost certain that the indigenous breeds of all the European horses have been derived from those of Scythia, at a very remote period; and although the latter possess many of the properties, and much of the general resemblance of the Asiatic horse, they are yet much inferior in the elegance of their shape, and the compactness of their joints.

There can be little doubt but that the state of the European horses was wretched indeed, before the wars of the Greeks and Persians, and afterwards the conquest of Spain by the Carthaginians; and it must be obvious that the communication Europe had with the south was of infinitely more advantage, in this respect, than that which it had with the north.

INFERIORITY OF THE ROMAN CAVALRY.

Polybius, in narrating the passage of the Trebia, where Hannibal obtained the celebrated victory over the Romans, gives a good idea of the wretched state of the horses of that nation. In describing the troops which were then under the command of the Consul Sempronius, he says—"Meantime, Sempronius sounded the retreat, in order to bring back the cavalry, who were ignorant of the proper mode of conducting themselves to an enemy by which they were fronted. They had, in fact, to deal with the cavalry of Numidia, whose practice it was to retreat in different directions, and then return with great vigour to the charge, when their enemy was not expecting it." The Roman army at that time was principally composed of infantry, and their cavalry was ill mounted on large and heavy steeds, little calculated to cope with the Numidian cavalry, which could boast of active and lively horses, by which means their evolutions were performed with great celerity.

The bas-relief horses of Marcus Aurelius are very unlike the eastern courser. In times still more modern, we find that the horses of Raphael, Le Brun, and other celebrated painters, are large heavy steeds, with coarse heads, which must have been the characteristics of the horses in their days. On the contrary, if we examine the figures of horses, given in the old Arabian manuscripts, particularly the celebrated ones concerning the arms, evolutions, &c. of the east, we find the same characteristics which the horses of that country preserve at the present time, although their execution as works of art are miserable in the extreme.

In the fourth century, the Greeks entered Europe by the north, overran it in a diagonal direction, as far as Spain, and, spreading laterally, dispersed Asiatic horses, and improved their breed. Afterwards the Moors, in the eighth century, introduced many horses from the east.

The Saracens, with a force of two hundred thousand soldiers, in the year 732, penetrated into France as far as the walls of Poitiers, the capital of the department of La Vienne, where they were totally routed by the army of Charles Martel. In consequence of this disaster, many of the superior horses of that people must have fallen into the hands of the French. The English might have obtained some of the improved breed of that district after the celebrated victory of Edward the Black Prince, on the 13th September 1354. Traces of eastern blood are still visible in this part of France; and in Limousin very fine horses are to be met with, which can only be accounted for from the dryness of the pasture.

Cardonne, in his Histoire d'Afrique, informs us, that, in the tenth century, the grand visier Abd-el-Malek ben Cheld presented, among other gifts of value, to the caliph Abdol-Rah-men the Third, fifteen Arabian horses of the best blood. Eastern monarchs were in the practice of sending presents of horses to France. In the year 800, Haroun-al-Raschid sent a variety of magnificent presents to Charlemagne, and among them some fine horses. It is also probable that during the crusades many eastern horses were imported into Europe by the princes and nobles engaged in that enterprise; indeed, it is almost certain that they would bring along with them some of these fine animals, which have been so highly valued by man from the remotest ages.

The celebrated Genguiskan, in the thirteenth century, brought all Asia under his sway. In his conquest he carried with him the armies of his subjugated states. This circumstance tended to amalgamate the breeds of India, Persia, and Arabia, which were ultimately scattered all over Asia.

Botam-chan, grandson of Genguiskan, in the year 1211, invaded the Crimea, dispersed the Cossack nation, and, crossing the Dnieper with his army, overran Poland, and advanced into Silesia, subduing Lublin, Cracow, Lignitz, and Breslau; penetrated into Hungary, and was on his march to Constantinople when his ambitious career was terminated by his death.

This adventurous incursion was followed by many others, but particularly by one of much importance—that of the famous Islam Gueray, who, in the year 1649, joined himself with 300,000 Tartars of the Crimea, under their leader Bogdan Schmielnicki: this army invaded Poland; and as these Tartars were in the practice of taking two horses with them in their wars, many must have been left in that country. Even in our own times, Prince Sanguisko of Volognia, sent his equerry, M. Buiski, to Haleb, whence he brought six Arabian stallions of great value; and General Obodynski brought with him, at two different times, from Constantinople, upwards of sixty horses.

MODERN HISTORY OF THE HORSE.

In the former section, we have endeavoured to show the progressive introduction of the eastern horse into Europe. But one thing of which we are assured is, that the first Arabian horse which was introduced into England was during the reign of James the First. Since that time, great intercourse has taken place between eastern countries and Europe, and also various wars; from which causes many different breeds have been imported, which have tended to improve the race. The southern varieties of the horse, however, have been preserved in their native purity in Great Britain and Ireland alone. Besides, in the deserts around the Sea of Aral, wild horses are also found in very large troops in those extensive upland vallies on the sides of the Mus Tag mountains, which bound the great valley of Asgar, through which flows the river Indus on the east, and the Belur Tag mountains on the west. There are also numerous herds in the vallies amongst the Great Candhur range, and also in the Hyderabad mountains.

In the Charmar mountains, towards the north of China, there are some inconsiderable troops of wild horses; and still farther north, amongst the vallies of the Altai range, and even so far as in the northern boundaries of Siberia, wild herds are occasionally to be met with; but these are an inferior race, with large heads, coarse, ill-formed limbs, and very thick about the joints. It is said that some straggling individual pairs have been seen even so far north as the plains in the district of Tungousi. Wild horses are also to be met with near the Cape of Good Hope, in the mountain plains of Graaff Reinett.

THE HORSE IN HIS NATURAL STATE.

"To have an idea," says Goldsmith, "of this noble animal in his native simplicity, we are not to look for him in the pastures or the stables, but in those wild and extensive plains where he has been originally produced, where he ranges without control, and riots in all the variety of luxurious nature. In this happy state of independence he disdains the assistance of man, which only tends to servitude. In those boundless tracts, whether of Africa or New Spain, where he runs at liberty, he seems no way incommoded with the inconveniences to which he is subject in Europe. The continual verdure of the fields supplies his wants, and the climate, that never knows a winter, suits his constitution, which naturally seems adapted to heat. His enemies of the forest are but few, for none but the greater kinds will venture to attack him; any one of these he is (singly) able to overcome; while, at the same time, he is content to find safety in society, for the wild horses of these countries always herd together."

Wild horses are always to be met with in droves of from five hundred to a thousand, seldom exceeding the former number in Asia or Africa, as food in these countries is less abundant than in America. They never attack other animals, but always act upon the defensive. Their pastures satisfy their appetites, and, when exhausted, they have only to shift their stations to places where their food is plentiful. They are seldom to be taken by surprise; but, if attacked, the assailant seldom comes off victorious, for the whole troop unites in defence of their comrades, and seldom fail either to tear their enemy to pieces, or kick him to death.

Wild horses usually retire to the confines of a forest to repose. One or more of their number are always awake to keep watch while the rest are asleep, and who warn their fellows of approaching danger, which is done by loud snorting or neighing; upon this signal they start to their feet, and either reconnoitre the enemy, or fly off with the swiftness of the wind, followed by the sentinel, and by the stallion who is patriarch of the herd.

In the desert tracts along the sides of the Don, in Russia, there are numerous troops of wild horses, which have sprung from emancipated progenitors. The Cossacks frequently take these, and breed from them, by crossing them with their domesticated horses, which are said to be thereby greatly improved. Pallas says they abound in the vicinity of the Palus Mæotis. These herds are the descendants of the Russian horses which were used at the siege of Asoph, in 1696, when taken from the Turks by Peter the Great, who was compelled, from want of forage, to set at liberty nearly the whole horses belonging to his cavalry, to seek food for themselves. They are now quite wild, and associate in troops in the same manner as other wild horses. Those herds which have remained close to the alluvial and fertile banks of the river are of a large size, owing to the rankness of their food; the ground in these situations is so extremely swampy, that no solid edifice can be erected near the river, the whole surrounding country being little better than a morass. The herds which inhabit the higher mountain districts have all the appearance of the horses from which they sprung. It is supposed that the troops found in the plains of Great Tartary are descended from the same source as those of the banks of the Don and the Ukraine.

AMERICAN WILD HORSES.

In the vast plains of South America, immense troops of wild horses are to be found, which have all sprung from emancipated individuals taken to that country by the Spaniards. The geographical range of these herds extends from the shores of La Plata to Patagonia. They have increased with such astonishing rapidity, that they are to be met with in troops of many thousands. Azzara affirms that they sometimes congregate in herds of not less than ten thousand individuals: they are invariably preceded by a leader, who appears to direct all their movements, which are performed in a manner so perfectly systematic, as hardly to be surpassed in regularity by the best trained cavalry. It is very dangerous for travellers to pass through the districts; for, if perceived by the wild herd, they will approach closely to those who are mounted on horseback. After their leader and videttes have reconnoitred the strangers, they will, at the direction of their leader, make a rapid course round the traveller, and, with loud and inviting neighing, tempt the tame horses, which are either saddled or loaded, to join them. If the rider does not use the utmost precautions, or the leader of the laden horse does not exert his utmost care, they will either fling the rider, or throw off their burden, and precipitately join the wild troop, after which they are lost for ever. The whole troop seem delighted at their acquisition, and hurriedly fly off in a body to the desert, while the neighbouring earth vibrates under the weight of these mighty phalanxes. They will frequently return, and sweep round the astonished traveller like the whirlwind of the desert, threatening instant annihilation, when, of a sudden, they will simultaneously set up the most vehement neighing, wheel in an opposite course, and disappear in the neighbouring wilderness. These immense troops do not always feed in company, and only congregate in cases of alarm, and again disperse into smaller herds when the cause of alarm has passed away.

In the province of Cumana there are numerous wild horses, associating in troops of from five or six hundred, and even one thousand. They occupy the great savannas, where it is dangerous to disturb or try to catch them. In the dry season, they are sometimes forced to travel two or three leagues, and even more, in search of water. They set out in regular ranks, four abreast, and thus form a procession of an extent of a quarter of a league. There are always five or six scouts, who precede the troop by about fifty paces. If they perceive a man, a puma, or a jagur, they neigh, and the troop stops; if avoided, they continue their march; but if an attempt be made to pass across their route, they leap on the imprudent traveller, and crush him under their feet. It is best to avoid coming in contact with them in these marches. They have also a chief, whose station is between the scouts and the squadron; he is a kind of adjutant, whose duty consists in preventing individuals from quitting the ranks. If any one attempts to straggle, either from hunger or fatigue, he is bitten till he resumes his place, and the culprit never fails to obey, but with disappointed looks, and with his head hanging down. Three or four chiefs march as the rear-guard, at five or six paces from the troop. An instinctive duty impels these horses to obey that rule which they seem to know is for their common good; and this instinct, if not absolutely reason, is very nearly akin to it. It is quite evident that all gregarious animals are aware that their safety consists in their united force, and in a principle of subordination, which in many respects is superior to the efforts of man in a savage state.

The wild horses of America are generally of a chestnut bay, sorrel, or black. The latter colour, however, is not very common, and the chestnut usually predominates, from which some authors suppose it to be the original colour of the horse; but we do not find that to be the leading colour of the Asiatic wild breeds, bay-dun being, in that continent, the most common.

When wild horses are attacked by the puma or jagur—which are their principal enemies in America—by a particular signal, which they all understand, they close into a dense mass, and trample their assailant to death; or, forming a circle, with the young and foals in their centre, defend themselves with their heels, and strike with such velocity and force, that no animal is capable of withstanding them. When an attack becomes necessary, their leader shows the example; and if he considers a retreat necessary, he gives them the signal, which they simultaneously obey.

Captain Head, in his journey across the Pampas, gives us an interesting account of his meeting a wild troop in a district of the country where the population is pretty dense. Some of the unfortunate captured horses are supposed to be forced along by their riders at their full speed; he says—"As they are thus galloping along, urged by the spur, it is interesting to see the groups of wild horses one passes. The mares, which are never ridden in South America, seem not to understand what makes the poor horse carry his head so low and look so weary. The little innocent colts come running to meet him, and then start away frightened; while the old horses, whose white marks on the flanks and backs betray their acquaintance with the spur and saddle, walk slowly away for some distance; then breaking into a trot, as they seek their safety, snort and look behind them, first with one eye and then with the other, turning their nose from right to left, and carrying their long tails high in the air."

HORSE-TAMING IN SOUTH AMERICA.

In South America there are no regular stables, their horses being either kept in pastures, which are fenced, or in what they call *corrals*, which consist of a circular enclosure of rough posts, driven into the ground so close, that a horse cannot pass through between them. In these, however, the mares and foals are never confined, but are allowed to graze about at freedom. They however usually keep one horse tied at the door of their hut, to be ready in case of immediate need, which they feed on a scanty meal of maize at night. If an additional horse is wanted, the gaucho (who is a native inhabitant of the plains) goes to the *corral* with his *lasso*, and fetches one which may have been only subdued the preceding day; or he will go to the plain where they are grazing at freedom, and bring one which he has backed for the first time; and when these horses have been once used, they are either put into the *corral* and fed with maize, or returned to the plain to feed at liberty. This *lasso* is a very simple contrivance, but of great power in the hands of the gaucho, who is accustomed to use it from his youngest years, or at least to see it done, and he puts it in practice as soon as he has sufficient strength to use it. Miers, in his Travels in Chili, gives the following account of it:—

"The *lasso* is a missile weapon, used by every native of the United Provinces and Chili. It is a very strong plaited thong, of equal thickness, half an inch in diameter, and forty feet long, made of stripes of green hide, plaited like a whip-thong, and rendered supple by grease. It has at one end an iron ring, about an inch and a half in diameter, through which the thong is passed, and this forms a running noose. The gaucho, or native peon, is generally mounted on horseback when he uses the lasso; one end of the thong is affixed to his saddle-girth; the remainder he coils carefully in his left hand, leaving about twelve feet belonging to the noose end in a coil, and a half of which he holds in his right hand. He then swings this long noose horizontally round his head, the weight of the iron ring at the end of the noose assisting in giving to it, by a continued circular motion, a sufficient force to project it the whole length of the line."

It is sometimes necessary to break in a number of horses at once: in this event, they drive a whole herd of their wild horses into the corral at one time. This scene was witnessed by Miers, who thus describes it:—"The corral was quite full of horses, most of which were young ones about two or three years old. The *capitaz* (chief gaucho), mounted on a strong sturdy horse, rode into the corral, and threw his lasso over the neck of a young horse, and dragged him to the gate. For some time he was very unwilling to leave his comrades; but the moment he was forced out of the corral, his first idea was to gallop away; however, a timely jerk of the lasso checked him in the most effectual way. The peons now ran after him on foot, and threw a lasso over his fore-legs, just above the fetlock, and, twitching it, they pulled his legs from under him so suddenly, that I really thought the fall he got had killed him. In one instant a gaucho was seated on his head, and with his long knife, and in a few seconds, cut off the whole of the horse's mane, while another cut the hair from the end of his tail. This, they told me, was a mark that the horse had been once mounted. They then put a piece of hide into his mouth, to serve for a bit, and a strong hide halter on his head. The gaucho who was to mount arranged his spurs, which were unusually long and sharp; and while two men held the horse by his ears, he put on the saddle, which he girthed extremely tight. He then caught hold of the horse's ear, and in an instant vaulted into the saddle, upon which the men who held the horse by the halter threw the end to the rider, and from that moment no one seemed to take any farther notice of him.

"The horse instantly began to jump in a manner which made it very difficult for the rider to keep his seat, and quite different from the kick or plunge of our English horse: however, the gaucho's spurs soon set him going, and off he galloped, doing every thing in his power to throw his rider.

"Another horse was immediately brought from the corral, and so quick was the operation, that twelve gauchos were mounted in a space which I think hardly exceeded an hour. It was wonderful to see the different manner in which different horses behaved. Some would actually scream while the gauchos were girthing the saddle upon their backs; some would instantly lie down and roll upon it; while some would stand without being held, their legs stiff, and in unnatural positions; their necks half bent towards their tails, and looking vicious and obstinate; and I could not help thinking that I would not have mounted one of those for any reward that could be offered me, for they were invariably the most difficult to subdue.

"It was now curious to look around and see the gauchos on the horizon, in different directions, trying to bring their horses back to the corral, which is the most difficult part of their work; for the poor creatures had been so scared there, that they were unwilling to return to the place. It was amusing to see the antics of the horses; they were jumping and dancing in different ways, while the right arm of the gaucho was seen flogging them. At last they brought the horses back apparently subdued and broken in. The saddles and bridles were taken off, and the young horses trotted off towards the corral, neighing to one another."

Captain Hall, in his journey to Peru and Mexico, describes the manner in which the gaucho takes a wild horse. He first mounts a horse which has been accustomed to the sport, and gallops him over the plain, in the direction where the wild herds are, and, circling round, by degrees gets close to one of them, which, as soon as he has approached sufficiently near, "the lasso is thrown round the two hind legs, and as the gaucho rides a little on one side, the jerk pulls the entangled horse's feet laterally, so as to throw him on his side, without endangering his knees or his face. Before the horse can recover the shock, the rider dismounts, and, snatching his *poncho* or cloak from his shoulders, wraps it round the prostrate animal's head. He then forces into his mouth one of the powerful bridles of the country, straps a saddle on his back, and, bestriding him, removes the poncho, upon which the astonished horse springs on his legs, and endeavours, by a thousand vain efforts, to disencumber himself of his new master, who sits quite composedly on his back, and, by a discipline which never fails, reduces the horse to such complete obedience, that he is soon trained to lend his whole speed and strength to the capture of his companions."

The mares are frequently killed for food, particularly on festive occasions. During the war of independence, General San Martin gave a grand feast to the Indians who had joined his standard as allies. The whole entertainment consisted of mares' flesh, and the blood mixed with gin. The Indians are in the habit of eating horse flesh raw, as well as that of other animals.

The rapid increase of horses in South America is somewhat checked by a species of madness which breaks out amongst them, owing to the scanty supply of water during the dry season. All the noble and generous qualities of this animal disappear, frenzy seizes them, and they rush precipitately into every pool or lake they meet with, trampling each other to death. On these occasions thousands have been found dead in the neighbourhood of a pool or rivulet.

There is a remarkable difference in the dispositions of the Asiatic and South American wild horses: those of the former country can never be properly tamed, unless trained very young; if taken when adults, they frequently break out in violent fits of rage in after life, exhibiting every mark of natural wildness; while those of America can be brought to perfect obedience, and even rendered somewhat docile, within a few weeks, nay, sometimes days. It would be difficult to account for this opposition of temper, unless we can suppose that it is influenced by climate.

PARTICULAR ACCOUNT OF THE HORSE.

The horse at five years of age, at which time he is in a state of maturity, has six incisory or cutting teeth in both the upper and under jaw, in familiar language termed nippers, and two canine teeth in each jaw, termed tushes, situated inside of the cutting teeth; six cheek teeth, or grinders, on each side, in both jaws; they are furrowed on both sides, and their crowns are flat, having on them several ridges of enamel. There is a void space between the canine and the cheek teeth. The upper lip of the horse is susceptible of considerable motion; his eyes are large; the pupils are of an oblong shape, and placed laterally; their sight is excellent, and they have even much acuteness in distinguishing objects in the dark; the ears are rather small, pointed, and placed erect, and capable of great motion; the feet are protected by a strong hoof; the tail provided with long flowing hair; and the neck decorated by an elegant flowing mane.

A few days after the birth of the foal, the two middle incisory teeth appear in each jaw. Betwixt the third and fourth months two others make their appearance at the right and left, and the last two within six months. These are called the milk teeth, and are reproduced at intervals of six months, between two and three years of age.

The age of a horse is known by certain marks on his incisory teeth, but no reference whatever is made to the grinders. Between two and three months, the centre nippers have reached their proper level, and the second pair grown.

The nippers are complete in number at a year old; the four middle teeth being worn level, and the two outer ones becoming flat. The marks of the two middle teeth get faint and wide; in the next two they become darker and more narrow—being darker, longer, and narrower, in the outer two.

The nippers at two years old exhibit a considerable change in the shape and markings.

At three years old the central nippers are considerably larger than the others, doubly grooved on their outer convex surface; the marks on the next two incisors being nearly obliterated, and beginning to disappear in the corner nippers. When a horse is rising three years, his two central nippers above and below fall out, and are replaced by new ones, having the hollow mark in the middle; at the end of this year the tushes will have made their appearance; there is also a visible difference in the form of the jaw.

At four years the central nippers are perfectly formed, and the sharp edges a little worn off, with the mark shorter, wider, and fainter.

At five years the jaw is nearly perfect. The tushes are much developed.

In the sixth year the marks in the centre nippers are worn out. There will, however, be some difference of colour in the centre of the tooth, as the cement, or enamel, which fills the cavity, is of a brownish hue.

At eight years the marks on the lower jaw are nearly filled up, but on the upper jaw they generally continue till ten; the two central ones are, however, obliterated at eight.

At this period the disgraceful practice of *Bishoping* is often resorted to; a term given from the name of the inventor. The marks on the surface of the corner nippers, which have now nearly become plain, are imitated, as at the age of seven, by an engraving tool. They are then burned with a hot iron, when a permanent black stain is left. This practice is sometimes employed on the next pair of nippers in a slight degree. By this infamous trick the ignorant are often imposed on. But the irregular appearance of the cavity, the diffusion of the black stain around the tushes, the sharpened edges, and concave inner surfaces, are wanting, which no art can imitate; thus an attentive observer need not be deceived.

At ten, merely the rudiment of the funnel of the nippers remains.

In a jaw at twelve years old, the nippers have lost the central enamel, and the septum of the root is rounded.

At sixteen, all the nippers have become triangular in shape, and the septum of the root forms a rounded point on all the tables of the teeth.

The ordinary time at which the mare gives up producing is from fifteen to eighteen, although there are some instances of their having foals at an advanced age.

The Limerick Evening Post for 1829 stated that at that time Mr Thomas Kepper, in the parish of Athnakisha, county of Cork, had a mare, which, in the June of that year, produced a foal while she was then in her forty-ninth year. Opposed to the above remarkable circumstance, we may mention, that, on the 12th May 1826, Mr Archibald Hamilton, Broomhill, parish of Wamphray, Dumfriesshire, had a mare which produced a foal, although at that time she wanted some days of being two years old, which is a circumstance altogether unprecedented in English breeding.

The horse will live to a great age if properly treated; the oldest on record is one which was in the stable of Ferdinand the First, which attained the very advanced age of seventy years. The most serviceable period of a horse's life is betwixt the years of five and ten, but horses have continued in unimpaired vigour till the age of twenty; and instances have been known of their being wrought till above thirty years old. Mr Ganby says, "In addition to the many recorded instances of a longer life in the horse than is commonly met with, I can adduce the following one of my own, and the best I ever possessed, whether in the field or on the road, and which I bought when he was *twenty-two years old;* and after this he was hunted hard three seasons, as well as rode as a hackney during the summers."

The mare goes with foal usually about eleven months, seldom varying more than a few days; she brings forth but one at a birth, which is covered with hair, and with the eyes open, and so strong as to be able to walk. Sometimes, however, twins are produced, but such instances are very rare. A remarkable instance is recorded in the Sporting Magazine for August 1794, of a mare producing twins; the first a few days after she had gone eleven months, so extremely weak and small as not to give any hopes of its attaining maturity, and so frightfully ill formed, that Bergem, the proprietor of it, was at first inclined, and universally advised, to destroy it, there being no hopes of it ever reaching maturity. He however permitted it to continue with the mare, who, after an interval of fourteen days, to the astonishment of every one, produced a colt-foal of the most lively and promising appearance, which, with the first weak foal, was allowed to be suckled by the dam.

The foal is suckled for twelve months, and does not reach its full adult state till five years.

INTELLECTUAL CHARACTER.

The horse is possessed of acute and delicate senses; his intellectual character is marked by a quick perception, a most retentive memory, and great benevolence of disposition. It is well known that a horse will rarely tread on a human being, if lying on the ground, but will step over him with the utmost caution.

Endowed with vast strength and great activity, the horse seldom exerts either to his master's prejudice; on the contrary, he will endure fatigue, and death itself, in the service of his owner. But it is not to man alone that his affections are confined, for he extends his attachments to all other animals with which he may be associated. Every person who is possessed of a dog and a horse must have observed their familiar attachment; cats also have been frequently the favourites of the horse, and his attentions to the goat are no less remarkable.

The horse is greatly attached to music, and listens to a band with apparent delight, and will frequently use his endeavours to get close to it. This propensity has been known from the earliest ages. We are informed by Gratius that the Libyan shepherds used to allure wild horses by the charms of music.

This valuable animal proves useful to man even after he is dead; his hide makes a valuable leather for harness and coach-work; from the hair of his mane and tail is manufactured haircloth, and it is also used for ropes and fishing lines; his bones are converted into magnesia, and ground into manure; and in Tartary and other eastern countries his flesh is esteemed excellent food.

SUPERIORITY OF THE HORSE IN ELEGANCE.

"Of all quadrupeds," says Buffon, "the horse possesses, along with grandeur of stature, the greatest elegance and proportion of parts. By comparing him with the animals above or below him, we find that the ass is ill made; that the head of the lion is too large; that the limbs of the ox are too slender and too short in proportion to the size of his body; that the camel is deformed; and that the grosser animals, as the rhinoceros, hippopotamus, and elephant, may be considered as rude and shapeless masses. The great difference between the head of man and that of the quadrupeds consists in the length of their jaws, which is the most ignoble of all characters. But although the jaws of the horse be very long, he has not, like the ass, an air of imbecility, nor, like the ox, of stupidity. The regularity and proportion of the parts of his head give him a light and sprightly aspect, being gracefully attached to his finely arched neck, which is well supported by the beauty of his chest. He elevates his head as if anxious to exalt himself above the condition of other quadrupeds. In this noble attitude he regards man face to face. His eyes are open, lively, and intelligent; his ears handsome and of a proper height, being neither too long, like those of the ass, nor too short, like those of the bull. His mane adorns his graceful neck, and gives him the appearance of strength and courage. His long bushy tail covers, and terminates with advantage, the extremity of his body. His tail, very different from the short tails of the deer, elephant, and hippopotamus, and from the naked tails of the ass, camel, and rhinoceros, is formed of long thick hairs, which seem to rise from his crupper, because the trunk from which they proceed is very short. He cannot, like the lion, elevate his tail; but, though pendulous, it becomes him better; and as he can move it from side to side, it serves him to drive off the flies which incommode him; for though his skin is very firm, and well garnished with close hair, it is nevertheless very sensible."

The way in which the head of the horse joins his neck, contributes, above all other peculiarities of his form, to give him a graceful aspect; its most advantageous position is when the front is perpendicular to the horizon. The superior ridge of his neck from which the mane issues, should first arise in a straight line from the withers, and then, as it approaches the head, form a curve nearly similar to that of a swan's neck. The inferior part of the neck should have no curvature, but rise in a straight line from the poitral or breast, to the under jaw, with a small inclination forward. If it rose in a perpendicular direction, its symmetry and gracefulness would be greatly diminished. The superior part of the neck should be thin, with little flesh near the mane, which ought to be decorated with long flowing and delicate hair. The neck, to be fine, must be long, elevated, and proportioned to the general size of the animal: when too long, the horse commonly throws back his head; and when too short and fleshy, the head is heavy to the hand in riding.

The head of the horse should not be too long, and it ought to be rather thin than otherwise. The front should be narrow, and a little convex; the eyepits well filled, and the eyelids thin; the eyes large and prominent, clear, lively, and sparkling with fiery glances. The pupil should be large; the under jaw should be a little thick, but not fleshy; the nose slightly arched, the nostrils open and deep, and divided by a thin septum or partition. The ears should be small, erect, and narrow, but not too stiff, and placed on the upper part of the head, at a proper distance from each other, but not too wide, as this always gives a horse a disagreeable aspect. The mouth should be delicate, and moderately split; the withers sharp and elevated; the shoulders flat, and not confined; the back equal, a little arched lengthwise, and raised on each side of the spine, which should have the appearance of being slightly sunk; the flanks short and full; the crupper round and plump; the haunches well furnished with muscular flesh; the dock or fleshy part of the tail firm and thick; the thighs large and muscular; the hough round before, broad on the sides, and tendinous behind; the shank thin before, and broad on the sides; the tendo Achilles prominent, strong, and well detached from the leg-bone, and the fetlock somewhat prominent, and furnished with a small tuft of hair behind; the pasterns should be of a middle length, and pretty large; the coronet a little elevated; the hoof black, solid, and shining; the instep high, the quarters round, the heels broad and a little prominent, the frog thin and small, and the sole thick and concave.

THE ARABIAN HORSE.

Although Arabia is not the original abode of the horse, as many have supposed, yet it is the country where he is to be found in a domesticated condition, exhibiting his pristine beauty, symmetry, and spirit. In that country he is preserved without the admixture of any foreign breeds, and consequently preserving the exquisite proportions, elegant structure, fleetness, and docility, for which he has been so famous for so many past ages. These are only of a middle stature, their limbs remarkable for the beautiful form and cleanness, and the make of their bodies rather slender.

The pure Arabians are somewhat smaller than our race horses, seldom exceeding fourteen hands two inches in height. Their heads are very beautiful, clean, and wide between the jaws; the forehead is broad and square; the face flat; the muzzle short and fine; the eyes prominent and brilliant; the ears small and handsome; the nostrils large and open; the skin of the head thin, through which may be distinctly traced the whole veins of the head. The body may, as a whole, be considered too light, and the breast rather narrow; but behind the arms, the chest generally swells out greatly, leaving ample room for the lungs to play. The shoulder is superior to that of any other breed; the scapulæ, or shoulder-blades, incline backwards, nearly in an angle of 45 degrees; the withers are high and arched; the neck beautifully curved, and the mane and tail long, thin, and flowing; the legs are fine, thin, and wiry, with the pasterns placed somewhat oblique, which have led some to suppose that his strength was thereby lessened, which is by no means the case; the bone is of uncommon density, and the prominent muscles of the forearm and thigh prove that he is fully equal to all that has been said of his physical powers.

Bishop Heber gives the following interesting account of the docility and mild temper of the Arabian horse. He says—"My morning rides are very pleasant. My horse is a nice, quiet, good-tempered little Arab, who is so fearless, that he goes, without starting, close to an elephant, and so gentle and docile, that he eats bread out of my hand, and has almost as much attachment and coaxing ways as a dog. This seems the general character of the Arab horses, to judge from what I have seen in this country. It is not the fiery dashing animal I had supposed, but with more rationality about him, and more apparent confidence in his rider, than the majority of English horses."

If the Arab lies down to sleep in his journey through the Desert, as he is frequently obliged to do from fatigue, his faithful mare will either browse on such herbage as may be near the spot, or will watch her master with the utmost solicitude; and if a man or animal approaches, she will neigh loudly till he is awakened.

The Arabs of the Desert have made the breeding of horses their sole occupation for ages bygone; and, from their strict attention to certain rules, they may be justly regarded as the first breeders in the world. They take infinite trouble in grooming their steeds, and are extremely regular in their hours of feeding them morning and evening. They get but little drink, and that is supplied to them two or three times a-day; they conceive that much water not only destroys their shape, but also affects their breathing. In spring they are pastured on dry aromatic herbage, and during the rest of the year they are fed on barley, with a small quantity of straw; and they are the hardiest horses in the world.

ANECDOTES OF ARABIAN HORSES AND THEIR MASTERS.

The following interesting account of the hardihood of the Arabian is given by M. Chateaubriand, who, in his Travels in Greece, says—"They are never put under shelter, but left exposed to the most intense heat of the sun, tied by all four legs to stakes driven in the ground, so that they cannot stir. The saddle is now taken from their backs. They frequently drink but once, and have only one feed of barley, in twenty-four hours. This rigid treatment, so far from wearing them out, gives them sobriety and speed. I have often admired an Arabian steed thus tied down to the burning sands, his hair loosely flowing, his head bowed between his legs, to find a little shade, and stealing with his wild eye an oblique glance of his master. Release his legs from the shackles, spring upon his back, and he will 'paw in the valley, he will rejoice in his strength, he will swallow the ground in the fierceness of his rage;' and you recognise the original picture of Job. Eighty or one hundred piastres are given for an ordinary horse, which is in general less valued than an ass or a mule; but a horse of well-known noble blood will fetch any price. Abdallah, Pacha of Damascus, had just given three thousand piastres for one.

"The history of a horse is frequently the topic of conversation. When I was at Jerusalem, the feats of one of these steeds made a great noise. The Bedouin to whom the animal (a mare) belonged, being pursued by the governor's guards, rushed with him from the top of the hills that overlooked Jericho. The mare scoured at full gallop down an almost perpendicular declivity without stumbling, and left the soldiers lost in admiration and astonishment. The poor creature, however, dropped down dead on entering Jericho and the Bedouin, who would not quit her, was taken, weeping over the body of his faithful companion. This mare has a brother in the desert, who is so famous, that the Arabs always know where he has been, where he is, what he is doing, and how he does. Ali Aga religiously showed me in the mountains near Jericho the footsteps of the mare that died in the attempt to save her master. A Macedonian could not have beheld those of Bucephalus with greater respect."

Clarke in his Travels gives the following agreeable account of the love of the Arab for his horse:—"Ibrahim went frequently to Rama, to inquire news of the mare, which he dearly loved; he would embrace her, wipe her eyes with his handkerchief, would rub her with his shirt-sleeves, would give her a thousand benedictions, during whole hours that he would remain talking to her. 'My eyes!' would he say to her, 'my soul! my heart! must I be so unfortunate as to have thee sold to so many masters, and not keep thee myself? I am poor, my antelope! Thou knowest it well, my darling! I brought thee up in my dwelling as my child. I did never beat nor chide thee; I caressed thee in the fondest manner. God preserve thee, my beloved! thou art beautiful, thou art sweet, thou art lovely! God defend thee from envious eyes!' This man's name was Ibrahim; being poor, he had been under the necessity of allowing a merchant of Rama to become partner with him in the possession of this mare. She was called Toaise; her pedigree could be traced on the side of sire and dam for five hundred years prior to her birth. The price was three hundred pounds, an enormous sum in that country."

The Arabs have no written rules for the management of horses; it is handed down by oral instruction from father to son. They will never sell their mares on any account whatever, even for any price, an excellent illustration of which will be found in the following well-authenticated anecdote:—

The whole stock of a poor Arab of the Desert consisted of a mare: this the French consul at Said offered to purchase, with an intention of sending her to Louis the Fourteenth. The Arab hesitated long, but, being pressed by poverty, he at length consented, on condition of receiving a very considerable sum of money, which he named. The consul wrote to France for permission to close the bargain, and, having obtained it, he immediately sent for the Arab to receive the mare and pay for her. He arrived with his magnificent courser. He dismounted, a wretched spectacle, with only a miserable rag to cover his body. He stood leaning upon the mare; the purse was tendered to him; he looked earnestly at the gold, and, looking steadfastly at his mare, heaved a deep sigh; the big tears trickled down his cheeks:—"To whom is it," he exclaimed, "that I am going to yield thee up? To Europeans, who will tie thee close, who will beat thee, who will render thee miserable! Return with me, my beauty! my jewel! and rejoice the hearts of my children!" As he pronounced the last words, he sprang upon her back, and was out of sight in a moment. What an amiable and affecting sensibility in a man, who, in the midst of distress, could prefer all the disasters attendant on poverty, rather than surrender the animal that he has long fostered in his tent, and had been the child of his bosom, to what he supposed inevitable misery! The temptation of riches, and an effectual relief from poverty, had not sufficient allurements to induce him to commit what he considered so cruel an act.

An Arab, who had arrived at upwards of eighty years of age without having had a day's sickness during that long life, had a favourite mare that had carried him for fifteen years through the perils of many a hard fought battle and long march, and which had produced to him several excellent foals. Being now unable longer to ride, he presented the mare, and a scimitar that had been his father's, to his eldest son, and told him to appreciate their value, and never to lie down to rest until he had rubbed them both as bright as a mirror. In the first skirmish in which the youth was engaged, he was killed, and the mare fell into the hands of the enemy. When the news reached the old man, he said, "What is life to me, now that I have lost both my son and the favourite of my heart?—they equally share in my grief, and I would gladly meet death, as my life is no longer sweet to me." He almost immediately thereafter took ill and died.*

The following amusing anecdotes are related by Sir John Malcolm:—"When the envoy, returning from his former mission, was encamped near Bagdad, an Arab rode a bright bay mare of extraordinary shape and beauty before his tent, until he attracted his attention. On being asked if he would sell her—'What

* Smith on Breeding for the Turf, p. 79.

will you give me?' was the reply. 'That depends upon her age; I suppose she is past five?' 'Guess again,' said he. 'Four?' 'Look at her mouth,' said the Arab, with a smile. On examination, she was found to be rising three. This, from her size and symmetry, greatly enhanced her value. The envoy said, 'I will give you fifty tomans' (a coin nearly of the value of a pound sterling). 'A little more if you please,' said the fellow, a little entertained. 'Eighty —A hundred.' He shook his head, and smiled. The officer at last came to two hundred tomans! 'Well,' said the Arab, 'you need not tempt me further; it is of no use. You are rich elchee (noblemen). You have fine horses, camels, and mules, and I am told you have loads of silver and gold. Now,' added he, 'you want my mare, but you shall not have her for all you have got.'

"An Arab shiek or chief, who lived within fifty miles of Bussorah, had a favourite breed of horses. He lost one of his best mares, and could not for a long while discover whether she was stolen or had strayed. Some time after, a young man of a different tribe, who had long wished to marry his daughter, but had always been rejected by the sheich, obtained the lady's consent, and eloped with her. The sheick and his followers pursued, but the lover and his mistress, mounted on one horse, made a wonderful march, and escaped. The old chief swore that the fellow was either mounted upon the devil or the favourite mare he had lost. After his return, he found the latter was the case; that the lover was the thief of his mare as well as his daughter; and he stole the one to carry off the other. The chief was quite gratified to think he had not been beaten by a mare of another breed, and was easily reconciled to the young man, in order that he might recover the mare, which appeared an object about which he was more solicitous than about his daughter."

The Arabs are most particular regarding the pedigree of their horses, and they have amongst them a breed which they pretend has descended from a horse of King Solomon's. It must not, however, be supposed that all the horses of that country are of the finer kinds, for they have three distinct breeds: the two inferior kinds they say were introduced from India and Greece. The superior kinds they call nobles, and they are never sold without a pedigree, which is more scrupulously attended to than with human beings in Europe.

PEDIGREE OF AN ARABIAN HORSE.

The following pedigree of an Arabian horse was hung about his neck when bought in Egypt by Colonel Ainslie during the last campaign:—

"In the name of God, the merciful and compassionate, and of Seed Mohammed, agent of the High God, and of the companions of Mohammed and of Jerusalem. Praised be the Lord, the omnipotent Creator. This is a high-bred horse, and its colt's tooth is here in a bag about his neck, with his pedigree, and of undoubted authority, such as no infidel can refuse to believe. He is the son of Rabbamy, out of the dam Lahadah, and equal in power to his sire; of the tribe Zazhalah. He is fine moulded, and made for running like an ostrich, and great in his stroke and his cover. In the honours of relationship he reckons Zaluah, sire of Mahat, sire of Kaliack, and the unique Alket, sire of Manasseth, sire of Alsheh, father of the race down to the famous horse the sire of Lahalala; and to him be ever abundance of green meat, and corn, and water of life, as a reward from the tribe of Zazhalah for the fire of his cover; and many a thousand branches shade his carcase from the hyænas of the tomb, from the howling wolf of the desert; and let the tribe of Zazhalah present him with a festival within an enclosure of walls; and let thousands assemble at the rising of the sun in troops hastily, where the tribe holds up, under a canopy of celestial signs within the walls, the saddle, with the name and family of the possessor. Then let them strike the hands with a loud noise incessantly, and pray to God for the tribe of Zoab, the inspired tribe."

THE ARAB'S TREATMENT OF HIS HORSE.

In Arabia the horse is treated with much gentleness and kindness: he inhabits the same tent with his master and his family. His wife and children, together with the mare and foal, associate together in indiscriminate friendship, occupying the same bed, where the little children may be seen prattling with and climbing over the body, or hanging round the necks of the docile animals, who in their turn will frequently repose with their heads resting on some one of the family. Whipping is never resorted to by the Arab: all services and affections of the horse are obtained by gentle measures; and hence the remarkable docility of disposition which is mixed up with their native fire and energy. The friendship betwixt the Arab and his horse is mutual; for should the rider fall, the horse will instantly stand still, even in his most rapid career, and wait till his master remounts.

The horses of most eastern countries are nearly allied to the Arabian blood, and now are almost entirely bred from males of that country. The Persian and Barb are, however, nearest to the Arabian in point of elegance of shape and docility of temper. Variety of climate and food are always asserting their influence on the form and size of the horse; and hence the astonishing variety which is to be found in different countries, and even amongst those of the same country.

ENGLISH HORSES.

THE RACEHORSE.

The British racehorses have a striking similitude to the Arabian and Barb, from which they have directly sprung. Indeed, their whole movements indicate their eastern origin. They are, however, much larger. In speed, the English racers are equal, if not superior, to the horses of every other country. It is certain that all the Arabian, Persian, Barb, and Turkish horses, which have been brought into this country, have been beaten by the English racehorses; and even in the eastern courses, which are most nearly allied to the soil of Arabia, as well as in the frigid temperature of Russia, the British racer has always beaten those brought into competition with him. A few years back, Pyramus, the best Arabian steed in the Bengal side of India, was beat by Recruit, an English racehorse of but moderate reputation. For carrying weight, and long endurance of exertion, or what is called *bottom*, our racers have the decided advantage over all other horses. Their high courage, determined spirit, and patience, indicate the purity of their lineage. An ordinary racehorse runs at the rate of a mile in two minutes, but the celebrated horse Childers accomplished a mile in *one* minute.

The head of the racer, in particular, is formed like that of the Arabian; his beautifully arched neck is finely set on, and his shoulders are oblique and lengthened; his hind-legs are well bent, and spread outwards, while his quarters are ample and muscular. His whole legs are flat, and rather short than otherwise, from the knee downwards, although not always so deep as they ought to be; his pasterns are long, elastic, and lie in an angle of about twenty-five degrees. Two points of those enumerated generally turn out well, viz., when the shoulder is well placed, and the hinder-legs well bent and properly spread.

Thorough-bred is a term employed in Britain to indicate the descent of a horse from an Arabian or Barb. The English racer has therefore been the progressively improved breed, from a commixture of British horses with those of Asia and Africa. The horses which are considered of the first blood, or in the nearest possible degree to the Arabian or Barbary horses, are such as are immediately produced from one or other of these horses with an English mare, which has herself been the produce of an Arabian or Barb, or by two crossings in the same degree.

The perfection of English racehorses seems to have acquired its height about a century ago; because at that time was produced the celebrated horse known by the name of the Flying Childers, which was the fleetest horse that ever ran; and although much trouble and expense have been devoted to improving the breed since his time, every effort has failed in producing an equal to him in point of speed.

There have been a very few instances of the native horses of Britain turning out good racers, without the commixture of foreign blood; among these may be particularised Sampson and Bay Walton.

All our best horses have sprung from the Darley Arabian, who was sire to Childers. From the same horse Eclipse descended, who, in point of proportions, was perhaps the most perfect which was ever foaled in Britain, and from whom the fleetest and best-bottomed horses of our country have sprung.

Although much attention is paid to the descent in breeding, yet it frequently turns out that foals of the horses and mares of the best blood prove very worthless; and it is a curious fact that first-rate horses have sometimes been produced by mares only three-fourths bred. But in breeding, a mare is generally chosen with as great a proportion as possible of the blood of the celebrated horse King Herald in her veins. She ought to be deep in the girth, long and full in the fore-arm and thigh, short in the leg, standing clean and even upon the feet, and wide and spreading in the hind-quarters. From such a mare there is every probability of obtaining a well-formed progeny, as we are convinced that fully more depends upon the form of the dam, than of the sire, in breeding.

The horse enters into the spirit of the race with as much zeal as his rider, and will in general strain every nerve to outstrip his adversary. As he advances towards the starting-post, all his motions betray the eagerness of his desire to start. When the signal is given, away he springs at a settled and steady pace. The rider becomes, as it were, a part of the quadruped, whose every motion should correspond to his movements. He proceeds forward, restrained by his rider to the pace he thinks best suited to his strength, and preserving his powers till the last. The rider knows well where to push him; he touches him to indicate his wish for a trial of his powers; the hint is speedily taken, when all his nerves are called into action, and he bounds to his utmost stretch. It sometimes, though rarely, happens that the spur becomes necessary to rouse every energy; he knows its import, and every muscle is called into action to defeat, if possible, his competitor. If he has spirit, little application of these will be necessary, and, if dull, all the punishment that can be inflicted will prove unavailing. But in general, the natural spirit of the racehorse, when roused into action from the opposition of the moment, has generally the effect of leading him through every obstacle; and the whip and spur in such a case are generally not required.

We have given a portrait of the celebrated racehorse Spaniel, winner of the Derby stakes at Epsom in 1831.

THE HUNTER.

The hunter is a combination of the thorough-bred racehorse and half-bred horses of greater strength and bone. He is less lengthy in his carcase, and ought to be from fifteen to sixteen hands high. The points most likely to discover a horse of good properties as a hunter, are a vigorous, sanguine, and healthy colour, with a lofty forehand, a head and neck as light as possible, whether handsome or not; a quick-moving and fiery eye, and a middle-sized ear. His jaws should be clean and wide, and his nostrils large and yielding; his shoulders thin, thighs strong and muscular, chest deep, back short, ribs should be large and wide, tail high and stiff, gaskins well spread, and hind-quarters lean and hard. Above all, let his joints be strong, firm, and closely knit, his legs and pasterns short; for we believe there never was yet a long limber-legged horse that was able to gallop down steep hills, and take bold leaps with a weight upon his back, without sinking or foundering; and, lastly, his feet should be moderately large and sound. With these points, a horse will in all probability have those qualifications required to make a good hunter.

It is not, however, every good and fleet horse that is a good hunter, for he may have strength and vigour for a long journey, and yet not be able to bear the shocks and strainings of a fox-chase; another may be swift enough to win a plate on a smooth turf, which yet will be crippled or heartbroken by one chase in February. The right hunter ought to have strength without weight, courage without too much fire, and speed without labour; a free breath, a strong walk, a nimble, light, but large gallop, and a sweet trot, to give change and ease to the speedy muscles. A horse should never be used for the sports of the field till he is six years of age, as his joints will not be closely knit, nor his tendons sufficiently tenacious, till that period. A horse in his fifth year may occasionally be taken out with the hounds, but then he should be ridden with moderation.

THE HACKNEY OR ROADSTER.

The hackney should be a hunter in miniature, his height not exceeding fifteen hands and an inch, but rather below than above that size. His form should be more compact than that of the hunter, with more substance in proportion to his height, so as to fit him for the fatigues of everyday work. His head ought to be small, his forehand high, but rather light, and placed on the neck in a gradually tapering manner, with his eyes full, clear, and sprightly; his shoulders deep and extensive; his back straight, with strong loins; his withers well raised; his fillets wide; the croup must not droop too suddenly, nor must his tail be too low set. The fore-arm and thighs ought to be strong and muscular, and the legs rather short than otherwise, straight, and somewhat near-set. When the shank bone is solid and flat, it is an excellent point in a hackney. It is of the utmost consequence that the bones beneath the knee should be deep and flat, and the tendon not too much tightened in. His feet should point straight forward, with the heels wide and open; the hoofs should be of a dark, tough, shining horn; the fore-legs closely set, and as straight as possible, for a horse with bent knees is very likely to fall when his feet come in contact with the smallest obstacle, especially with a heavy weight; his hind-legs should be thrown considerably behind him, and very widely set. The back should be straight, and rather short than otherwise. Some prefer a hollow-backed horse, but such will neither stand much work nor bear a heavy weight, although their paces are generally easy.

Nothing is more essential in a hackney than sound strong fore-legs, and also well-formed hind ones; his feet must be quite sound and free from corns, to which hard-ridden horses are very liable; and he ought only to lift his fore-legs moderately high. Some are of opinion that he cannot lift them too high, and conceive, while he is possessed of this quality, he never will come down. There is a medium, however, in this, as a horse that raises his fore-legs too high in trotting is always disagreeable in his action, which greatly shakes and fatigues the rider; besides, he batters his hoofs to pieces in a few years. The principal thing to be attended to is the manner in which the hackney puts his feet to the ground; for if his toes first touch the road, he is sure to be a stumbler. The foot should come flat down on the whole sole at once, otherwise the horse is not to be depended upon in his trotting. There can be no doubt that a horse should raise his feet so as to pass over projecting stones, for otherwise he is likely to be tripped by them, and thus thrown off his centre of gravity. But every horse is liable to fall while going on a road, and therefore his mouth should always be felt by the rider. A hackney can scarcely be too close before or too wide behind. It is erroneously imagined, that, if the fore-legs are close, the hoofs must necessarily cut the pasterns, as it is only when the feet are twisted, or irregularly set in one way or other, that they cut.

Our present breed of hackneys has a considerable portion of racing blood in them, varying from a half to seven-eighths. The latter are too highly bred for the general purpose of a roadster, as their legs and feet are rather tender; and their long paces and straight-kneed action are ill adapted for the road, being more fitted for cantering and running than the trot, which is the distinguishing characteristic of a good hackney. Indeed, they should never be permitted to go at any other pace than a trot, which is undoubtedly much better adapted for the road than cantering.

A hackney should be particularly even-tempered, and not given to starting. The thorough-bred hackney ought to possess two qualities indispensable to the safety of the rider: he should never shy at any thing on the road, and his motion at a trot should be much more smooth than that of a half-bred horse.

THE COACHHORSE.

When coaches were first introduced into Great Britain, the horses used were of the large unwieldy kind, as speed was not regarded in those days; for if travellers could be safely conveyed fifteen or twenty miles in a day by a vehicle, it was then considered a great feat: consequently, in those days coachhorses were just such as those now used in the lighter kinds of waggons. Such was the tardiness of their movements, that, about sixty years ago, a journey betwixt London and Edinburgh occupied from a fortnight to three weeks' time, which is now performed in forty-three hours.

The better kind of coachhorses owe their origin to the Cleveland bay, and are principally bred in Yorkshire, Durham, and the southern districts of Northumberland, and some few have been produced in Lincolnshire. The coachhorse is produced by a cross of the Cleveland mare, with a three-fourth or thorough-bred horse, which is possessed of sufficient substance and height. The produce of these is the coachhorse of the highest repute, and most likely to possess good action. His points are advantageously placed, with a deep and well-proportioned body, strong and clean bone under the knee, and his feet open, sound, and tough. He possesses a fine knee action, lifts his feet high, which gives an elegance to his paces and action: he carries his head well, and has a fine elevated crest. The full-sized coachhorse is, in fact, only an overgrown hunter, too large for that sport.

Some have supposed, that, in Britain, the rage for breeding coachhorses, for so much speed, is a prostitution of the powers of the horse, and that it is barbarous to drive them with that rapidity which is now the prevailing fashion. We do not, however, consider it so very blameable, as expedition is so desirable for the mercantile interests of the country; and if proper care is taken to shorten the stages, there can be little harm to the horses travelling short distances at a pretty sharp rate. It is quite certain, that, within the last few years, every means has been used to promote the establishing of posthorse stations at very short distances.

THE CARTHORSE.

The carthorses of Great Britain are extremely variable in point of size as well as in shape, differing in almost every county. One principal character, however, is weight, to give more physical force in the draught. They should not be above sixteen hands high, with a light well-shaped head and neck, short pointed ears, with brisk sparkling eyes; their chests should be full and deep, with large and strong shoulders, but rather low in front than otherwise. The back should be straight, and rather long, but not too much so, as this always impairs his general strength; the legs should be somewhat long, but not too *leggy*; his fillets should be large and swelling, and the bones flat; he should stand wide on all his four legs, and considerably wider behind than before; he ought to have great pliability in the knee-joints, and be able to bend them well, which assist in producing a brisk and active step in walking, a quality of much consequence in a cart or waggon horse. The height of a draught horse, however, to be desired, will depend upon the purpose to which he is to be employed; and they are, therefore, not unfrequently bred seventeen hands in height, with lofty forehands, and many of them deep in the centre, as is the case with the coachhorse. A great object is to increase strength, activity, and power, to remove weight, and to be of the height of sixteen hands for ordinary utility; and, indeed, it has been proved that horses of this height have performed feats of strength of greater magnitude than those of more gigantic proportions.

The finest breed of carthorses is the large *blacks*, the breed of the midland counties, and the Suffolk breed. An excellent breed also was the Cleveland bays. The Earl of Egremont, one of our greatest and most successful English breeders, is said to have preserved these horses in his stud, and still propagates them in purity; and it is supposed that these fine horses are purely indigenous, without the mixture of any foreign blood. The Clydesdale are highly valued to the present day. The latter are excellent for the purposes of agriculture, but particularly so on the road. They reach to a large size, and are not unfrequently to be met with sixteen and a half hands high. These animals are strong and hardy, but their heads are coarse, and they are rather flat on the sides and hinder-quarters. The usual colour of these horses is grey or brown. This breed is supposed to have originated about 130 years ago, between the common Scots mare and the Flanders horse. An excellent example of the Clydesdale breed is given in the beautiful work, by Mr Howe, on the Horse.

In the midland counties, viz. Warwickshire, Derbyshire, Leicestershire, Lincolnshire, and Nottinghamshire, there is a very large breed called the great carthorse. It was bred in the lowland rich alluvial pastures of these counties, from the Flemish and Dutch horses, with the larger English breed. Mr Bakewell introduced horses, and also mares, from the Netherlands, and thus produced those fine animals with Belgic blood, both on the side of the sire and dam. From this stock, about thirty years ago, Mr Bakewell produced one of the finest animals of the kind which was ever seen, and sent it to Tattersal's, for the inspection of King George the Fourth. His head was light and well-set on, his forehand lofty, his shoulders deep, his legs clean and flat-boned, with the general activity of a pony; and it was universally acknowledged, that, for lightness, cleanness of make, and bulk, he was a superlatively excellent animal. Mr Bakewell recommended this animal as highly adapted for the purpose of breeding, with appropriate mares, cavalry horses, hunters, and strong hacks; but his Majesty did not enter into Mr Bakewell's views, nor did he assign any reason for not trying the experiment.

In Essex and the neighbouring counties, in former times, horses were of all colours, as brown, grey, bay, and black; but since the time that Mr Bakewell became so celebrated for his breed, black is now the prevailing colour.

The very large horses of seventeen hands and upwards, are only useful for the purposes of brewers' drays, waggons, and the slop-carts of London, and of which we have given an excellent representation, engraved by Bonner of London. We, however, doubt much of their answering the better for their gigantic size; and all who have written on the subject consider that they are inferior in point of strength, on account of their bulk, for by the feeding which is required to increase their dimensions, little of muscular fibre is produced, the growth being principally in the cellular tissue and fat; and the additional quantity of food required to keep up their system must more than counterbalance any advantage to be reaped from their size.

THE GALLOWAY.

The galloway is a stout compact horse, about fourteen hands in height, and takes his name from the county of Galloway, in Scotland, where he was originally bred. These horses are now nearly extinct; they were celebrated as excellent, speedy, and steady roadsters, very sure-footed, and on that account invaluable in travelling over rugged and mountainous districts. The beauty and speed of the galloway was supposed to have arisen from the breed having been the produce of the Spanish jennets that escaped from the wreck of the invincible Spanish armada, and these, crossed with our Scottish horses, gave rise to this esteemed breed. But we apprehend they were famous at a date long prior to that event, as this district is known to have supplied Edward the First with great numbers of horses. This breed seldom exceeded fourteen hands in height: their colour was generally bright bay or brown, with black legs, small head and neck, and their legs peculiarly deep and clean.

Dr Anderson gives the following description of this variety:—"There was once a breed of small elegant horses in Scotland, similar to those of Ireland and Sweden, and which were known by the name of galloways, the best of which sometimes reached the height of fourteen hands and a half. One of this description I possessed, it having been bought for my use when a boy. In point of elegance of shape, it was a perfect picture, and in disposition was gentle and compliant. It moved almost with a wish, and never tired. I rode this little creature for twenty-five years, and, twice in that time, I rode 150 miles at a stretch, without stopping except to bait, and that not for above an hour at a time. It came in at the last stage with as much ease and alacrity as it travelled the first. I could have undertaken to have performed, on this beast, when it was in its prime, sixty miles a-day for a twelvemonth running, without any extraordinary exertion."

In 1814, a galloway performed a feat of greater magnitude than any thing mentioned by Dr Anderson. He started from London along with the Exeter mail, and, notwithstanding the numerous changes of horses, and the very rapid driving of the mail, he reached Exeter a quarter of an hour before it—thus performing the astonishing distance of 172 miles, at an average of about nine miles an hour. The experiment was of the most brutal kind, and was fatal to the farther energy of this fine animal, which, with good treatment, might have been long an invaluable servant. Twelve months after this astonishing feat, he was seen spavined, wind-galled, and ring-boned, exhibiting a picture of the utmost wretchedness, brought on by the barbarous inhumanity of man.

THE HIGHLAND PONY.

The ponies of the Highlands of Scotland, although very hardy, from being seldom kept in a stable, even in the winter season, are cross-made animals of a small size, and much inferior, in point of appearance and action, to the galloway, so long the boast of Scotland. They have large heads and long backs; their legs short, standing considerably lower before than behind, which gives them a most unpleasant action and rough trot. The only way in which they can be comfortably ridden is at an amble. They can go considerably faster up a gentle acclivity than on level ground, and are very serviceable in the higher mountainous countries, being sure-footed, and extremely cautious what road they pursue. The Rev. Mr Hall, in his "Travels through Scotland," gives the following illustration of this fact:—"When these animals come to any boggy piece of ground, they first put their nose to it, and then pat on it in a peculiar way with one of their fore-feet; and from the sound and feeling of the ground, they know whether it will bear them. They do the same with ice, and determine in a minute whether they will proceed."

It would be difficult to assign a cause for this amazing falling off in the horses of Scotland. There can be little doubt but that they had a powerful breed in early times, otherwise they never could have coped with the English in the frequent wars in which these countries were engaged from the earliest times; and it is well known that an Arabian horse reached Scotland about 450 years before we have any authentic record of this breed being introduced into England, which must have had considerable influence in improving the breed of the Scottish horses.

GENERAL ANECDOTES OF THE HORSE.

During that destructive war, which, for a space of thirty years, desolated all Germany, till it was terminated by the peace of Westphalia, the carriers, who conducted the inland traffic of the country, used to unite themselves into large companies, for their mutual defence, in order that they might travel with greater security against the numerous marauding parties which infested every part of the empire. One of these carriers had a horse which was of an extremely vicious disposition, and greatly addicted to biting and kicking, from which even his master was not always secure, and which often embroiled him with his fellow-travellers. They were one evening attacked in a ravine by three hungry wolves, which, after a long contest, they found they should hardly be able to compel to quit them, without allowing them some prey. It was therefore agreed among themselves that they should pay the owner of the vicious horse the price of that animal, and make a sacrifice of him to the wolves. The bargain was soon concluded; and the horse, having been taken out of the harness and turned loose, the wolves immediately attacked him. He, however, defended himself courageously with his teeth and heels, retreating, at the same time, into the interior of the forest, while the carriers availed themselves of the opportunity to hasten on to a place of security, not a little rejoiced at having got rid of so troublesome a companion so much to their advantage. As they were sitting at supper in the inn where they usually stopped for the night, a knocking was heard at the house door, which, on being opened by the maid, a horse pushed in his head. The girl, frightened, shrieked out, and called to the carriers, who, coming to the door, were no less surprised than rejoiced to see the heroic conqueror of the three wolves, though much wounded, yet still faithful to his master; and, on account of his meritorious conduct upon this occasion, they agreed to forgive him his former misdemeanours, and retain him in their company.

A remarkable instance of revenge in a horse owned by a person near Boston, in America, is related on good authority. A person, a few years since, was in the habit, whenever he wished to catch his horse when it was running in the field, of taking a quantity of corn in a measure. On calling to him, the horse would come up and eat the corn, while the bridle was put over his head. But the owner having deceived the animal several times, by calling him when he had no corn in the measure, the horse at length began to suspect the design, and coming up one day as usual, on being called, looked into the measure, and seeing it empty, turned round, reared on his hind-legs, and killed his master on the spot.

A gentleman rode a young horse, which he had bred, thirty miles from home, and to a part of the country where he had never been before. The road was a cross one, and extremely difficult to find; however, by dint of perseverance and inquiry, he at length reached his destination. Two years afterwards he had occasion to go the same journey. He was benighted three or four miles from the end of his destination. The night was so dark that he could scarcely see the horse's head; he had a black and dreary moor and common to pass, and had lost all traces of the proper direction he was to take. The rain began to fall heavily. He now contemplated the uncertainty of his situation. "Here am I," said he to himself, "far from any house, and in the midst of a dreary waste, where I know not which way to direct the course of my steed. I have heard much of the memory of the horse, and in that is now my only hope." He threw the reins on the horse's neck, and, encouraging him to proceed, found himself safe at the gate of his friend in about half an hour. It must be remarked, that he could not possibly have been that road but on the occasion two years before, as no person ever rode him but his master.

White, in his Natural History of Selborne, proves the sociable disposition of the horse by the following anecdote:—"There is a wonderful spirit of sociality in the brute creation, independent of sexual attachment: the congregating of gregarious birds in the winter is a remarkable instance. Many horses, though quiet with company, will not stay one minute in a field by themselves; the strongest fences cannot restrain them. My neighbour's horse will not only not stay by himself abroad, but he will not bear to be left alone in a strange stable without discovering the utmost impatience, and endeavouring to break the rack and manger with his fore-feet. He has been known to leap out at a stable-window, through which dung was thrown, after company, and yet, in other respects, is remarkably quiet."

On the evening of Saturday, the 24th February 1830, Mr Smith, supervisor of excise at Beauly, was proceeding home from a survey of Fort Augustus; and to save a distance of about sixteen miles, he took the hill road from Drumnadrochit to Beauly. The road was completely blocked up with, and indiscernible amidst, the waste of snow; so that Mr Smith completely lost all idea of his route. In this dilemma he thought it best to trust to his horse, and, loosening the reins, allowed him to choose his own course. The animal made way, though slowly and cautiously, till coming to a gully or ravine, near Glenconvent, when both horse and rider suddenly disappeared in a snow-wreath several fathoms deep. Mr Smith, on recovering, found himself nearly three yards from the dangerous spot, with his faithful horse standing over him, and licking the snow from his face. He thinks the bridle must have been attached to his person. So completely, however, had he lost all sense of consciousness, that beyond the bare fact, as stated, he had no knowledge of the means by which he made so striking and providential an escape.

A Wiltshire gentleman, in 1821, lent a well-bred and fiery mare to a friend from town, who had come down to try the Essex dogs against the Wiltshire breed of greyhounds. At the close of a very fine day's sport, the huntsmen had beat a small furze-brake, and, for the purpose of better threading it, the London gentleman dismounted, and gave the bridle of the mare to the next horseman. Puss was soon started; the "halloo" was given; the person who held the mare, in the eagerness of the sport, forgot his charge, loosed his hold, and, regardless of any other than his own steed, left the mare to run, like Mazeppa's, "wild and untutored." But, to the astonishment of all, instead of so doing, or even attempting to bend her course homewards (and she was in the immediate neighbourhood of her stable), she ran the whole course at the tail of the dogs; turned as well as she could when they brought the prey about; and afterwards, by outstripping all competitors (for the run was long and sharp), she stopped only at the death of the hare, and then suffered herself to be quietly regained and remounted. But what renders it still more remarkable, is, that she had only twice followed the hounds previous to this event, which strongly indicated her natural love of sport. The brace of dogs that were slipped at this course were the property of the owner of the mare, and the groom had been in the habit of exercising them with her. Whether this had any effect on her actions, is quite uncertain; but, be this as it may, the circumstance is not the less worthy of our admiration.

In 1794, a gentleman in Leeds had a horse, which, after being kept up in the stable for some time, and turned out into the field, where there was a pump, well supplied with water, regularly obtained a quantity therefrom by his own dexterity. For this purpose, the animal was observed to take the handle into his mouth, and work it with the head, in a way exactly similar to that done by the hand of a man, until a sufficiency of what nature called for was produced in the trough.

One of the most intelligent of horses seems, from all accounts, to have been that belonging to Mr Banks, whose renown is alluded to by Shakspeare in "Love's Labour's Lost," act first, scene second, and by Dekker, in his "Untrussing of the Humourous Poet." It is related of this horse, that he would restore a glove to its owner, after his master had whispered the man's name in his ear; that he would tell the number of pence in any silver coin. He danced, likewise, to the sound of a pipe, and told money with his feet. Sir Walter Raleigh says, "that had Banks lived in older times, he would have shamed all the characters in the world, by the wonderful instructions he had given his horse."

Johnson, the celebrated horseman, is well remembered by many persons now alive. Being at Derby in one of his excursions, he married the daughter of Alderman Howe, who then kept one of the principal inns, and succeeded him in his business. He conducted himself so as to be well esteemed by the gentlemen of the county; and his black horse, which he still kept, was one of the favourites of the Vernon hunt, then probably the first in England. The following feat, performed by him and his horse, is worth remembering:—The hunt were taking leave of Lord Vernon one day by the side of the Ha ha, when his lordship told Johnson, it was extraordinary he never had been tempted, in the course of any day, to do more as a horseman than all the members of the hunt could do. "Well, my lord," said he, "what would you wish me to do?" "I am not to choose," said his lordship; "but surely you can do something more than others." "I will go over that Ha ha, my lord." "So can others—myself for one." "But I, my lord," said he, "will go over it in a way in which your lordship cannot." He rode his black horse up to the brink, and, as he stopped, laid his hands upon the pommel of the saddle, and sprung from that posture clean over the Ha ha. The hunt applauded, but the performance was not over. He was something shaken by the fall, and did not immediately rise. The horse looked at him attentively all the while; and, when he had got out of the way, followed him over, ran up to him, and stood by his side till he mounted.

Some years ago, a gentleman farmer, in the neighbourhood of Edinburgh, who was in the possession of a very vicious hunter, happened to be relating some of his bad propensities to a party of friends at dinner, and among these mentioned was the difficulty which the groom had in trimming his fetlocks. This operation was never accomplished without the aid of several assistants, and even then attended with great difficulty and danger. During this conversation, in which he defied any of his friends present to perform the task singly, he was unconscious of the presence of his youngest child, a fine boy about three years of age. This juvenile Nimrod was by no means the inattentive observer which might have been expected from his tender years, as was evinced next morning. His father, in passing through the stable-yard, descried, with great horror and agony, his infant busily employed with a pair of scissors, attempting, with great coolness, to clip the fetlocks of the hind-legs of his vicious hunter, which, in place of exhibiting his usual determined resistance to this operation, was looking round with the greatest complacency on his pigmy groom, whom the father every instant expected to see struck dead at his feet. He, however, shortly afterwards walked away from the horse unharmed.

The above horse had a particular antipathy to strangers. On one occasion his master was returning home from a jovial meeting, where he had been very liberal in his potations, which destroyed his power of preserving his equilibrium, and rendered him at the same time somewhat drowsy. He had the misfortune to fall from his saddle, but in so easy a manner, that it had not the effect of rousing him from his sleepy fit; and he felt quite contented to repose where he alighted. His faithful steed, on being eased of his burden, instead of scampering home, as one would have expected from his habits, he stood by his prostrate master, and kept a strict watch over him; he was discovered by some labourers, at sunrise, very contentedly snoozing on a heap of stones by the road side. They very naturally approached the gentleman, to replace him on his saddle; but every attempt to approach was resolutely opposed by the grinning teeth and ready heels of his faithful and determined guardian.

A gentleman of Bristol had a greyhound, which slept in the stable along with a very fine hunter of about five years of age. These animals became mutually attached, and regarded each other with the most tender affection. The greyhound always lay under the manger, beside the horse, who was so fond of him, that he was unhappy and restless when out of his sight. It was a common practice with the gentleman to whom they belonged to call at the stable for the greyhound to accompany him in his walks; on such occasions, the horse would look over his shoulder at the dog with much anxiety, and neigh in a manner which plainly said, "Let me also accompany you." When the dog returned to the stable, he was always welcomed by a loud neigh; he ran up to the horse, and licked his nose; in return, the horse would scratch his back with his teeth. One day, when the groom was out with the horse and greyhound for exercise, a large dog attacked the latter, and quickly bore him to the ground; on which the horse threw back his ears, and, in spite of all the efforts of the groom, rushed at the strange dog, who was worrying at the greyhound, seized him by the back with his teeth, which speedily made him quit his hold; he shook him till a large piece of the skin gave way, when he fell to the ground. He no sooner got on his feet, than he judged it prudent to beat a precipitate retreat from so formidable an enemy.

EXTRAORDINARY FEAT OF A DRAUGHTHORSE.

An unparalleled instance of the power of a horse, when assisted by art, was shown near Croydon. The Surrey iron railway being completed, and opened for the carriage of goods from Wandsworth to Mertsham, a bet was made that a common horse could draw thirty-six tons for six miles along the road, and that he should draw his weight from a dead pull, as well as turn it round the occasional windings of the road. A number of gentlemen assembled near Mertsham to witness this extraordinary triumph of art. Twelve waggons loaded with stones, each waggon weighing about three tons, were chained together, and a horse, taken promiscuously from the timber cart of Mr Harwood, was yoked into the team. He started from near the Fox public-house, and drew the immense chain of waggons, with apparent ease, to near the turnpike at Croydon, a distance of six miles, in one hour and forty-one minutes, which is nearly at the rate of four miles an hour. In the course of the undertaking he was stopped four times, to show that it was not by the impetus of the descent the power was acquired. After each stoppage, a chain of four waggons were added to the cavalcade, with which the same horse again set off with undiminished power. And, still farther to show the effect of the railway in facilitating motion, the attending workmen, to the number of about fifty, were directed to mount the waggons; still the horse proceeded without the least distress; and, in truth, there appeared to be scarcely any limitation to the power of his draught. After the trial, the waggons were taken to the weighing machine, and it appeared that the whole weight was as follows:—

	Tons.	cwt.	lb.
Twelve waggons first linked together, weighed	38	4	2
Four ditto, afterwards attached . .	13	2	0
Supposed weight of fifty labourers .	4	0	0
	55	6	2

CONCLUSION.

We conclude this account of the horse by the following quotation from Captain Brown's work, entitled "Biographical Sketches and Authentic Anecdotes of Horses," which contains a great mass of curious information regarding that noble animal:—

"Plutarch says, a good man will take care of his horses and dogs not only while they are useful to him, but also after age renders them unfit for service. A beautiful illustration of this benevolent maxim is recorded of the Athenians, who, when they had finished building the *Hecatompedon*, set at liberty the animals employed in its erection. It is related that one of these, at the head of his fellow-labourers, some time after the completion of the temple, led the way to the citadel, which so highly pleased the people, that a decree was made by the senate, enacting that these faithful and willing servants should be kept the remainder of their lives at the public expense.

Every humane mind must shudder at the brutal treatment to which that noble and generous animal, the horse, is but too frequently exposed in Europe. The ass, also, a beast of great sagacity and gentleness, is almost invariably treated with savage barbarity. Let those unfeeling and unprincipled wretches look to the mutual love that subsists between the Arab and his steed, and the kindness manifested by the people of eastern nations to their asses and mules, and the benefits they derive from such a mode of treatment. If no other principle will awaken their kindly feelings, surely that of self-interest should stimulate them to adopt gentler measures.

Although the horse seldom exerts his strength and power to the prejudice of his master, we have, however, one instance of recollection of injury, and an attempt to revenge it. This is inserted in a work of D. Rolle, Esq. of Torrington, in Devonshire. A baronet, one of whose hunters had never tired in the longest chase, once encouraged the cruel thought of attempting completely to fatigue him. After a long run he dined, and, again mounting, rode him furiously among the hills; when brought to the stable, his strength seemed exhausted, and he was scarcely able to walk. The groom, possessed of more feeling than his brutal master, could not refrain from tears at the sight of so noble an animal thus sunk down. The baronet, some time after, entered the stable, when the horse made a furious spring upon him, and, had not the groom interfered, would soon have put it out of his power ever again to misuse his animals.

The first breaking of the horse should only be intrusted to persons of mild dispositions, as it is by kind and patient treatment alone that we can hope to succeed in rendering this valuable animal truly useful and docile; for although force may produce obedience, it will be found, as with man himself, that so soon as fear is removed, and the animal has discovered its own strength, revenge will generally follow. I have no doubt but in nine cases out of ten, where horses betray furious or stubborn tempers, that these have been produced from the cruelty or ignorance of their first trainers. The horse is an animal of great intelligence; but every thing addressed to his perceptions should be clear, short, and distinct, for he is incapable of following a train of spoken language. Few words delivered with precision, accompanied by caresses and gentle treatment, will be found more effectual than any other course."

It cannot be expected that we should enter into the treatment and cure of the numerous diseases incidental to the horse; but we may offer the few following cautions as preventives to many of these:—

Stables should be well aired, and have windows in opposite sides, so that the air may pass currently through them; these should be invariably open when the horses are out of the stable, and frequently even when the horses are in their stalls, taking care, however, never to allow cross draughts when the horses are heated, or after returning from active exercise, as this may produce cough, and other inflammatory diseases. Grooms are in the constant practice of keeping stables so completely free from air, that they even resort to the practice of closing up the bottom of the stable door with dung at night. Great warmth produces a fine glossy coat, but it is most destructive to the constitution of the horse.

A horse should never be ridden hard down a hill, as this has a tendency to shake and weaken his fore-legs; and he ought to get but little water on a journey, and he should not be allowed to drink until perfectly cool; nor should he be fed with oats for a quarter of an hour at soonest, after having had exercise. The first thing that should be attended to is to rub the horse carefully down, and not to leave him while a wet hair remains on his body.

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GENERAL ACCOUNT OF THE UNITED STATES:

Their Form of Government; Army and Navy; Expenses of Government; Manufactures, Commerce, and Trade; Canals, Railways, and Public Works; Minerals; Climate, Soil, and Natural Productions; Prices of Labour; Population, white and coloured; Manners; Religion; Learning and Arts; Means of Education; and National Prospects

MAP OF NORTH AMERICA.

HISTORICAL NOTICE.

THE continent of America, with all its islands, and the people who originally inhabited them, was unknown to the inhabitants of Europe till the end of the fifteenth century. They were discovered in the year 1492 by Christopher Columbus, while he was in search of a route by sea to the East Indies; and when he first saw them, he believed that they were part of China or Japan; so little idea had the Europeans of those days of the existence of the vast countries which have since exercised such a powerful influence on the fate of their descendants.*

The rude state of the native inhabitants, and the superior military knowledge of the Europeans, which they used with very little regard to right, enabled them soon to seize on all such parts of the country as they preferred, and to drive away, or reduce to subjection, the original possessors. In this way the southern part of the continent was subjugated, and partly colonised, by the Spaniards and Portuguese; while the northern portions fell into the hands of the other maritime nations of Europe, the English, French, Dutch, and Swedes, who formed colonies at different points along the coast. The whole of these, however, soon fell into the possession of the English and French alone. Under these two powers the American colonies continued to afford a refuge to people of the European countries, who considered themselves oppressed or aggrieved at home. During the seventeenth century, when extensive emigration first began to take place, it was not so much the want of employment, or of subsistence, which induced men to seek for a change of residence, as the wish of escaping from persecution on account of religion, or from the civil wars of the time. This was the case particularly in England, during that period when religious and political animosities greatly disturbed the country. Troubles of other kinds, and latterly the necessities of an overcrowded population, continued to afford a motive for the people resorting to America; and during great part of the eighteenth century, it is reckoned that from 5000 to 8000 persons yearly removed to these countries from Europe.

Some disputes arose, about 1755, between the French and English, who were now the sole possessors of North America; these at last led to a war, which terminated in the total destruction of the French power in that country, and in the transference to the English of all their colonies there, except some thinly peopled regions on the Mississippi. This result took place in 1763; but though it gave to Britain a large addition of new territory, and relieved her old possessions from an enemy, it left her burdened with large debts. In order to avoid unpopularity at home, the ministry of the day projected the scheme of throwing part of the burden of these upon the colonies; alleging as a reason, that the war had been undertaken for their benefit, and in order to deliver them from an enemy who continually hung on their frontiers. The first tax proposed for this purpose was a stamp duty (1765); but the colonies firmly refused to submit to it, saying that they were perfectly willing to pay the expense of their own governments, but that they would not endure to be taxed by a foreign body like the British Parliament, which was situated at the distance of 3000 miles, and in whose deliberations they had no voice, while it might employ the money obtained from them for purposes hostile to their own freedom or welfare. This feeling was universal among the people of the colonies; for these being generally the descendants of men who had left Europe in disgust at some real or fancied oppression, had not those habits of deference to the commands of persons in high station, which often tend to secure obedience and quiet in other countries.

In consequence of this determination on the part of the colonies, and of the obstinacy of the English ministry in adhering to their demands, a great many irritating occurrences took place. The Americans refused to import or to use British manufactures; riots took place in almost all the towns, but chiefly in

* To any one who wishes for elaborate information concerning the statistics or geography of the United States, we cannot too highly recommend "Warden's Statistical, Political, and Historical Account of the United States"—a work which we have frequently consulted in compiling this paper. Morse's Geography is an admirable work in regard to the physical features of the country; and to those who wish to compare its past state with its present, it is invaluable. Williams's American Annual Register contains a store of statistical and commercial facts of the highest value. Mr Ferguson's book of travels, and the excellent volume of Mr Stuart, contain an accurate picture of manners; to which we may add the amusing gossip of Captain Hall and Mrs Trollope, who are both excellent in their way, if readers make the usual allowance for travellers and satirists.

Boston; and the taxed articles which were sent out were destroyed. A meeting of delegates from the several colonies or districts was held in 1765, to petition and remonstrate against what they considered an injustice. Still the British government persevered. And though there was at one time an apparent disposition to recede from some of the propositions which had caused most irritation, the right of taxing the colonies was vigorously maintained. New taxes were soon after imposed (1767) on tea, glass, and paints. The pertinacity of both parties led to frequent violence, and at length to actual demonstrations of war on the part of the Americans. This war lasted for about seven years, from 1775 to 1782, and concluded at last, as might have been anticipated, by the British being compelled to relinquish a country of which every inhabitant was their enemy. The war was conducted on the part of the Americans by General George Washington, to whose talents and perseverance its speedy termination was greatly owing, and whose moderation in using the influence which success had given him over his countrymen has been too seldom imitated by conquerors. The councils of the Americans, and their negociations with other powers, were mainly directed during these transactions by Benjamin Franklin, a man who was equally distinguished as a philosopher and a lover of his country.

FORM OF GOVERNMENT.

Each of the English colonies, as they settled in America, had had a certain form of government assigned it for maintaining the necessary order. This consisted generally of a house of assembly, chosen by the people, with governor, judges, and other officers, appointed by the king, but paid out of taxes levied by the representatives. On acquiring independence after their war with the mother country, the different colonies, now called *States*, made such alterations, each in its own constitution, as they believed to be suited to their circumstances; and a general government, framed and appointed by the consent of the whole, was formed to take charge of such national affairs as the states could not manage separately. The states have each a senate and house of representatives; the members of the former are fewer in number than those of the latter, and a part of them only is chosen at each election, so that they remain in office for several years, generally four: the house of representatives is elected anew every year. The resolutions agreed to by these two bodies for the government of the state are afterwards submitted to a president or governor, whose sanction constitutes them part of the law. Both senators and representatives are paid for their attendance on the public business, generally at the rate of two dollars (or nine shillings sterling) per day, besides an allowance for travelling expenses. The right of election resides in the people under certain limitations: in some states the possession of a certain property (about L.50) is required in the electors: in others, the regular payment of certain taxes: in all, a residence in the state, varying from two years to six months, is requisite. But there are only eight of the states in which black people are allowed to give votes. The judges and other magistrates are in some states elected by the people: in others, by the governor, subject to the approval of the two houses: and their tenure of office is in some for a term of years; in others, during good behaviour; and in several, till the holder attain a certain age (about 70).

This is the form of the states' governments. The general government is constituted on the same model, consisting, like them, of a president, senate, and house of representatives, who are chosen by the same electors as those of the provincial legislatures. The members of both houses receive 36s. per day, with travelling expenses. The senate consists of forty-eight members, two from each state; sixteen of these are elected every two years, so that the whole may be renewed in six years. The members are required to be at least thirty years of age, to have lived nine years in the United States, and to be at the time of election residents in the state by which they are returned. The senate exercises most of the functions of the British House of Lords. The house of representatives is chosen annually, and the members are required to be at least twenty-four years of age, to have resided three or four years in the state for which they are chosen, and, in one or two of the districts, to possess a certain property. There is one representative nearly for every 40,000 persons, five black men being reckoned in this enumeration equal to three white. The house of representatives perform the duties allotted by the British constitution to the Commons' House of Parliament, and have the right, like them, of originating all bills for raising revenue; while the senate, on the other hand, like our House of Lords, is entrusted with the exclusive power of impeaching any officer of state for public misdemeanour. Bills which have passed the two houses have not the sanction of law till they are signed by the president, or, on his refusal, are voted a second time by two-thirds of each of the houses. The president, senate, and house of representatives, are called the Congress of the United States, and their powers in making regulations concerning the public affairs are defined and limited by the original articles of the constitution. Congress is prohibited by these from making any law concerning the establishment or free exercise of religion, the liberty of the press, and freedom of speech, or the privilege of public meetings, to express their opinions peaceably on the measures of government. The people are secured in the right of bearing arms, of fair trial, and in the possession of their property against all aggressors, either public or private. Of these rights no act of Congress, or other authority, can deprive them; and if they are invaded, the sufferer can have redress by applying to the public courts of justice.

The judicial power is vested in one supreme court, and in such inferior courts as congress may from time to time establish. The present judicial establishment consists of a supreme court, thirty-one district courts, and seven circuit courts. The supreme court consists of a chief justice and six associate justices, who hold a court in the city of Washington annually; besides which, each judge attends in certain districts to hold circuit courts with the local justices. The processes of law are in general simple and direct, and are not made difficult of access to the poor by any burdensome expenses.

EXPENSES OF THE GOVERNMENT, AND TAXES.

The following is a list of the salaries of some of the principal officers of the American government:—

	Per annum.		
President,	L.5625	0	0
Vice-President, Secretary of State, and Secretary of Treasury, each	1125	0	0
Secretary at War,	1012	0	0
Chief Clerks of Treasury, &c.,	450	0	0
Postmaster-General,	625	0	0
Chief Justice,	900	0	0
Six Associate Justices, each	787	0	0
Attorney-General,	675	0	0
Seven ambassadors to the following States:—England, France, Russia, Netherlands, Spain, Portugal, and Sweden, each with an allowance of L.2025 for outfit,	2025	0	0
Ambassador's Secretary,	450	0	0
Consuls at London, France, &c.,	540	0	0
Army.			
Major-General (with rations or provisions for fifteen men),	540	0	0
Brigadier-General (with twelve rations),	274	0	0
Colonel (with six rations),	202	0	0
Major (with four rations),	135	0	0
Chaplain (ditto),	135	0	0
Captain (with three rations),	108	0	0
Surgeon (ditto),	121	0	0
Serjeant (one ration),	17	10	0
Private (ditto),	13	10	0
Navy.			
Commodore (sixteen rations),	270	0	0
Captain of 32 gun-ship or under (eight rations),	270	0	0
Lieutenants (three rations),	108	0	0

The pay of seamen is regulated by that of the merchant service.

The expenses of the state during the year 1829 are stated as follows:—

Salaries to officers of state, expenses of managing the public lands, aids to canals, penitentiaries, and improvements, lighthouses, mint, &c.,	L.298,590
Salaries to ambassadors for protection of American subjects in other countries, and foreign intercourse,	40,722
Military establishment, pay of the army,	255,213
Repair of fortifications, militia expenses, building piers, improving the navigation of rivers, pensions to invalids, civilization of Indians, &c.,	1,155,002
Naval establishment, including pay and subsistence of the navy, expenses of stores, construction of works, repairs, &c.,	744,482
Public debt (since paid off) charge	2,786,395
Total expenses of general government in 1828,	L.5,634,980

The annual charge of the public debt is to be deducted from the above sum, as the whole has now been very nearly discharged. But in estimating the whole cost of the government, it is necessary also to take into account the sums required for the expenses of the different states. We do not find any direct notice of the amount of these; but as Captain Hall states that each person pays to the state government 3s., and to the general government about 9s. 4½d. per annum, this proportion would make the amount of expenses of the different states about L.2,087,029; and the whole cost of government is therefore L.7,722,009, amounting, according to Captain Hall's estimate, to about 12s. 4½d. for each person. The national debt having been now nearly paid off, the yearly sum paid in taxes, by each person, may be estimated at 9s. The only taxes are those on articles imported from foreign places, none whatever being levied on the manufactures or produce of the country itself; and there are no direct taxes, like the house or window taxes in this country. Part of the revenue is derived from the sale of public lands, and this amounted, in 1828, to L.290,821.

ARMY AND NAVY.

The army of the United States amounts to about six thousand men; it consists of four regiments of artillery, and seven of infantry—in all (comprising the general staff), 6188 men: it is under the command of one major-general, and two brigadier-generals. A national militia is kept up, in which the men acquire a knowledge of certain military exercises, but submit very little to subordination. There is a military academy for educating young men as officers; the number under tuition is limited to 250; and the instruction given is well fitted for training their minds to knowledge and gentlemanly feelings; the course consists of natural and experimental philosophy, mathematics, engineering, ethics, drawing, and the usual military exercises. The young men educated here are received into the army as cadets, and their promotion is afterwards regulated strictly by seniority, except in extraordinary cases.

The American navy has seven ships of the line—seven frigates of 44 guns, and three of 36; with twenty sloops of war, and smaller vessels. The number of captains is 37; of masters commanding, 33; and of lieutenants, 253. There are seven navy yards, of which the principal are on Long Island, near New York, at Philadelphia, and at Washington.

Notwithstanding the free genius of the American constitution, and the little attention paid to wealth or difference of rank in common life, discipline is enforced with great strictness in the naval service, and with the more jealousy, perhaps, because there is always a danger of the seamen and inferior officers falling into the independent habits of their countrymen, which would be inconsistent with the authority of a commander at sea. Captain Hall tells a story of a young officer who announced his intention of appealing to the people on having been reprimanded by his captain. This being reported at head-quarters, an order came down to say, that the officer was perfectly at liberty to appeal as he proposed; and in order that he might do so without inconvenience, his discharge from the navy was enclosed. Great care is taken in the selection of persons wishing to enter the naval service; and these gentlemen are also exposed, afterwards, to frequent and rigorous examinations, by which means incompetent persons are excluded.

The ships of the American navy are generally well built, and good sailers: they are constructed in great part of a wood called the *live oak*, or *evergreen oak*, which grows in the salt marshes of Florida, and which is almost incorruptible. Large plantations of this valuable tree are formed, and carefully attended to by the government, the only instance in which forest trees are at all cared for in America.

MANUFACTURES.

The Americans do not greatly occupy themselves in those manufactures which require large collections of people in one place, or a great outlay on different kinds of machinery. In England, a great deal of time and capital has been expended in training the work-people to their several departments in these large concerns; and in most places where they are established, there are a variety of different manufactures existing about the same spot, most of which are some way useful or necessary to each other, so that much expense is saved in carriage, &c. It takes a long course of time to collect all the *furniture* of a manufacturing town; but as this has been already done at many places in England, and as wages are much lower there than in America, the English manufactures can be produced more easily, and at less expense, than those of America. It is by no means from any want of ingenuity in the people that they do not succeed there; for, during the war (1812), when English goods were excluded, the Americans began to manufacture for themselves, and not only constructed excellent machinery, but produced perfect imitations of the goods which had been hitherto imported. They were not, however, so cheap, from the causes we have mentioned; and now that there is peace, English goods would be universally used, were there not high duties imposed on them, in order to favour those in America who had gone to expense in establishing manufactories, and learning the necessary processes. The northern states (by whom chiefly the American goods are made) express themselves indignant at the idea of depending on foreigners for goods which they can produce at home, where the work-people would afford a market for the farm produce of the country, while those of the south, who have no manufactures, wish to have the cheapest articles, from whatever quarter they come. There has been a good deal of angry discussion on this subject between the parties, which has now, however, been compromised, some of the prohibitory duties having been repealed, and others reduced, so that, though there is still a considerable preference given to American goods, those of England are not altogether excluded.

The manufactures which are followed with most advantage in America, and without fear of English rivalry, are those which produce articles too bulky or too heavy, in proportion to their value, to bear the expense of a long carriage, or of which the materials are found in the country, and can be wrought up there at less expense than by carrying them to cheaper tradesmen at a distance. Some of these branches may be mentioned—such as, the making of soap, candles, and hats; tanning and working in leather, particularly bulky articles; building of carriages; making of all kinds of agricultural implements; carpentry, sawing, and turning of most descriptions; building of ships and steam-boats; constructing and putting up of mill-work and machinery; distilling; the employments of goldsmiths, tinsmiths, and printers. There are several businesses, however, whose prospects depend chiefly on prohibiting the cheaper manufactures of England, and which of course are liable to be deranged by any alteration in the tariff laws; these are the making of glass and earthenware; spinning and weaving most kinds of cotton goods; making of woollens, carpets, &c.; most of the finer kinds of hardware, iron, steel, and brass; hempen goods and silk goods.

The native American manufactures, limited as they are in some respects, are sufficient to give employment to every one who wishes to work; and there is still a continual call for new hands. Capital also finds abundant remuneration in the existing state of things, so that there seems to be no necessity for the Americans troubling themselves to establish new manufactures, all their spare hands and spare money being already occupied to advantage. To prove that there is full employment for all disposable capital, we may mention what is stated by an intelligent traveller, that a hotel which let for 350 dollars per annum was sold for 2500, only seven years' purchase—a sufficient proof, as there was no poverty or bankruptcy to compel the sale, that the owner knew of some profitable way in which ready money could be employed. Another proof of the same state of things is the circumstance which we have mentioned elsewhere, that the legal rate of interest is seven per cent., while ten per cent. is very often obtained.

Household manufactures of woollen, linen, and cotton, are made to a great extent. Many families spin, weave, and make up their own clothing, sheeting, table-linen, &c. They purchase cotton, and mix it up in the yarn with their linen and woollen stuffs; blankets, quilts, coverlids, stockings, mits, &c., are made chiefly in the family. These are perhaps neither so fine nor made so expeditiously as those of regular tradesmen; but they are produced for domestic use at times when there is no other employment, and in this manner may be said to cost nothing except the material of which they are made. It is supposed that nearly two-thirds of the domestic clothing are so made in country places, many families, as in Canada, having a loom in the house. It is the same with soap, candles, and maple-sugar, all of which are manufactured by the farmers at home. The articles made by families in the state of New York for their own use, were, in 1831, reckoned at L.1,03?,360 in value. Attempts have recently been made, with great success, to introduce the manufacture of silk: the mulberry-tree grows spontaneously in the middle states, and the light easy labour which the collecting of the silk requires, would afford employment to old people and females, enabling them to add to the income of their families, when they could not otherwise be able to do any thing.

In the southern, or slave states, there are no domestic manufactures; every article of clothing which the slaves require has to be purchased; and this is the reason why these states found the operation of the tariff so oppressive.

COMMERCE.

Foreign Trade.

The wealthiest class in the United States are generally the merchants of large sea-port towns. Commerce may be considered as forming the aristocracy of that country, and is regarded every where as highly honourable. Young people are educated for it with as much care as for the army, or for any of the learned professions; and they acquire a knowledge of the languages of the foreign countries with which they propose to be connected, their modes of transacting business, &c., instead of learning dead languages, and the manners of extinct nations, as with us. The manufactures and markets of foreign states—the quality, value, and profits of every commercial article, form the objects of their study, and prepare them for engaging in business with system and advantage.

The Americans show great activity in all commercial and maritime business; ships are laden and unladen in a few days, which would have required as many weeks in some other countries; their merchant vessels are built quicker, and sail better, than those of almost any other country. The pilot schooners of Baltimore have been known to take a cargo from an American to an English port in seventeen or eighteen days; and this admirable construction of their ships is seconded by the enterprise of the seamen. Sloops of one hundred and sixty tons, and eleven men, have sailed from Albany (one hundred and sixty miles up the Hudson river) to the coast of China, where the people thought them at first the long-boats of some merchant vessel. Nantucket and New York sloops of eighty tons, with ten men, double Cape Horn, and pursue the whale fishery in the South Seas, or take in cargoes of seal-oil and skins on the coast of New South Shetland.

The tonnage employed in the foreign and internal trade of the states in 1830, was 1,741,391 tons of shipping, and about 140,000 seamen—numbers little less than those of Britain herself. In the papers presented to Congress, we have the following statement of the amount of exports and imports in the year 1830:—

Exports.

	Dollars.	Dollars.
Manufactures—		
Cotton goods . .	1,318,?83	
Other manufactures .	4,0?2,707	
		5,320,980
Product of agricultures—		
Cotton . . .	29,674,883	
Tobacco . . .	5,586,365	
Grain of different kinds	8,992,342	
Cattle, live and dead, and their products . . .	2,379,652	
Fruits, seeds, sugar, roots, &c.	277,841	
		46,077,332
Product of forests		4,192,047
——— seas		1,725,270
Total domestic exports .		59,462,029
Foreign articles .		14,387,479
Total exports		73,849,508

Imports.

Articles free of duty .	12,746,245	
Articles taxed on importation	58,130,675	
Total imports		70,876,920

Tables are given of the different countries with which this trade is carried on. The following abstract will give an idea of the extent of transactions with each in 1830:—

	Imports.	Exports.
Russia	1,621,899	416,575
Germany, Holland, and Netherlands	2,778,266	6,321,459
Sweden, Norway, and Denmark	1,173,494	476,642
Britain	24,479,214	26,229,242
Spain and Portugal .	1,160,859	791,050
France - - - -	7,922,198	11,893,959
Mediterranean, except French and Spanish ports -	1,493,479	1,747,820
Gibraltar - - -	90,028	883,398
Africa and African islands	489,183	373,601
West Indies generally -	9,813,420	9,163,752
British West Indies -	168,570	1,901
Hayti - - -	1,597,140	823,178
British American colonies	6?4,586	3,786,373
Mexico - - -	5,235,241	4,837,458
Brazil - - -	2,491,460	1,843,238
Other South American republics	4,050,021	3,024,835
East Indies and Malay islands	2,030,483	1,196,717
China - - -	3,878,141	742,193
South Seas - -	20,748	27,942
North-west coast of America	- -	53,090

The commerce of the states, therefore, to the different quarters of the world, may be summed up as follows:—

	Imports.	Exports.
Europe - -	40,726,437	47,861,145
West Indies and other parts of America - -	23,807,436	23,473,825
East Indies, China, and South Seas - - -	5,937,372	1,966,852
Africa and its islands -	489,183	373,601

Of this trade the following is the amount which is carried on with Britain and her different colonies and dependencies:—

	Dollars.
Imports to America - -	26,764,984
Exports from do. - -	31,547,761

The annual amount of the American commerce is about sixteen millions sterling in imports, and a little more than that sum in exports. It appears that these sums form about half the amount of the British foreign trade. The American shipping, however, is nearly equal in tonnage to that of Britain. This apparent inconsistency is accounted for in two ways: first, a great deal of the trade to Britain is carried on in American bottoms, and not equally in ships of the two countries; and, secondly, there is a larger quantity of tonnage occupied by the Americans in the coasting or internal trade of the country than there is in Britain. It is, in fact, the traffic between the different parts of the Union which gives its chief activity to American commerce. This is owing to the circumstance that the northern and southern states, being situated in very different climates, have products as different from each other as England and Egypt. America has here a source of permanent and secure trade, in which no foreign power can interfere, either to disturb or to share it.

INTERNAL COMMERCE.

The immense number of navigable rivers which run through the country in every direction, and discharge themselves into the ocean or the lakes, afford the means of a great internal trade. These facilities have been increased at many important points by canals, connecting the different rivers at points where they approach each other, or where they flow away in opposite directions from sources lying in the same neighbourhood. Between the southern and eastern states there is a constant interchange of commodities along the coast, and a similar trade goes on from the western states to the south, by the Ohio and its branches, down the Mississippi. New Orleans is the great entrepôt for the goods of the latter branch of internal commerce. The north-eastern states furnish rum, molasses, cordials, dried fish, European goods of all descriptions, and articles of small value, quaintly styled *notions*; and they take in return corn, grain, cotton, and tobacco, from the south; while from the western states are received hams, beef, laid flower, &c., either for use or for exportation to the West Indies, and the other parts of Southern America. To show the extent to which this traffic is carried, we may mention that there are two hundred large steam-boats on the Mississippi, making the voyage up and down in twenty-four days. The cargo of one of these is given as follows:—501 barrels of pork, 9 hogsheads of hams, 2136 kegs of lard, 3147 barrels of flour, 30 barrels gin, 92 barrels beef, 50 boxes merchandise, 32 barrels porter, 224 barrels eggs, 50 horses, 32 cabin passengers, 42 deck do., 31 way do.; and this was the usual cargo every trip. The traffic from north to south along the coast is greater than might be inferred, even from this specimen of internal trade by the rivers; because the productions of the northern and southern districts on the sea-coast are as different from each other as those inland, while the states in that part of the country have been longer and more densely peopled. This active intercourse by rivers, canals, railroads, and sea-coast, increases the value of land and of industry every where: the produce of the country agricultures can always be sent easily to the market of towns, and that of manufacturing places to those which are more exclusively agricultural. The Americans are perfectly aware of the stimulus which these accessible channels of conveyance give to the activity of their citizens, and they accordingly use every means to have them extended.

CANALS, RAILWAYS, AND PUBLIC WORKS.

When America was first settled, the people chose lands in the vicinity of the sea or navigable rivers, so as to have the means of free communication to all parts by water; and lands even of inferior quality were found more valuable in such districts than richer soils in places where the produce could not be brought to market. All the available ground, however, in these favourable situations, was soon occupied, and people who wished to settle were forced to cultivate lands very inconveniently placed for carriage and communication with markets. These lands, however rich, afforded no more than the means of subsistence to their occupants; who, as they could send little or nothing to the great towns, could buy nothing from thence; they contributed, therefore, very little to the general trading prosperity of the country. As soon as canals were heard of in Europe, the Americans saw what advantages they might produce to such secluded districts in their own country, and immense efforts were made to set such works on foot. Their enterprise has been successful. The canals and railways of that country are now hardly to be equalled in the world, and these channels have opened the tide of population and prosperity into inland districts and rich lands, which must otherwise have lain waste, and lost, except to a few slovenly and ignorant persons. One of the states alone (Pennsylvania) has, since 1826, devoted no less than L.5,800,000 to this object. New York has been even more liberal; and there is no part of the country (always excepting the slave states, which in this respect, as in all others, are greatly behind) where such means are not taken to afford the occupiers of land means of bringing their produce to the market of cities. This is a matter which very nearly concerns the settler every where; because, however good the soil of his farm, or however unremitting his own industry may be, every advantage would be thrown away, if he could not get the produce disposed of. Some of the settlers in Canada, at the head of Lake Erie, were so badly off in this respect, till the opening of the Erie canal, that their surplus wheat and cattle were worth nothing: money was not given for farm produce in that quarter. Wherever there is a good canal or navigable river, on the other hand, the prices of farm produce rise, and land which was unsaleable becomes in request, and is covered with a throng of settlers from Europe, or of the restless speculators of America.

New York State.

The Erie canal was planned by an American patriot, Mr De Witt Clinton, and was carried into effect at the expense of the state of New York. It extends three hundred and sixty miles along a rich and fertile country, which had formerly no communication with markets, but which can now send its produce to the sea in two directions. It is forty feet wide at top, twenty-eight at bottom, and four feet deep. It was finished in five years, at an expense of L.1,600,000. The average collection of dues from vessels passing in the spring of 1831, was L.450 per day.

Houses, villages, and towns, are starting up along its whole line with unexampled rapidity. Lockport, for example, is a place where the canal is carried by locks up a steep rock of seventy feet. This spot has been suddenly transformed from a wilderness into a thriving village of two thousand inhabitants. Rochester is another example of the benefits the canal has conferred on the country: at that place there was abundance of most fertile land, and there were also certain falls on the river Genessee, which were admirably adapted for giving water-power to mills and other machinery; but all these advantages existed to little purpose without good roads and markets. The opening of the canal has supplied these, and the consequence has been, that Rochester has all at once started up from a desert into a populous city, and presents, says Mr Fergusson, a remarkable instance of what may be done in the way of transition, exhibiting in its streets a perfect sample of the progress from stumps to steeples. It is not long ago since its most crowded streets were a forest. The first settlers cut down the trees, leaving the stumps standing till they had more leisure; and this place now presents as elegant buildings as any in Europe, with churches whose steeples might do credit to London or Edinburgh.

This canal terminates in Lake Erie, and forms a channel by which the trade of the large inland seas, Lake Erie, Lake Huron, and Lake Michigan, may find access to markets in the populous cities of western America and Europe. The fertile shores of these lakes will therefore be rapidly settled, and all their natural advantages soon be brought into operation for the profit of mankind.

There are a number of other large and useful canals in this state, such as the Champlain canal, the Oswego canal, the Cayuga and Seneca canal, besides several others which are in progress.

Delaware and Hudson Canals.

A canal has been made to connect the rivers Delaware and Hudson, said to be one hundred and nine miles in length, with a rail-road attached of sixteen miles. The cost of the two was L.500,000, which was wholly expended by the New York merchants. It opens a conveyance for the coals and agricultural produce of Pennsylvania to the market of New York. The same two rivers are connected at a point farther down by a still larger work, called the *Morris canal*, which, like the former, is carried forward into the state of Pennsylvania, a considerable distance.

The Delaware and Chesapeake Canal.

This is a large canal formed by cutting across the upper part of a neck of marshy land which separates two large bays or firths, the Delaware and the Chesapeake. It affords an easy and quick water communication between two of the principal cities, Baltimore and Philadelphia. It is about fourteen miles in length, sixty feet broad, and ten feet deep, with a rise of eight feet only above the tide to its summit level. The largest schooners that navigate the two bays can pass through, and the work presents the greatest excavation ever attempted. The cost is estimated at 1,200,000 dollars, or L.270,000.

Navigation of the Potomac and Shenandoah.

The Potomac and Shenandoah are two noble rivers, leading far up into the country from the head of the Bay of Chesapeake. The navigation, however, is interrupted on both by rapids, which rendered them useless for the purposes of trade: these have been overcome by the construction of canals, and lockage at each of the rapids, by which the rivers are rendered completely navigable, and an inland navigation opened west of the city of Washington, of the extent of eight hundred miles. Many works of this kind have been completed, particularly in Pennsylvania.

The Chesapeake and Ohio Canal.

This canal was commenced in 1828. The proposed length is three hundred and forty-one miles; the breadth at the surface of the water, sixty to eighty feet; at the bottom, fifty feet; the depth of water, six to seven feet. According to the plan of this canal, it will pass from the tide-water of the Potomac, above Georgetown, and will terminate near Pittsburgh, in Pennsylvania. The cost was estimated at 22,375,000 dollars, or L.5,034,375; but it is not supposed that much more than half that sum will be actually wanted.

There is another important work commenced for connecting the western countries with the Atlantic—this is the Baltimore and Ohio rail-road, which is to extend from the city of Baltimore to the river Ohio, a distance of three hundred and fifty miles. It is now in progress, and is the greatest work of the kind—ten miles of it were open in 1832.

It would be idle in us to attempt here an enumeration of even a small proportion of the undertakings of this nature which have been executed in America. Wherever the navigation of a river has been impeded by rapids or the occasional shallowness of its bed, the obstacle has been overcome, if there were either useful minerals or fertile land to be made accessible. Along the banks of some rivers of this kind, canals have been carried for one hundred miles; as, for instance, the canalling of the Lehigh and Schuylkill, in Pennsylvania. Wherever two navigable streams flowing to different seas are separated by a ridge which it is possible to penetrate by a canal, the work is attempted, and the communication made complete from sea to sea. Examples of this are found in the Champlain canal, which is completed, and connects the Hudson and St Lawrence; and in canals between the Miami and the Wabash, the Fox river, and the Ovisconsin, which are both likely to be effected. It is not that the Americans are more generous or more patriotic than other people that they undertake these works; it seems rather to arise from a spirit of restless enterprise, which cannot be satisfied with turning to advantage the land within their reach, but must be always hurrying away to secure the resources of some new region which is supposed to be more fertile than any yet discovered. Another reason for the manner in which the Americans outstrip the British in this species of undertaking, ought to be mentioned. All great improvements in this country are impeded by powerful factions of men who thrive upon ancient systems, however absurd; whereas in America all classes seem to strive to improve the country on general principles of utility, without regard to antiquated usages. Whatever may be the cause, it has had the effect of opening up to the over-crowded population of Europe rich and inexhaustible countries to which they may emigrate for ages without filling them, but which would have been of little advantage without the channels of communication now opening by the Americans. The only other work of this kind we have room to mention is the

Ohio State Canal.

This canal is to pass from Portsmouth, on the River Ohio, to Cleveland, on Lake Erie, a distance of three hundred and nine miles. Of these, one hundred and nine miles are completed, and the rest under contract to be finished by a given time (1835). This canal will complete an unbroken line of communication from New Orleans, on the Bay of Mexico, up the Mississippi and Ohio, to Portsmouth, thence to Lake Erie; and, from this point, either to New York by canal, or down the St Lawrence to Montreal and Quebec. There is also in progress a canal from Cincinnati, on the Ohio, to effect the same object: this canal, in 1831, had been executed from Cincinnati to Dayton, sixty-five miles, and the remainder is in progress to join the River Miami, which falls into Lake Erie at Laurenceville. The whole length (including feeders) is two hundred and ninety miles. The general government gives donations of land to aid in the completion of these works.

SEA-COAST, LAKES, AND NAVIGABLE RIVERS.

Bays and Harbours on the Sea-Coast.

There are some countries which are deprived of the advantage of bays, harbours, and good protection for shipping. France, for instance, with a long line of sea-coast, has but few of these natural advantages; and a more remarkable instance still, is afforded by the coast of Coromandel in India, which has not one good harbour or bay where vessels might take shelter, along its whole extent. America is very differently situated in this respect: from north to south along the whole coast which fronts the Atlantic, the country is deeply indented with large navigable bays, which afford ready protection to her shipping, and give points of rendezvous to the trade of numerous rivers which fall into them. It would be needless to mention the whole of these: the smallest of them on the coast of India, where ships are exposed to all the hazards of an open sea, and lie off, delivering their cargoes by means of rafts or lighters sent backwards and forwards to the shore, would be reckoned sufficient to give wealth and importance to a large city. They are so numerous on the coast of America, that the commercial facilities of half of them cannot be taken advantage of: among the principal, are the Bay of Chesapeake, where the mouths (or firths) of several large rivers, the Susquehannah, the Potomac, the James, the Rappahannoc, &c., meet together, and concentrate the commerce of a large tract of country belonging to each. There is hardly another bay in the world which, by the rivers that fall into it, gives access to inland places so remote from each other. North from this is the Bay of Delaware, very little inferior to it in the facilities it affords for trade, and the communication its rivers (the Delaware, Lehigh, Schuylkill, &c.) afford with the interior. North from these is the Bay of New York, which affords an entrance to the large river Hudson, besides several others; and which, by means of canals, has now a communication with the St Lawrence, the lakes of Canada, and the whole fertile country lying on the banks of these, forming an extent of inland navigable waters larger than any other which is known.

The coast north from New York has the Bays of Providence, Barnstaple, Boston Harbour, Penobscot, &c., all of the greatest utility for shipping, and enabling the people to bring all the natural advantages of the country into operation for commerce.

To the south of the Chesapeake, in the slave countries, there are also many noble harbours, bays, and rivers, which, under circumstances more favourable to the moral and commercial improvement of the people, would give to the trade of this part of the Union all the facilities which have contributed so powerfully to the prosperity of the north.

Lakes.

The American states are bounded to the north by a chain of the largest fresh-water lakes on the globe, which are all connected together by one continuous river, called, after it leaves them at its lower portion or outlet, the St Lawrence. These lakes lie along the summit of a range of elevated ground, which stretches nearly across the continent, occupying certain deep cavities hollowed out on this summit level, and they receive the waters of all those small rivers which are formed on the flat region lying around them. The principal lakes are four in number, and are called (beginning from the eastward) Lakes Ontario, Erie, Huron, Michigan, and Superior; the navigation from Lake Ontario to Lake Erie is interrupted by the falls of Niagara, where that river (the same which is called the St Lawrence after it quits the lakes) is precipitated over a rock one hundred and sixty feet high. From Erie to Huron, vessels of large size pass uninterrupted, but the communication is again impeded in the channel which connects the two latter with Lake Huron, by the falls of St Mary's. At Niagara, a canal, called the Welland canal, has been formed by the British government on the Canada side of the river, which enables vessels to pass from Ontario to Erie without impediment; and the like will no doubt be performed by one or other of the governments, for the falls of St Mary, whenever the commerce upon these more remote lakes shall justify the expense of such an undertaking. The whole chain of these inland seas will then be navigable from one end to the other; and as their shores are all of great fertility, the region lying around them may be expected at some future time to be one of the busiest and richest on the globe. At present, as they extend along the northern limits of the United States, they afford to that inland boundary nearly the same commercial advantages as those possessed by a sea-coast, and give a sensible stimulus of the industry of all the districts connected with them. The following is a summary of particulars connected with the extent, depth, &c. of the lakes:—

Name.	Length Miles.	Width Miles.	Depth Feet.	Elevation above the Sea—Feet.
Ontario	180	40	500	231
Erie	270	80	200	565½
Huron	250	100	900	618
Michigan	400	50	unknown	618
Superior	480	109	900	641

None of the navigable rivers of the United States fall into the lakes, and there is no river that flows out of them over which that country has command, so that it would appear that the advantages it can derive from them are but limited. To remedy this inconvenience, which the Americans soon perceived and regretted, they have led canals from the most of their inland districts to the upper portion of the lakes; while from their lower shore (or that which is next the sea) they have conducted others, to give them an outlet to the ocean within their own territory. The navigation is thus rendered complete, from the shores of the sea at New York, by a canal, to Lake Erie; thence to Huron and Michigan; and from thence by other canals to the inland states of the west. We shall again have occasion to allude to this in mentioning the American canals.

Navigable Rivers.

The navigable rivers on the eastern side of America are numerous and important. We may first mention the Connecticut, a large stream flowing into the Atlantic near the north-east end of Long Island; the Hudson, a river navigable for steam-boats of the largest class for one hundred and sixty miles above its mouth, and the channel which has enabled New York to extend its commerce by a canal to the lakes: the Delaware, flowing past Philadelphia, and affording communication by itself or its tributaries with a country three hundred miles in length, and of nearly equal breadth: the Susquehannah, the Potomac, the James River, and others flowing into the Bay of Chesapeake, which, by the help of canals, afford entrance to vessels of one kind or other into the deepest vallies and recesses of the eastern country. Southward are the Roanoke, flowing into Albemarle Sound, and the Pamlico river, affording channels for the commerce of North Carolina; while South Carolina and Georgia are canalled in the most complete manner (if we may use the expression) by the rivers Pedee, Santee, Savannah, Ogeechee, Alatamaha, &c.; and East Florida enjoys the same convenience in the river St John's and its branches.

But the eastern rivers, useful as they are (and they have certainly as yet been the chief seats of commerce in the country), are by the Americans themselves entirely lost sight of in the enthusiasm of their admiration for the immense streams which water the western and inland states. These great rivers are certainly not to be equalled in any other country, at least in any country which has had such skill, or such a form of government, as have enabled its people to turn the commercial facilities of their inland waters to proper advantage. The American rivers to which we allude, are the Mississippi, and the large tributaries which arrive from the east and west to fall into the channel of that great stream, of which a description has been given in a former article.

MINERALS.

There is a great variety of useful minerals distributed through different parts of the states: coal may be mentioned among the first: it exists through all the country, lying north of a line drawn from Philadelphia to the mouth of the Ohio, and is particularly abundant on the upper waters of the Susquehannah, as well as on the Allegany and the Monongahela. At Pittsburgh there is a hill principally composed of coal, and it is found at many places in this district within a few feet of the surface. There are extensive coal-mines also on the Roanoke and Appomatox, in Virginia.

The country on the Ohio is particularly rich in mineral productions. The whole district is bottomed on limestone, on which rests the wide and valuable coal formation mentioned above, extending from the head waters of the Ohio, in Pennsylvania, to the river Tombigbee. Iron ore is found abundantly in the same district, principally towards the upper part of the Ohio; bog ore is found in the vallies of the Allegany chain; and various kinds of ores, of the same metal, are met with in the New England states: at one place, carbonate of iron is found, which, on being reduced, produces steel, and is called *steel ore*. Black lead, in beds of from five to six feet wide, traverses the states of New York, Jersey, Virginia, Carolina, &c. Copper ore is found in Virginia, in Connecticut, and in New Jersey: it exists also in the neighbourhood of the lakes, and a piece of pure malleable copper, weighing three pounds, was found in Illinois.

Gold mines have been traced extending through a large tract of country in the western parts of Virginia, North and South Carolina, and Georgia; they are wrought to considerable extent, twenty thousand men being employed at the different workings; the miners, who are people of all countries, say that the produce is richer than that of any other mines on the globe; one piece of pure gold was found weighing twenty-eight pounds. The annual produce is about one million sterling; but we have not heard what proportion of this is expended in the work, or what actual profit has been realised. One singular fact is remarked concerning these mines, which is, the indubitable evidences found that they have been wrought at some period before America was known to the Europeans. Many pieces of machinery which were used for this purpose have been discovered in the workings, among which were several crucibles of earthenware, which are far better than those now in use.

Silver and its ores are not of frequent or extensive occurrence. Mercury has been found native in Kentucky, but it occurs plentifully in the ore as bituminous cinnabar, through the Ohio and Michigan territory. It is found in the soil as a black or red sand, sometimes as a fine red powder, and at other times in iron clay. There are lead mines of vast extent on the Missouri; they are said to occupy a surface of six hundred miles in length, and two hundred in breadth. One miner will raise about two thousand pounds per day, which sell for forty-five dollars, and yield twelve hundred pounds of pure lead.

Epsom salts, Glauber salts, and nitre, are found in Ohio and Indiana; the two latter in caves, the former in a thin layer on rocky surfaces. Salt, which in countries far removed from the sea is an article of great expense, is produced from salt-springs, or from borings in different parts of the western country. Mineral waters of valuable medicinal qualities occur at several places; the springs principally frequented are those of Saratoga, in New England. Oil of vitriol, or sulphuric acid, is got almost pure from the earth, in Genessee, near the town of Byron. It oozes out from the soil of a low hummock, and may be collected by digging holes in the ground. There are several places where inflammable gas issues from the earth: one is a small lake called Sodem, the bottom of which is formed of grass-green slate, the sides of white shell-marl, and the brim of black mould; the water is uncommonly transparent, so that the basin looks like an immense porcelain bowl; the water is of the quality of that of Harrowgate; the gas issues from it abundantly, and, when kindled, burns along the surface with a bright red flame by day-light.

GEOLOGICAL PECULIARITIES.

In examining the geological structure of the American continent, some singularities have been observed, which are believed not to correspond with the theories formed in Europe on this subject. We shall mention a few of those which appear to be most interesting. There is no chalk found any where in the states, neither is there any roestone (or oolite, as it is called by geologists), though the localities where both might be expected are sufficiently marked. Mr MacLure states, that some shells of the recent alluvial formations in New Jersey are identical with species found in the secondary rocks. There have been discovered in naked limestone of the elder secondary formation, the prints of human feet; the marks are those of a man of ordinary size standing erect, with his heels drawn in, and his toes turned outward; the toes are much spread, and the feet flattened, like those of people not accustomed to shoes; the impressions are strikingly faithful, exhibiting every muscular swell and depression with accuracy. Every thing seems to warrant the conclusion, that these marks were made at a time when the rock was soft, and received them by pressure, which geology dates at a period very long indeed before the general flood. They were examined by Governor Cass and Mr Schoolcraft, at St Louis and Herculaneum, on the Mississippi, and they exist also at the Cumberland mountains, always in the same kind of limestone. Other singular facts (unconnected, however, with the above) have been observed in this district. At Pickaway plains, on the Ohio, a human skeleton was found seventeen feet below the surface, in a bed of pebbles and shells deposited by water, and having nine feet of earth over them. At Cincinnati, in digging a well, an arrow-head was found ninety feet below the surface; and in Illinois, fragments of antique pottery and jars of coarse earthenware have been found at a depth of eighty feet below ground. In forming the Erie canal, the workmen, when digging this ridge of gravel, found several hundred living shell-fish at a depth of forty-two feet. They were chiefly of two kinds of *mya*, a salt-water mussel, of which several species exist in Britain; one, called *smurslin*, is used for food in Zetland, and another is eaten about Cork, where it is called *sugar loons*: we do not know if the species which were dug out of the gravel are found among the present American shell-fish. *Living toads* have been found in America, as here, in solid rock, of what has been called the mill-stone grit.

PECULIARITIES OF DIFFERENT DISTRICTS.

America is generally considered and spoken of as one country, its people as forming a single nation, and the remarks which are made with regard to one part of it are supposed to be equally applicable to all. No idea, however, can be more fallacious. The region which we term the United States is composed of sections of country as remote from each other as London is from Constantinople, or Madrid from Berlin; they lie under different climates, and the different circumstances under which their inhabitants are placed form in each a totally different set of manners. The English language is common to all, and they all profess the Christian religion; but in most other respects the difference between them is as great as between any two European nations. The great divisions under which the country ought to be viewed are the north-eastern or New England states, in which for the present may be included Pennsylvania; 2d, The southern or slave states, to which section also we may refer Kentucky and Tenessee; and, 3d, The new states of the west, which are in progress of settlement. The manners of the New England states are formed on the model of those of our own country, and there are few circumstances in the nature of the climate which tend to produce any material alteration; it is among them only that due provision is made for the education of the people or for religious instruction. The productions of the soil—the modes of agriculture—the arts and occupations to which these give rise—the alternations of season—and many other things, have all a resemblance to those of our own country. They cultivate wheat and the other European grains; their garden vegetables, potatoes, turnips, carrots, cabbages, &c., are the same as ours; they employ the same domestic animals; and they use, of course, the same agricultural implements, the same grist-mills, &c., requiring also the same tradesmen to prepare and work them

Even in these great divisions which we have pointed out, there are portions which differ exceedingly from each other. New Orleans, for instance, which belongs to the slave states, has a completely different set of manners from Charleston in Virginia: the former is a city of immense trade, situated at the mouth of the great river Mississippi; it contains a mixed population of blacks of all shades, and of white men from every nation in Europe. Its streets are crowded and speckled with people of every colour; its quays with ships of every country; and its wharfs are loaded with bales of goods from all quarters of the earth, some coming from Europe or from China, to be carried for three thousand miles up the inland rivers of America; others sent down these rivers some months' voyage, to be carried to the West Indies or the Mediterranean. The air of the place is unwholesome, and it is a mart where people hurry to make money before they be overtaken with disease and death. Such are the influences under which the manners and character of the people of New Orleans are formed. Charleston, on the other hand, is the capital of a wealthy agricultural state; the pursuits of the people are not decidedly commercial; the town is the resort of numerous country gentlemen, who pride themselves rather on the oldness and respectability of their families, and the extent of their property, than on the activity of their business habits. The gentry strive to keep up, between themselves and their slaves, an exterior resemblance to the feudal relations of Europe; coats of arms are fashionable, as are liveries for servants: there is a general air of elegance and splendour in the buildings of the town; some of the houses "are real palazzos, surrounded with orange trees, magnolias, and other trees of an almost tropical climate." There is much taste for the fine arts among the higher classes, and among the lower an absence of all that bustle and variety of language and dress, which mark a great commercial city. It is obvious, therefore, that the manners of these two places can have very little in common.

If we look again at the northern states, we shall find a difference of a similar kind existing between New York and Philadelphia. The former city is the great thoroughfare of all emigrants and commercial agents who arrive from Europe; the people passing through it daily are sometimes estimated at 15,000 or 20,000; it lies at a central point, having communication by rivers, canals, and rail-roads, with the whole northern parts of the American continent. Grain, provisions, lumber, and manufactures, are brought from countries a thousand miles inland, for exportation, or for the use of places along the coast, which have not the same facility of conveyance. People arriving there are secure of finding a passage to every other city inland or coastways; hence the streets and quays are constantly crowded with travellers and their luggage. The extent of its commercial transactions gives a facility to those who wish to engage in any kind of speculation, because here they can always learn the prices or the demand for every article of American produce; hence there is a restlessness, bustle, and continual spirit of change among its population, or a great part of them, which it would be vain to seek elsewhere in Europe or in America. Philadelphia, on the other hand, though also a place of very extensive commerce, has fewer channels of communication with the distant inland countries, and has of course a smaller variety of produce either raw or manufactured; hence there is less speculation; business proceeds with more steadiness, but less apparent bustle; there is in the streets an air of quiet regularity, where every one seems to go easily and leisurely about his business; and the transit of strangers through the place is but inconsiderable. The prevailing religion, which is Quakerism, has also a manifest influence in producing these effects. The influence of circumstances upon the manners of a people is nowhere more remarkable than it is here in the case of the negroes. Slavery is not permitted in this state; and the inhabitants do not countenance in all its severity that feeling of contempt with which black people are regarded in other parts of the Union; hence the Africans reside here in freedom and comfort, while they see their countrymen, a few miles to the southward, poor degraded slaves, and they are generally in consequence a contented, cheerful, and industrious caste.

If we look again at the western states, we shall find, that, though there is a certain uniformity of manners over the whole, they are here also differently modified, according to circumstances. Pittsburgh, for instance, with the neighbouring towns, Wheeling and Steubenville, are in the centre of a country which is rich in various kinds of minerals, coal, iron, lime, &c.; they are therefore filled with a manufacturing population, and the pursuits, appearance, and manners of their inhabitants, differ from those of the country around them, as those of Birmingham may be supposed to do, from other places in the centre of England. The town of Cincinnati, again, which is situated on the Ohio, as these places also are, is a great inland depôt for merchandise to be exported or imported. Its inhabitants are merchants, attendants in counting-houses and warerooms, owners of river steam-boats, and a population attracted by the general trade of the place, while there is also a large number who are occupied in the very peculiar business of killing and preserving for exportation the immense quantities of live stock reared in the country.

CLIMATE, SOIL, AND NATURAL PRODUCTIONS.

The state of Maine, which is the farthest north of the Union, reaches to latitude 48°; Florida, on the south, extends to within 25° of the equator; between these two points there is a great variety of climate; and the differences of temperature are increased by the flat or sheltered situation of some districts, and the mountainous features of others. The New England states and Pennsylvania, lying between 40° and 48° north, approach nearest to the climate of England; but owing to causes which are not yet perfectly understood, the whole Atlantic coast is warmer in summer and colder in winter by about 10°, than the same latitudes in Europe. Some of the plants of this country, such as the holly, and the common *whin* or furze, when transplanted thither, fade equally under the heats of summer and the frosts of the cold season, and cannot be preserved except in green-houses. In winter the rivers are frozen, so as to bear horses and waggons. The air is in general drier than in this country, and wet showery weather much less frequent; so that farm-work is conducted with more regularity and more security than with us. Winter does not set in till the middle of December; after which, frosts continue with more or less severity till March, with frequent and great changes from mild weather to intense cold. In April the season becomes again fine, sunny, and dry.

In the states south of the Potomac, the climate is much warmer; the winters, which indeed are hardly to be called winters in our sense of the word, are short and mild, frost being little felt except during the night. The heat of the warm season is like that of tropical countries; but this is felt chiefly on the sea-coast, which is in general low, flat, and far from healthy. The inland parts being more elevated and hilly, the climate there is more temperate. The whole coast from north to south is subject to tremendous hurricanes, which sometimes do much mischief.

The climate of the western states, forming what is called the Basin of the Ohio, is different both from that of New England, and from the southern districts in the same latitudes. The *average temperature of the year* is nearly the same at corresponding points on both; but there are fewer inequalities in the west, neither the heat nor cold reaching the same extremes. The thermometer seldom falls more than ten or twelve degrees below the freezing point. Frost does not become permanent till near the close of December, when standing water and small rills are frozen from three to fifteen days. Many plants, such as the cotton, the catalpa, sassafras, the Illinois nut, flourish in the western states, in latitudes where they would not thrive on the sea-coast. The air is more moist, fogs and heavy dews more common.

Soil.

That portion of the New England states which lies east of the river Hudson, is broken and hilly; the soil in general thin, unproductive, and better adapted for pasture than tillage. From New York, all along the sea-coast southward to the Mississippi, there is a tract of flat sandy soil extending inland from thirty to one hundred miles; it produces nothing but shrubs and pine-trees, except on the banks of rivers and marshy places, where rice is grown. Backward from this line to the foot of the Allegany Mountains, there is a tract of coarse land of variable breadth, but of great fertility. The Alleganies themselves are not cultivated, but the vallies between their ridges are rich and useful land. The district inland from these is the Basin of the Mississippi, a region of vast extent; it is generally bottomed on limestone, well watered and inexhaustibly productive.

Agricultural Productions.

Oats, rye, and barley, are raised in all the northern states, and also in the hilly districts of the south. Of barley, two crops in a season are obtained in favourable situations. Maize is common to every part of the Union, but thrives best in the middle states; it is a vegetable adapted to a greater variety of soil and climate than wheat, and yields a much larger produce. The sugar maple grows every where, but thrives best in the good maize districts. Wheat is also cultivated through the whole Union; but it is only a profitable crop to the north of the Potomac, or in the hilly districts of the south; in these situations it yields large returns, and of excellent quality: in the low warm districts it is not cultivated; these are more favourable to the rice crop. In general, it is remarked the late wheat countries are favourable to the European constitution, and that in rice countries, which are warm and moist, the African population has a great advantage in respect to health and longevity over whites.

The cultivation of tobacco begins in Maryland, in latitude 39°; it is raised to a greater extent in that state, and in Virginia, than in any others of the Union; but it thrives also in all the western states. Cotton does not succeed well farther north than the latitude of 37°, though some of the districts raise it for domestic use; it forms the staple of all the districts south of the river Roanoke. The best kinds grow in South Carolina and Georgia, in dry situations, upon the sea-coast. The cultivation of rice occupies nearly the same region as that of cotton; it is a very unhealthy occupation for the slaves who are engaged in it. The climate which is favourable to sugar does not extend beyond the latitude of 32°; it is raised in the states chiefly for domestic use, and is not an article of export to any extent. The crop is rather precarious, from the frosts which sometimes occur even in the most southerly districts. Indigo has been tried in America, but could not come into competition with that of Bengal.

The vine grows spontaneously in most of the southern and western states, and is cultivated as a fruit about Philadelphia. The mulberry-tree, hops, and hemp, all succeed well in the middle and western states.

The timber trees of the states are of numerous kinds, and many of them of the best quality. There are twenty-six kinds of oak, of which eleven or twelve species are in request; the best for common purposes is the *white oak*, a tree which is found plentifully over the whole country: the *live oak* grows in marshy places near the sea, and has a hard, heavy, and durable timber, much used for ship-building. There are eighteen kinds of pine, cedar, and larch; seven kinds of maple, three or four of which furnish sugar; the best is called the sugar maple; ten kinds of walnut trees; four kinds of birch, the bark of one of which furnishes the Indians with canoes; six kinds of ash (the ash of this country is not of the number); besides many other trees, of very useful qualities. There are one hundred and thirty kinds which rise to a height of more than thirty feet; while in France there are only thirty-seven of that size. The flowering shrubs, *Kalmia* and *Rhododendron*, which are cultivated here with so much attention for their splendid flowers, grow wild on the sides of the American hills, to the height of fifteen or twenty feet.

Even in the most thickly-peopled states, there are still remaining large tracts of uncleared woodlands, which give the country a wild appearance, and form an aspect on the whole very different from any thing seen in Europe, where forests have long been too valuable to be allowed to remain uncut.

RATES OF PROFIT, WAGES, AND STYLE OF LIVING.

There is abundance of fertile land in the United States, which needs only to be broken up and cleared of woods to yield large returns for a slight outlay. There are none of those obstacles to the cultivation of solitary districts which exist in the lawless or unimproved condition of some other countries. Property is secure every where, and there is hardly any spot, however remote, which has not ready communication by rivers, canals, or roads, with one or other of the large cities. Hence, fertile lands which are of easy access are to be found by every one who is at a loss for employment, or who thinks his present occupation less profitable than he would wish. On such soils, the accumulation of capital in agriculture is much more rapid than has ever been exhibited in any other nation. The valuations of 1799 and 1814 furnish interesting information on this head. From these it appears, that, in the fifteen years between these periods, the value of lands and houses (not reckoning slaves) in the seventeen states, had, on an average, increased one hundred and sixty per cent., or from a hundred to two hundred and sixty. The rate of increase for the whole is about 6¼ per cent., and the original capital is doubled in about eleven years. At this rate, capital accumulates more than twice as fast as population; or in other words, the increase of the people is always met by a double increase of the means for employing and maintaining them. These remarks are derived from the condition of the agricultural population; but they apply equally to the whole, the rate of profit being the same in all occupations. No man will submit to take small wages, or to carry on business with slender profits where he can betake himself to farming, with the certainty of acquiring, in a few years, an independent property, especially where agriculture requires as yet no particular skill or apprenticeship to secure adequate success. The legal rate of interest is seven per cent.; and when money is lent for commercial speculations in the western states, ten per cent. is reckoned favourable terms. The average price of labour was reckoned in 1815 at 80 cents, or 3s. 4d. per day; wheat at 1¼ dollar, or 6s. 9d. per bushel (27s. per boll); and at these prices, it has been computed that a labourer can earn as much in one day as will maintain himself, his wife, and four children, for three days nearly. Hence the style of living among all classes is full and liberal; there is less perhaps of that princely but invidious magnificence, which, in the palaces of Europe, is so often beheld surrounded and besieged with the importunity of beggars; but there is an equal distribution of comfort every where. The houses of the middle classes are well and conveniently furnished. As a specimen of the way in which they live, we may mention, that a man who pays 13s. 6d. per week for board, lodging, and washing, dines at the family table, where there is a roast turkey once or twice a-week, fowls, beef-steaks, ham, sausages, pudding, pies, soup, fish, &c.; a variety of these are given at every meal, and generally three kinds of vegetables, with coffee or tea at breakfast and supper.

A beggar is scarcely to be seen; but there are persons in all countries, who, from age or bodily infirmities, are unable to support themselves. In America, these are reckoned on the sea-coast at one to two hundred and thirty of the population; in the interior at one to three hundred and fifty, most of them foreigners, or worn-out negroes. In England, the proportion is one to six or seven of the population.

POPULATION OF THE STATES.

The rapid increase of population in the United States is one of the most interesting circumstances connected with their history. When the general style of living among any people is comfortable, and they continue at the same time to add rapidly to their numbers, it is a proof that their country affords abundant resources for subsistence, and that they have industry and skill to turn these to good account. England doubles the number of her people in about one hundred years, Scotland in one hundred and fifty, in America they are doubled in about twenty-five years; and it is reckoned, that, by the end of a century from this date, if the same increase continues, the American population will be more than two hundred millions; a number greater than that of any nation at present speaking one language on the face of the earth. From the rapidity with which successive generations come forward, it is generally remarked that the number of aged persons in any neighbourhood appears small compared with the multitudes of young people by whom they are surrounded; and from the same reason the number of individuals below sixteen, who in other countries form hardly a third of the population, are in America fully one-half of the whole. In Carolina and Kentucky, the number above sixteen was considerably less than that of those under it.

The population at successive periods has been given as follows from the official census:—

			White People.	Blacks.
Population	in	1790	3,929,328	697,697
„	„	1800	5,309,758	896,849
„	„	1810	7,239,903	1,191,364
„	„	1820	9,638,166	1,538,001
„	„	1830	12,856,177	2,010,436

These returns show an average increase of thirty-three per cent. in ten years; a rate incomparably greater than has ever been witnessed in any other country. The number of persons who come from Europe to settle in the states is estimated variously, from 8000 to 20,000 yearly; the most accurate accounts incline to the former statement. The number of foreigners not naturalised who were residing in the states in 1830 was 53,687; and as these persons cannot be naturalised till they have been five years in the country, this amount, with a little deduction, may represent the arrivals during the last five years, which will therefore be about ten thousand per annum.

The census for 1830 gives the number of persons who have attained the age of one hundred and upwards, as follows:—

White men above one hundred . .	297
Ditto women	234
Black people—men	1099
„ „ women	1011
	2641

The proportion of black people who live to great age appears therefore to be much higher than that of the whites. This advantage the African race seem to possess chiefly in the southern districts. In ten of the states south of the Ohio and Potomac, the whole number of white inhabitants was five and a half millions, the number of blacks one million and a half (nearly); yet of the former only three hundred are above one hundred years of age, while of the latter there are 1780—a circumstance which shows that the climate of the south is better fitted for the negro constitution than for that of white people. Of the latter, only one in nineteen thousand arrive at the age of one hundred; while of the Africans one in every nine hundred reaches that age. On the subject of longevity we may mention, that, in August 1817, within a circle of twelve miles in diameter, in North Carolina, there were living sixteen persons between eighty and ninety years of age, twelve from seventy to eighty, and twelve from sixty to seventy. A child was lately born there whose father was eighty-four and mother fifty-seven years at the time of birth (*Warden's United States—Walsh's Register*). In Cumberland county (Virginia), seven persons died between the ages of ninety and one hundred and twelve years, within a short time of each other. In South Carolina it is remarked, that all who could be found above eighty (1808) were emigrants from Europe, and living in the upper hilly country.

THE COLOURED POPULATION.

Slaves.

The states which continue to support slavery are those which lie south of Pennsylvania and the river Ohio, with the new districts to the westward of the Mississippi; in all the others it is abolished. The whole number of slaves in 1830 was two millions. The condition of these poor people is every where very low; the field slaves are fed, lodged, and attended to, exactly on the same principle as that on which farmers in this country take care of their oxen and horses; a planter is sorry to see them dying or diseased, because he loses their labour; but they meet with no farther regard. It is frequently profitable to cultivate rice in very marshy grounds, or in fields artificially overflowed, where the negroes must work up to their knees in water in the heat of the day. Numbers of them take sick and die in this unhealthy occupation, but the planter only calculates whether the profits of his crops will pay for the number of new negroes which he is obliged to buy; he never thinks of the distress of these poor people, and even takes credit to himself in being liberal in sacrificing his blacks, in order to keep those rich grounds in cultivation which otherwise must be lost to the country. Mr Stuart of Dunearn mentions that even where the slaves were well fed and attended to (as it is the interest of every proprietor to do with his cattle), he found them, in respect to knowledge and feeling, little removed from brutes, while all declared themselves unhappy and miserable in their situation. When their tasks are found deficient, they are whipt, put in the stocks, or forced to wear irons. One person was in the habit of punishing his slaves by [illegible]ing them down in coffins, and some of them had died under that treatment. The cruel owner might have been punished by law had there been sufficient evidence of the facts; but as he took care to have no one present but slaves, whose testimony is not admitted in the courts, nothing could be done.

The gangs of slaves on large estates are in general tolerably well fed and clothed; but there is a numerous class of slaves belonging to very poor, and often very improvident, white people, and these are exceedingly wretched, toiling hard, with little subsistence and the harshest treatment. In all cases, the slaves live together with little more feeling of the decencies of life than the brutes that perish. Even when they are employed as waiters in the large inns and hotels of cities, they are not furnished with beds, all lying like dogs in the passages of the house. There are laws by which every one who shall teach a slave to read, or permit him to be taught, may be imprisoned for twelve months. The advantage of having labour performed by slaves, is to the proprietor very considerable: they are maintained at an annual expense of about thirty-five dollars each; while the interest on their original cost, at ten per cent., may be forty dollars; the amount is seventy-five dollars, or about L.17 per annum. Now, the wages of a white labourer are here three times as great as in Europe, and cannot be reckoned at less than five hundred or six hundred dollars, from L.120 to L.150. It is no wonder, therefore, that the proprietors of slaves in America are jealous of any attempts to instruct or emancipate them.

Free Blacks and Coloured People.

From the black people having been first introduced into America as slaves, they are regarded every where with great contempt, whether free or in bondage. In the states where slavery remains in force, the free negroes or mulattos are treated with the greatest contumely; every impediment is thrown in the way of their obtaining education; and the senate of Virginia even voted that the increase of schools for coloured people was a nuisance which ought to be put down; by laws in the several states, any one who may instigate them to resent this ignominious treatment, or in any way to diminish the respect which is commanded to free people of colour for the whites, may be punished by fine and imprisonment. Clergymen in their pulpits, and judges on the bench, are not exempted from this regulation. But even in the free states, though laws of this kind are not in existence, people of colour are subjected to every mortification: they are not allowed to eat at the same table with white men, to attend at the same public meetings, or even to enter the same churches. From being thus always exhibited in a kind of degraded light among the more powerful class, they have not the same respect for themselves which they ought to entertain. Of the persons who are punished for crimes, a larger proportion are people of colour than whites. They have a greater difficulty in getting proper remuneration for their industry or talents than that favoured class; and their exertions are discouraged in all the higher lines of life. Numbers of them, however, notwithstanding all these difficulties, rise to great wealth, and live in a style of much elegance. They have churches and schools for themselves, with ministers and teachers of their own people. Great exertions are making by the Quakers, and other benevolent persons in the free states, to establish and maintain respectable schools for the education of black children. As the memory of their former slavery wears away, they will come to be regarded in a more favourable view. The whole number of free-coloured persons in the states is about 300,000.

The Indians.

The number of Indians now remaining within the territory of the states is estimated to be somewhere between 400,000 and 600,000; of these, about 75,000, consisting of tribes called Cherokees, Creeks, Chickasaws, and Choctaws, are in possession of tracts of land lying contiguous to each other in Georgia, Alabama, and Tenessee. There have been some disputes concerning their territory, and some of the adjoining states have used very despotic means to have them ejected from it: they still, however, retain possession; and as any violence done to them directly would excite much odium both in Europe and among well-thinking people in the states, they are likely now to remain undisturbed. They have quite renounced the character of savages, and are all more or less in progress towards civilization; they cultivate wheat, maize, pumpkins; rear cattle and horses; manufacture cloth, oil, leather, &c. The tribe which has made the greatest advances is the Cherokees, whose population, in 1824, was 15,560; in 1810, it was 12,400, so that they are not falling off in number like the other Indians. They possess a fine, well-watered, and arable country of five millions of acres; agriculture is well understood; apple and peach orchards are common; butter and cheese are produced of good qualities: they have slaves, good horses, and about 22,000 head of cattle. Several of them are good tradesmen, as blacksmiths, weavers, millers; and they have saw-mills, grist-mills, waggons, and other furniture of an improving community. They have a newspaper edited by one of their own people, in their own language. Numerous and flourishing villages are seen in every section of the country. They are remarkably clean and neat in their persons, and practise bathing universally. A young man solicited the hand of a young Cherokee woman: she refused his offer, and gave as a principal reason that he was not clean in his appearance; that he did not, as the Cherokees do, bathe himself in the river. They consider bathing and cleanliness in the light of a moral virtue.

The Choctaws, Chickasaws, and Creeks, have not been so much noticed as the Cherokees; but they, too, are in a satisfactory progress towards civilization. They have good orchards and corn fields, and some of them are the owners of inns or hotels on the roads through their country, which are found, we believe, to be very comfortable places of entertainment to travellers. There are a few books in the Choctaw language; and the Creeks produce very neat articles of pottery, jars, vases, &c., and pipe-heads of black marble. Their ploughs, spinning-wheels, &c., are a farther proof of their thriving condition, and the growth of economical habits.

The Indians in the northern part of the states, and along the lakes, retain much more of the idle unsettled habits of their ancestors than the southern tribes; and those of them who remain near the white settlers are little superior in appearance or character to the gipsies of Europe. Reserves of land have been set apart for them out of their former hunting grounds, and in many cases these have been entirely surrounded by the farms and settlements of the whites, the Indians still remaining in their original patch of forest. In this state, they appear to be like animals of prey under confinement; their natural occupation is taken from them, and they seem to have no powers for any other. Their numbers are found to be smaller upon every enumeration; and their idle, uncomfortable way of living, with the disrespect which is every where shown them by the whites, tend greatly to prevent any spirit of union among them, or any steps to prosperity. Some few of them have settled into agricultural communities, and have built houses, churches, &c.; others have submitted for a time to the instruction of missionaries. But as this adds nothing to their respectability among their own people, who prefer a good hunter to a good mechanic, they have seldom the steadiness to persevere.

GENERAL REMARKS ON AMERICAN MANNERS.

There are perhaps some national traits which may be stated of the Americans generally, and which pervade all the districts: one of these is, that among white people, there is not that deference paid to rank or wealth which is reckoned their natural right, or at least are claimed for them as such in Europe. The demand for work-people is always so great that masters are glad to get them at whatever price; and on this account the men themselves feel much greater independence of their employers; while the employer, on the other hand, is much at a loss if at any time he offend the workmen. This circumstance modifies the whole intercourse between man and man, among the white inhabitants of America. Labourers very generally sit at meat with their masters; and in families the whole establishment, masters and domestics, eat at the same table. The American working people seldom, however, bring up any of their children as house servants, which among them is reckoned a degrading employment; and if any of them submit to act in that capacity, they will still not allow themselves to be called servants, but are denominated *helps*. The name "*master*" is also disliked; and an employer is generally called *boss* in preference. In consequence of this unpleasant kind of feeling, which imposes a sense of degradation on one party, and of constraint on the other, white people are as seldom as possible sought for as house servants; these are generally blacks or mulattos, who are not allowed any where in the states to eat with white men, and who therefore never think of it, nor feel hurt about it, when in service. The difficulty of getting servants, and the high rate of wages, leads every one, as far as possible, to do his own work. A gentleman of considerable property goes to market, and brings home a turkey for dinner; if he even mend his own shoes, it is not thought anywise strange. Judge Marshall (Chief Justice) used to carry home his dinner in his hand, and no one appeared to think it unbecoming.

In their domestic manners, there are some peculiarities which may be mentioned. They live a great deal in large boarding-houses, or hotels, instead of having homes of their own; and travellers passing through the country, in stopping at any town, have frequently the opportunity of dining at the inn with a great part of the respectable persons of the place. Work-people adopt very generally the same mode of living; and there are houses in the different towns where as many as forty or fifty board and lodge together, paying at a certain rate per week or month. Even young married people frequently live in this way for some years, not troubling themselves with a separate establishment till it be absolutely necessary for their family. Marriages are generally a great deal more early with them than in this country; a circumstance which contributes to this practice of boarding, as young people, though they have always abundant employment and subsistence, cannot till after some time accumulate sufficient for furnishing a comfortable home. We have Mr Cobbett's authority for stating that long courtships receive no countenance from young ladies in America; females of every rank very quickly dismiss a lover who requires time to make up his mind. It may be noticed here that women every where receive the greatest attention, both in their families and when they have occasion to go abroad. Captain Hall, who seems at one time to doubt concerning this circumstance, says in another, "it is a rule which we saw universally attended to in America, never to think how men shall fare, till every female has been fully accommodated." As a proof that the same feeling exists among the working classes, we may mention, that, in farming establishments, the females are never asked to do any work out of doors.

There are certain laws in the United States which have a peculiar influence on the manners of the country. It is not, for instance, allowed for a rich proprietor to leave the whole of his wealth to any one of his children; the laws direct that it shall be divided equally, or nearly so, among the whole. Hence large properties are broken down, and the aristocracy of landholders, the most important class in all other countries, have no existence in the states. As it is this class which in Europe gives the tone to a great many of the observances and even feelings of society, the want of it in America has a powerful influence in forming a set of manners different from ours: the farmers there are almost universally the proprietors of the land which they occupy, and it is seldom very extensive. They have no rents to pay, and they cultivate only the best soils; hence they have always large returns on their outlay; and though few of them acquire great fortunes, the majority are in easy circumstances. Some of the southern planters, who are the richest *class* in the United States, have incomes as high as L.18,000 or L.20,000 per annum; many have from L.3000 to L.5000, but the incomes of the majority do not probably exceed L.700 to L.1500 per annum. The next class to the planters, in point of wealth, are the great merchants in the commercial cities, some of whom possess fortunes of L.250,000; these, however, are not numerous. As none of these sums are, however, equal to the large fortunes which are inherited in Europe by the accumulations of several generations in one person, it is evident that there cannot exist in America those clubs of enormously wealthy individuals, who have such a powerful influence in all the affairs of the older countries. Extensive concerns and great establishments, which in other countries are supported by single individuals, are here carried on by joint-stock companies: not only is this the case with banks and canals, but with mills, steam-boats, woollen, cotton, and iron manufactories. The shares in the stocks of these companies are generally small, and they afford a ready means for mechanics, labourers, and persons of all classes, investing their savings with advantage.

From the comfortable circumstances in which people of the middling classes generally find themselves, there are not the same restraints upon their moving from place to place, to improve their circumstances, as there are in Europe. Young persons have never the apprehension, for instance, of leaving their parents destitute, or dependent upon others, which often keep them at home with us. Married people, again, with a growing family, have generally a sufficient stock to enable them to move away with all their children, and take a long journey in whatever direction they may see a prospect of thriving. In England, where they have hardly a sufficiency from one day to another, this would be impossible; and hence the small number of working people in this country who are able to transport themselves to take advantage of the higher wages and better living of America. The journey by canal, river, and lake, to some of the back settlements there from the coast, is more expensive than that of an English family would be to Halifax, and the improvement of circumstances hardly so great; yet how few in this country, to whom this improvement would be the greatest, are able to take advantage of it! This power of shifting their place, and seeking to better themselves, has had a more peculiar effect upon the character of the Americans than any other circumstance. They have less of that superstitious attachment to one spot than is found in poorer countries, where the people cannot leave it: families think little of a journey of some hundreds, or even thousands of miles; and the numbers who are continually moving with their luggage, has made the opening of new canals and rail-roads to distant parts more profitable than it could have been in any other country.

RELIGION.

All forms of religion are equally favoured by the state in America, and the members of all have equal privileges. None of the clergy are paid by government, or out of public property, in any shape; they depend for their salaries entirely upon the congregations for which they officiate, and by which they are elected. The bishops, ministers, elders, or other officers, are chosen by the members of each persuasion, according to their several forms of church government, without the intervention of any other party. There are a great number of different denominations of Christians in America; the principal are the same as in this country, consisting of Catholics, Protestant Episcopalians, Presbyterians, Quakers, and the various classes of Independents. In some of the states there are certain denominations more prevalent than others. New England, for instance, was settled by the Puritans in Cromwell's time, and its religious condition bears the impress of that origin. Maryland was colonized by Roman Catholics, who are still numerous there; Pennsylvania by the Quakers or Friends; while Episcopacy prevailed in Virginia, the Carolinas, and Georgia. The first Presbyterians came from England, Scotland, and Ireland, and settled in Delaware and New Jersey. If the whole population of the states were divided into twelve parts, three of them would be Calvinists, chiefly of the Independent and Presbyterian sects; two Baptists; two Methodists; one Episcopalians and Lutherans. The rest include persons of many various forms of belief, and a considerable number who follow no religious profession.

There are about sixty colleges and seminaries for the education of young men devoted to the church, of all the different sects. In New York, it is found that there is one clergyman to every 1384 of the population; in Pennsylvania there is one to every 1123; in Kentucky, one to every 1377 of the white inhabitants. In Great Britain, the proportion is one to every 800 or 900—in Europe generally, one to every 1000. It must be recollected, however, that in America this whole number are actually employed in the ministry; there are none of them who are merely dignitaries, or who hold offices without labouring for the instruction of the people: this renders the proportion of actual religious teachers greater than at first sight it appears, when compared with the number of clergymen in European countries.

These remarks apply chiefly to the old settled states of the east and north; and on this subject we beg to give the following extract from the work of a recent traveller of our own country, Mr Fergusson of Woodhill:—

"The religion of the states is marked by some peculiar features. It has been too frequently disgraced by wild and extravagant fanatics, and Unitarianism has in many places made dreadful strides. Still, the conclusion to which I have come is favourable to the growth of pure and vital Christianity in the populous and civilized portion of the states. I observed, in public and in private, a decent observance of the Sabbath. The official papers of the government uniformly recognise the superintendant care of a beneficent God. No shops were to be seen open on the day of sacred rest, still less were the theatres or places of public amusement; public travelling was not in general use, and the transmission of the mail on that day had been debated in the preceding session of Congress, when the question was lost, chiefly on the ground that the constitution forbade any interference by government with matters of conscience. There can be no doubt, however, that Sabbath profanation is practised in some quarters to a great extent. As regards the fruits of religion, there can be little question, that, taking them as a people, the citizens of America are virtuous and exemplary. Conjugal infidelity is extremely rare, and, in more than one of the states, is visited by fine and imprisonment. In the large cities, at least of the middle and northern states, vice does not stalk abroad in that disgusting form which may be said to deprive respectable females in European towns of the free enjoyment of our public spectacles and walks."

We give one more extract on this subject: it is from Mr Stuart of Dunearn:—

"We went to attend divine service at Mr Stebbings' church. He had gone from home, and was unavoidably detained; and the person who had promised to officiate for him failed to appear, in consequence of the morning being stormy. The congregation assembled—a pause ensued: at length Dr Smith, one of the elders, rose, and said, that they ought not to separate without discharging those religious duties which had led them to assemble on the first day of the week. He then gave out a psalm from his own seat, and afterwards prayed. In the meantime, he had sent home one of his daughters for a volume of sermons, one of which he read. A second psalm was given out by him and sung, after which the service was concluded by a prayer from Mr Lister, a farmer in the neighbourhood, and one of the elders—the whole without any appearance of bustle or exertion." There are a great number of religious newspapers in America, which is a further proof of the serious habits of a large part of the population.

The remarks we have have made apply exclusively to the New England states, and to the older settled districts of the east; they may also perhaps be extended to the *towns* of the newly-formed western states, in which much attention is given to religion. In the slave countries, however, this condition is altogether reversed. North Carolina, with a population of 600,000, has hardly fifty clergymen; and South Carolina, with 420,000 inhabitants, has not more than forty. In Georgia there were only ten in 1818. In Virginia, the population is about one million; the number of clergymen not one hundred. The situation of Maryland is similar.

In the countries on the Ohio, Michigan, &c., which are in progress of settlement, there are no regular churches except in towns; the only opportunity the colonists have of attending sacred ordinances being at field-meetings, or *tent-preachings*, as they would be called in Scotland, which are held in the forests, and are sometimes continued for several days. The first settlers in these districts are generally rude men, and little heedful of religious matters; but these meetings serve to keep alive among them a feeling of what is due to their character in this respect, and, as the population becomes more dense, gradually lead to the establishment of regular pastors and churches.

MEANS OF EDUCATION.

The state of the people in respect to education is very different in different parts of the states. In the old settled districts, the proportion of well-informed and well-educated people is greater than in most countries of Europe. In the slave states of the south, and in the western districts, which are as yet only occupied by a thinly-scattered population, the number who can read and write is very small in proportion to the population. Some idea of these different conditions in respect to education may be formed from the following account of the number of students at college in the different districts in proportion to the whole inhabitants of each:—

In the eastern or free states,	1	student to	1231	inhabitants.
— middle slave states,	1	—	3165	—
— southern slave states,	1	—	7232	—
— western or new states,	1	—	6090	—

In the New England states, it appears, by the number of young men who are thus receiving a liberal education, that there is care taken to provide instructors for the rising generation, as well as to secure respectable attainments in those who are to exercise the professions of clergymen, lawyers, medical men, engineers, &c. In the slave states there is a lamentable deficiency of all this. In the newly-settled districts it cannot of course be expected that people so thinly scattered over the wilds should have regular means of education.

In the New England states the means of instruction provided for the children of the labouring classes are in general such as to put the knowledge of reading, writing, and arithmetic, within the reach of all. Every state has a public fund set apart for paying the salaries of teachers; and if this is not sufficient to provide one for each township, the inhabitants are expected to assess themselves to make up the deficiency. They generally elect school-committees, who build school-houses, choose teachers, and apportion funds, according to the necessities of each parish. Children are entitled to attend at these seminaries without any charge but that of paying for the books which they use. In order farther to secure the education of young people who may be obliged to go early to *service*, it is common in these states to stipulate *schooling as part of their wages*. This was in former times a regular condition in respect to young farm-servants in Scotland, only that here they were generally taught by the master or mistress themselves, whereas in America they are sent to school for that purpose. The result of all this is, that the number of people of the working classes who can read and write is here fully greater than in any country of Europe, not even excepting Scotland or Switzerland. The means of education are seldom awanting, while the wages of the labouring classes enable them to provide books, and to maintain their children at school for a longer period than can be easily done in Europe, where their services are soon required to assist in maintaining the family. It is remarked, that, "though the number of learned and scientific characters is much smaller than in France or England, the mass of the population are better informed than in either of these countries. Reading the journals universally (which are afforded at a fifth part of the price of newspapers in this country), and knowing a little of what is doing at home and the world generally, they betray none of that awkwardness which springs from conscious ignorance."

It must not be supposed, however, that this general account of the state of education applies equally to every district. It relates, indeed, chiefly to the great towns, and to the thickly-peopled places in their neighbourhood. The remote townships, which in a country so lately occupied form a large proportion of the whole area, are frequently as much deficient in the means of instruction as in regard to religious edification; and they have indeed little anxiety to improve themselves. Many of them pay no attention to the regulations for establishing schools, and, were it left to themselves, would allow their people to remain as they are, without either reading or writing. In America, however, as in most other free countries, the well-informed portion of the community is the most active, and, like the little leaven which leavens the whole lump, it is continually at work to stir up a desire for information and light in all the dark places round it. The operations of benevolent societies have the same effect in the remote districts of America which with us they have produced in the Highlands of Scotland and elsewhere; and they are ultimately more successful, because, whenever a desire for information has been excited, the comfortable circumstances of the people enable them to go on educating themselves. In all the newly-settled states, lands have been allotted for the erection of academies, and the establishment of regular district or parochial schools, according as the population increases: six hundred and forty acres are generally set apart in each township for this purpose, besides one or two entire townships in each state for university funds.

LEARNING AND THE ARTS.

America has produced several names of the highest celebrity, both in learning and the arts. Classical studies, which used to be looked on as the great test of learning, are not very extensively cultivated; but in general philology, or acquaintance with the principles of language, this country possesses several very eminent scholars—among whom we may mention Mr Duponçeau, a native of France, but naturalised in America, and celebrated for his researches into the history and affinities of the different Indian tongues. Mr Wheaton, also, who is well known for his acquaintance with the languages and history of the north of Europe, deserves to be mentioned; and a dictionary of the *English language* has been published by an American scholar, Dr Webster, which was reprinted in England, and is highly esteemed. Many American writers of the present day have attained very high fame, and their works stand side by side with the best English authors. To mention those only which are well known in Europe, there is Dr Channing and Jonathan Edwards in divinity; Irving, celebrated both as a historian and a novelist; Bryant, a poet of high power and elegance; Cooper, whose fictitious narratives have attained a fame hardly inferior to those of Scott, and which exhibit a set of manners completely original to Europeans. It is questionable, indeed, whether there is not as great a proportion of living American writers who have attained celebrity in England, as there are of English authors of the present day whose works are read on the other side of the Atlantic. The American reviews, which often give publicity to the opinions of men of talent in that country, as ours do to those of philosophers and statesmen here, produce frequently as deep an impression as any European publications of a similar kind; and the selections which appear now and then in this country from the American periodical literature, give evidence of as high talent in the writers, and of as cultivated taste in the readers for whom it is prepared, as any thing of the same description among ourselves.

In science, the reputation of Europe is so compacted of what her philosophers of former times have done, and of what is now doing by those who continue their researches, that it would be absurd to institute a comparison in this respect. It may be remarked, however, in regard to America, that she possesses men who keep pace with all the discoveries and improvements of the sciences, and who are able to canvass and examine every thing which any new train of investigation may bring to light in other countries: if we add, farther, that one of the most splendid of these original trains of investigation was derived and traced to its result, the identity of the electric fluid with lightning, by the American philosopher Franklin, we shall have said as much for the scientific fame of America, as can be arrogated to itself by any European country. Of the American journals of science, that of Dr Silliman is well known in Europe, where it enjoys a high and well-merited celebrity. The recent growth of every thing in America has not given time as yet for the formation of those extensive museums and libraries which so much facilitate the researches of learned men in the old countries of Europe; and as the legislature has not power to vote money for these objects, it may be a considerable time before any thing is witnessed there like the splendid national collections of Paris, London, and Rome. There are, however, several museums; as, for instance, those at Salem, Boston, and Philadelphia, whose fame will gradually accelerate their own increase, and may at last attract national attention to the subject. There is no public astronomical observatory in the states, and the expense would be too great for any private means.

In mechanical science, which is the absorbing pursuit of the present day, the Americans have been no whit behind other nations in devising means for facilitating and abridging such processes of labour as are carried on in their own country. Steam navigation, though certainly first discovered in Scotland by Mr Taylor, was as certainly first brought to a useful and practical result in America by Mr Fulton. The machine which was contrived by an American for separating cotton from the seed—that for distilling salt water, or procuring sweet water at sea, by separating it from the salt—some contrivances for abridging the manufacture of iron-work—and many others adapted to the peculiar circumstances of their country, show the Americans to be equally ingenious, and equally acquainted with the resources of mechanical invention, as the English or any other nation.

The science of the Americans has also been displayed in a very remarkable and useful manner, in the construction of several large canals and railways, some of which are hardly to be equalled in any other country. The same skill is seen in improving the navigation of their rivers, in constructing bridges, in architecture, and in ship-building.

FUTURE PROSPECTS OF THE UNITED STATES.

From the rapidity with which the population of the states has hitherto increased, and is diffusing itself over the wide and fertile continent of which it is in possession, the most magnificent anticipations are formed by the Americans of the future greatness of their nation. "Let us assume," say they, "what appears highly probable, that the people of the United States will ultimately spread themselves over the whole North American continent west of the Mississippi, between the parallels 30° and 49°, as far as the Pacific Ocean. This will be found to add 1,800,000 square miles to the territory east of the Mississippi, and, putting both together, the area of the United States, thus enlarged, will be 2,700,000 squares miles. A surface of such extent, if peopled to the density of Massachusetts, would contain two hundred millions; or if peopled to the density of Great Britain and Ireland, four hundred and thirty millions. If the population of the United States continue to multiply in the same proportion as hitherto, it is demonstrable that the two hundred millions, necessary to people this vast territory, will be produced within a century." These are indeed magnificent anticipations, and we know no reason why they should not be realised. But we must remark, that, whatever they may add to the national greatness of the American name, they are by no means likely to be favourable in the same degree to the individual comfort of the members of its population. It cannot be doubted but that the high rates of wages and profits, and the rapidity with which capital now accumulates in that country, are partly owing to the large tracts of fertile and easily accessible land, which are always at the disposal of its inhabitants. Were the government weak, ignorant, or partial, these unoccupied territories might exist, as they do in many other countries of the world, without being of advantage to any one. In America, the qualities of the government render them easily available, as long as they last; but nothing can renew the same advantage after it has once been expended. As those splendid prospects, in which the Americans are fond of indulging, approach to realization, the quantities of new land will be daily growing less—the rapidity with which capital now accumulates will be diminishing in the same proportion—the wages of industry will gradually fall off—and as the nation becomes greater and more powerful, in the same degree will the resources of its individual population be lessened. But the truth is, these fancies concerning the rapid increase of population, and the filling of the whole American continent with a nation of unparalleled power, "greater than the sands of the sea in multitude," are mere playthings of the imagination. Too little is known of the real numerical progress of population to enable us to say any thing on the subject; and certainly it is not the circumstance that their immense and fertile country *will one day be fully occupied*, which ought to be a subject of satisfaction or pride to the Americans, however powerful the nation might then be, but rather that their gigantic population has rich fields and abundant pasture in which to carry on its increase for many ages. During this time, it may set an example of equal government and peaceful industry to the rest of the world, which, unhappily, has been hitherto wanting; and by the reaction of just principles on the influential part of the old continent, the new nations of the west may be the means of redeeming it from many oppressions. When these are removed, it will be seen, that, in our world too, there is not wanting abundance of unoccupied and rich land: whole kingdoms and provinces of Europe, Asia, and Africa, are at present shut up from industry by one kind of barbarism or other, and the example of America may yet enable mankind to enjoy the advantages of their fertility.

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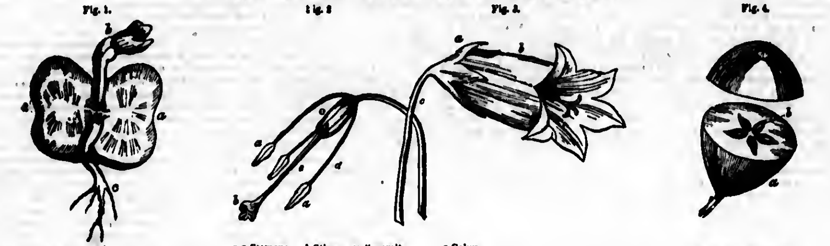
VIEW OF BOTANY, OR THE VEGETABLE KINGDOM.

THE PHYSIOLOGICAL STRUCTURE OF PLANTS EXHIBITED.

Fig. 1. Fig. 2. Fig. 3. Fig. 4.



a Cotyledons, or Seed-Lobes. *b* Leaf-Germ. *c* Root spreading into Fibrils.

a a Stamens. *b* Stigma, or Summit. *c* Ovary, or Seed-Bag. *d* Filament. *e* The Style.

a Calyx. *b* Corolla. *c* Peduncle.

a Pericarp and Pulp. *b* Seed-Vessels.

The material universe with which man is acquainted consists of two grand orders of existences—those which are organised, and those which are inorganised; or those which possess life, and those which are destitute of any living principle. Of the nature of the living principle, no idea can be formed, but we mean by it that power or quality resident in certain structures, by which they are enabled to elaborate or incorporate with themselves those nutritive particles of matter which they require, so as to enlarge without destroying the peculiar shape or form which they possess; and this they do through a series of continued changes or actions of the structure, from a state in which the body is first brought into existence, until it has reached maturity, and afterwards gradually passed into a state of decay. Organised bodies are divided again into two distinct classes—animals and vegetables; and although human ingenuity has been nearly exhausted in attempting to decide to which of these two classes certain productions belong, such as the sponge and the fresh-water polypus, yet the more perfect specimens of each class have strongly marked differences. In a general sense, when the term *plant* is used, every one knows that it signifies an organised body, which is fixed in the earth at a certain place; and when we say an *animal*, we imply an organised body, which possesses the power of locomotion, and is under the government of a sentient principle, by which it performs these operations at pleasure. Plants differ from animals in being destitute of a common gullet, a stomach for receiving food, and intestines; and there are other differences as striking, such as their having neither heart nor lungs, although they exhale and imbibe aëriform fluids. The economy of plants is limited to nutrition and reproduction; and being stationary in one place, the mechanical structure required for performing these functions is less elaborate and various than that necessary to the active, sentient, and locomotive animal. Nutrition comprises an extended series of operations both in the vegetable and animal economy. In the former, there is first included the absorption of particles of matter, their transmission to organs where they are subjected to the action of the air; their circulation through the plant, and farther elaboration in different receptacles, so as to be converted into peculiar products which enter into union with the plant, and enlarge its size or supply the place of wasted materials. For reproduction there is also required a peculiar set of organs, of which we shall speak in detail afterwards. Plants are divided into herbs and trees; and although they present almost every variety of difference in regard to form and texture, they all nevertheless possess in common certain parts or members, which are named the root, the trunk, and the branches, from which proceed the leaves, the buds, the flowers, the fruits, and the seeds. Every one is familiar with the infinitely diversified appearances which these assume in different classes of vegetables, and yet they are found to originate from a few constituent or elementary organs, whose situations, proportions, and combinations, give rise to the infinite varieties which we behold in this kingdom of nature.

According to the best physiologists, there are only two parts essentially distinct, namely, the pithy part and the ligneous part. Malpighi, a celebrated writer upon the subject, calls the two constituent parts the ligneous and utricular portions, and to these have been assigned the general appellations of the vascular tissue or system, and cellular tissue of plants. Tissue, which signifies a web, is the name given to the soft and flexible parts of animals and plants; cellular tissue is divided into cells, the vascular system or tissue into vessels. Vegetable like animal structures are composed of solid and fluid parts. Few of the latter are considered simple in their composition, as they contain more or less of a gelatinous matter, which frequently imparts to them a consistency approaching to that of a solid body. The gum which we often see exuding from trees is an instance of the viscidity of vegetable fluids. Many of them, also, contain minute globules of matter, which thicken them to a considerable degree. It has next been discovered that these often cohere and form solid masses, or unite in lines so as to constitute fibres. These, again, collect together, and compose various kinds of texture. The solid parts of a vegetable are membrane and fibre, which form the tissues referred to, and their varied combinations in the bark, wood, pith, and medullary or marrow rays. The fluid elements are watery solutions of the soluble materials of the soil, which, by chemical and mechanical agency, as well as the influence of the principle of life, are decomposed, and again united in different proportions so as to form new substances, or, in other words, the solid components, the textures, and secretions of the vegetable.

Membrane is an extremely fine, transparent, colourless film, capable of resisting the action of water and watery solutions in the plant whilst alive; but when life ceases, it is easily acted upon. It resembles a simple pellicle, or the film of a soap-bubble, varying in transparency in different plants, and in different parts of the same plant. The woody fibres consist of collections of fusiform or tapering vessels placed close and parallel to one another, with the narrow extremities of one set wedged in between those of another set. These fibres are generally collected together into bundles, and are accompanied by cells and vessels of various descriptions, and in different stages of transition. They gradually acquire a degree of rigidity, which enables them to support the plant, of which they constitute the framework or skeleton. Such is a general outline of the structure of vegetables—a more minute account will be necessary.

OF THE CELLULAR TISSUE.

The most elementary parts of the vegetable structure appear to consist of minute bags, bladders, or vesicles, the coats of which are transparent membranes of extreme tenuity. If a very thin slice of the stem of any plant be put into a drop of pure water, and examined by the microscope, it will be found to consist chiefly of these cells. Their size differs very considerably, from even the thousandth part of an inch to the thirtieth. Although in their original state they possess an oval or globular form, yet, by being variously compressed, they are made to assume other forms, such as twelve-sided figures, or six-sided, like a honeycomb, and pass by insensible gradations into the tubular structure. These various modifications of the same elementary texture have received separate technical names, which, however, it is unnecessary to specify. By the concurring observations of modern botanists, these cells consist of separate vesicles closed on all sides, and destitute of inlet or pore. It seems to have been satisfactorily established that the partitions which separate them, however thin, must consist of a double membrane, formed by the adhesion of the coats of the two contiguous vessels, and that the fluids gain access not by means of regular apertures, for none can be detected, but by exuding through the substance of the membrane. As from the shape of the cells the coats cannot be supposed to unite at every point, the spaces thus formed have been called *intercellular passages*, *canals*, &c., and they are supposed to perform an important part in the function of nutrition. The nature of the matter contained in the cells and the intercellular spaces, differs according to the part in which it exists, and the peculiar powers of the plant. Sometimes they are filled with certain liquids, the products of vegetable secretion; at other times the contents are simple watery sap, and occasionally they are only filled with air. Air-tubes and cells are most frequently met with in the centre of stems and in leaves, rarely in roots, and never in the woody part of plants. Although some plants consist entirely of cells, yet, as already observed, the greater number of them have, in addition to these, numerous ducts or vessels, consisting of membranous tubes of considerable length, interspersed throughout every part of the system. With regard to the origin of these, Dr Roget observes: "There can be little doubt, indeed, that the vessels of plants take their origin from vesicles, which become elongated by the progress of developement in one particular direction; and it is easy to conceive, that, where the extremities of these elongated cells meet, the partitions which separate their cavities may become obliterated at the points of junction, so as to unite them into one continuous tube with an uninterrupted interior passage. This view of the formation of the vessels of plants is confirmed by the gradation that may be traced among these various kinds of structures. Elongated cells are often met with applied to each other endwise, as if preparatory to their coalescence into tubes. Sometimes the tapering ends of fusiform cells are joined laterally, so that the partitions which divide their cavities are oblique. At other times their ends are broader, and admit of their more direct application to each other in the same line, being separated only by membranes passing transversely; in which case they present, under the microscope, the appearance of a necklace of beads. When by the destruction of these partitions their cavities become continuous, the tubes they form exhibit a series of contractions at certain intervals, marking their origin from separate cells. In this state they have received the names of *moniliform*, *jointed*, or *beaded vessels*. Traces of the membranous partitions sometimes remain where their obliteration has been only partial, leaving transverse fibres. The conical terminations occasionally observable in the vessels of plants also indicate their cellular origin."

OF THE VASCULAR SYSTEM.

By this term may be understood in a general sense all those parts of plants which do not exhibit the form either of membranes or of cells. It constitutes almost the entire bulk of the more solid parts of trees. If a branch be cut transversely early in spring, the sap will be found to exude, and cover the whole of the cut surface, which if examined will be found to consist of a vast number of exceedingly small fibres, vessels or pipes through which the liquid portions of the vegetable ascend or descend. These are as it were the veins and arteries of the plant. Indeed, whilst the tissue of cells above described may be said to constitute the flesh of plants, the tissue of fibres may be said to stand for the bones and other firm parts of the system. In animals, the fluids are conveyed to and from a central reservoir called the heart; but such an organ does not exist in the vegetable kingdom. The fluids enter by innumerable mouths at the root, and are conveyed by the vascular system to all parts of the plant fitted to receive them. There is little variation in the diameter of the vessels, and their general form is cylindrical. Their minuteness is quite astonishing. In a piece of oak of about the size of 1-19th of an inch, 20,000 vessels have been reckoned to exist. Hedwig measured the largest vessel in the stem of a gourd; it appeared 1-12th of an inch in diameter through his instrument, which magnified 290 times; so that its real diameter was the 3480th part of an inch. The vessels of plants do not, like those of animals, exist single, but are collected in bundles, or fasciculi as they are called, which sometimes contain hundreds of vessels. They occasionally also ramify; that is, some vessels shoot off from one parcel to unite with another, and afterwards return to that which they had left. By this ramification a reticulated appearance is frequently produced, especially in the bark and leaves of plants. They do not ramify like the vessels of animals from greater into less; but, by the division of a greater fasciculus into several smaller fasciculi, they at last become single, and thus their ramification is effected. It is generally supposed that they do not open into one another; that is, actually unite and be lost in each other, forming that kind of connection which anatomists call inosculation or anastomosing (from a Greek word which signifies to open the mouth).

These vessels have been named according to the functions which they perform, or the appearances which they assume. There appear to have been two kinds of vessels discovered in plants, the straight and the spiral. Grew describes the former as straight hollow threadlets, fifty times finer than a horse hair, forming a larger tube, as if we should suppose a walking-cane composed of small straws. Leuwenhoeck describes them as composed, like the quills of birds, of two transparent tissues, one placed lengthways and the other across, with no lateral communication. It is the opinion of the highest authorities that both fibres and straight vessels take their origin from spiral vessels. The first is called the simple spiral. If the fleshy scale of any bulb, for instance that of the water-lily, be cautiously broken, and the parts separated, the spiral vessels will be observed like screws, partially unrolled. They consist of opaque silvery shining fibres, twisted in a spiral manner, so as to form a hollow cylinder, the spires being generally in contact. This hollow tube is sometimes formed of one continuous fibre, sometimes of several parallel fibres adhering together. The fibres are tenacious, and in some plants elastic. They differ much in size in different plants, and at different stages of the growth of the same plant. They stretch through the whole of its length, from the roots to the leaves and flowers, following the various curvatures of the stem. Grew found that they alternate with the straight vessels in every part of the wood, and surround and ensheath them in the leaf-stalk, the leaf, the flower, and the fruit. The straight vessels are said to be formed in spring, the spiral vessels in summer. These spiral vessels undergo various transformations. In many cases the inner fibres of the tube, instead of forming a continuous spiral, appear in the shape of rings succeeding one another at regular intervals, and constituting what are called annular vessels (from *annus*, a ring). This is considered a primary form of vessel, and from the two simple varieties of vessels described, more complex forms are elaborated as the plant advances in age. In the punctuated vessel the spires are separated to nearly equal distances from each other, and the intervening spaces are filled up with a membrane sprinkled over with small obscure points or dots.

This is the largest in respect of diameter of the vegetable vessels; it is at first transparent, but becomes opaque by age. A fourth variety of vessel, which has the same origin as the last, being formed of rings, is that in which the separations are not filled with membrane, but with small productions proceeding from these rings themselves. These ramifications often have the appearance of network, whence they derive the name of *reticulated* spiral vessels. Neither they nor the former variety exist in the young plant, but are gradually developed as it approaches maturity, and by the same series of actions; that is, the spires or rings which were at first contiguous separate at a later period, and the intervals are filled up by ramifications from the spires themselves. The reticulated spiral vessels are found but in few plants, and they appear to differ from the punctuated variety principally in the position of the rings, which are more or less obliquely placed, and at different points send off one or more branches. A fifth variety, called *beaded vessels*, has been already mentioned. They derive their name from resembling a chain of oblong ovate cells or beads, and are classed by various writers, sometimes amongst vascular vessels, sometimes as belonging to the cellular tissue. Very contradictory opinions prevail with regard to the functions of the vegetable vessels. By some writers it is asserted that two distinct species exist, one of which is intended to convey sap and the other to convey air, and hence called *tracheæ* (windpipes); but it has been found that the latter occasionally convey sap. From the various modifications of structure which these vessels undergo at different stages of a plant's growth, it seems natural to suppose that they may perform different functions at different times. But a minute investigation of this subject cannot be ventured upon in this place. It seems to be the fact, that the spiral vessels, in all their variety, serve the office of conveying the sap throughout the whole of the plant. Besides the vessels already enumerated, vegetables contain certain organs denominated *glands*, which are composed of closely compacted cells, and which perform the function of *secretion*; that is, the conversion of the nutritious juices into particular products required for various purposes in the economy of the plant, as will be afterwards shown.

The vessels above described are those which belong to the woody parts of vegetables; but there are others peculiar to the bark, which have received various names, such as *returning vessels* (the former being occasionally termed *conducting vessels*), *proper vessels*, *cortical vessels*, &c. It must be confessed that none of these appellations are either very precise or characteristic of the functions which these vessels perform; but the following description will elucidate what is meant:—For about a month during the early part of spring, the sap rises through the wood alone, and is not distinguishable in the bark at all. In course of time, however, as the leaves become developed, the sap is rendered no longer visible in the wood, although it undoubtedly continues to ascend through that channel, and the bark becomes moist, or saturated with fluid. Now, as it has been determined beyond a doubt that no sap can reach the bark by the roots, nor enters it directly from the root, there is no other way of accounting for these phenomena but by supposing that the leaves are the organs by which the sap is carried off from the wood and conveyed into the bark. This inference has been confirmed by the fact, that the bark continues dry until the leaves shoot forth, and that, after having been moistened, it again becomes dry if the leaves be stripped from the tree. The fluids, which undergo a peculiar change in the leaves, are carried downwards by means of vessels situated near to the inner margin of the bark. They differ but little in structure from the more simple vessels of the wood. They run in straight parallel fasciculi (or bundles), a new layer of which is yearly added to the inner surface of the bark, as well as a new layer of ligneous vessels to the outer surface of the wood. Grew, a great authority in these matters, observes, that the new matter of the tree is every year distributed two contrary ways, one part falling outwards towards the bark, and the other part retaining its situation inward, to constitute the wood. By this peculiar mode of growth, vessels in the bark exhibit reticulation or a net-like appearance, the meshes being filled with cellular matter. Each vessel is an entire tube of a small size, and arranged according to the nature of the plant and its habits of vegetation.

In the foregoing observations we have attempted to give a view of the elementary organs of plants. These, again, enter into combination, and form what are sometimes called compound organic constituents, or common textures, but which, for the sake of clearness, we propose to distinguish by the name of

SECONDARY ORDER OF ORGANS.

These are the pith, the wood, the bark, and the epidermis or skin. The pith is that soft, light, and spongey sort of substance which occupies the centre of the stem (hence sometimes called the heart), where it is commonly surrounded by a circle of vessels, which construct for it an appropriate canal. When seen in its most perfect form, it is found to consist entirely of cellular tissue, rather loose in texture as in the alder, or compact as at the knot of the ash. The wood (lignum) is that hard cylinder which immediately surrounds and envelopes the pith, and is enclosed by the bark. It is essentially composed of vessels, and of cellular tissue combined in an infinite variety of ways, and exhibiting every diversity of form. If a tree of several years' standing be cut transversely and examined, it will be found to consist of a number of cylinders, enclosing one another like so many layers or concentric circles disposed around an axis. By the number of these the age of the tree may be determined. The outermost, which is spongey and less durable than the inner or heart-wood, is called alburnum. The whole are traversed by rays or lines diverging from the centre of the stem to its circumference. These are called medullary rays, or silver grain, and they are composed chiefly of large cells, extending transversely, or in the direction of the diameter of the tree, and composing by their union continuous vertical planes the whole length of the trunk. They are called medullary (from *medulla*, marrow), because they were supposed to be processes of the pith, or a continuation of it, which is not the case. Their use appears to be to keep open the communication between the bark and the pith, which the formation of the wood would otherwise have destroyed. The bark resembles wood in its component parts, being made up like it of vessels and cellular tissue, intimately connected with each other. As in trees, a new layer of vessels is annually added to the wood, so a similar but much thinner layer is also made to the bark, to which the name of *liber*, or inner bark, is usually applied, the old layer being pushed outwards. Between the vessels thus annually produced, a considerable portion of cellular tissue is interposed, the cells being commonly filled with juices. The whole is surrounded by an outer zone or envelope, to which the names of skin, epidermis, cuticle, or rind, have been given. It is an extremely thin membrane, and extends over the surface of every part of the plant, excepting the spongelets of the roots, and the summit of the pistil in flowers. The rind of plants is similar to the skin of animals in the functions which it performs. It is no doubt intended to protect the more sensible organs beneath. As the scarf-skin of the hand becomes indurated by hard labour, so the rind of the tree, if exposed to a stormy climate, becomes rough, whilst the rind of the same species of plant, if reared in a sheltered situation, like the hands of a delicate lady, remains smooth. As the plants grow, the rind stretches, and sometimes to a considerable extent; but in cases in which it is not easily stretched, as in the elm, it breaks up into innumerable cracks. The birch, and some other trees, "casts its bright skin yearly, like the snake." The rind is transparent and colourless where it is very thin; but it is usually of a brown or grey colour when thick. Various opinions are entertained respecting the origin and structure of this membrane. Some philosophers hold it to be continuous with the bark, and formed of the outer sides of its cells. Others describe it as a separate membrane, composed of minute cells or "bladders," as Grew calls them, which shrink and are dried up as the plant grows older. This opinion is now supported by the highest authorities. There has in some instances been found a very delicate, transparent, and apparently inorganised membrane on the outside of the rind. Whether it possessed pores, or, as they are sometimes termed, glands, was long a disputed point, but their existence has lately been incontestibly proved. They are a sort of minute bags opening on the outside by an oval slit with a raised border, which contracts when water or moisture is applied, and expands in dry air, or when exposed to sunlight.

Such is a view of the general component parts of the vegetable structure; we have now to turn our attention to the compound members or organs which they form. These, as already observed, have been divided into two distinct classes, namely, organs of nutrition, or, as they are sometimes denominated, conservative organs, and organs of reproduction. The principal compound organs of perfect plants belonging to the first class are, the root, the stem or axis, the buds, and the leaves, together with the appendages of these parts. Those of the second class are the floral envelope, the reproductive organs, and the seed.

THE ROOT.

The root (*radix* in Latin) is commonly defined to be that part of a plant which attaches itself to the soil where it grows, "or to the substance on which it feeds, and is the principal organ of nutrition." Exceptions to this definition occur, as in the case of some vegetables which grow floating loosely in water, as duckweed, and others, having no root at all. By far the greater number of plants, however, have roots, which perform the above functions. As the nourishment of a plant is derived from the earth, the root is that part which grows in an opposite direction to the stem, and is buried in the ground. Roots are generally found to spread much farther on the windward than on the sheltered side of a tree, and to be proportional to the branches, spreading to considerable extent in trees planted in an open field, but remaining in narrow compass in thick woods and forests. A root consists of several parts, which have been called the body or *caudex*, the collar or life-knot, the branches or radicles, when such exist, and the rootlets or small fibres, which seem to be indispensable in all roots. The body assumes various forms: the top or pivot root, which is, 1. simple, long, and taper, as in the carrot, beet, and parsnip, or like a flattened globe, as in the turnip; 2. branched, in which one principal stem sends out a number of branches, these again separating into smaller, till they become like fibres. It must be mentioned, however, with reference to carrots, potatoes, and the like, that modern botanists are disposed to consider them rather as subterranean stems than roots, because they perform the functions of stems more than those of roots. There are three sorts of these subterranean stems—the tuber, as in the potato and arrowroot; the corm, as in the crocus and meadow saffron, and cuckoopint, erroneously termed a bulb, as it has no scales; and the creeping-root stem, as in couchgrass.—*Rennie.* The same writer thus enumerates the various forms of the root:—"It may," says he, "be vertical, spindle-shaped, conical, turnip-shaped, round, twin, palmate, as in peony, digitate, abrupt, knotted, tuberculated, bundled, jointed, contorted, fibrous, hairy, or beaded." The crown, collar, or life-knot, as it is variously called, is that part which lies between the stem and the root. It is the most essential portion of the whole; for if it be removed or seriously injured, the plant will inevitably die; whilst the small fibres or rootlets, although an essential part of a plant, may be destroyed at pleasure so long as the crown remains, for it readily reproduces them. When it is of a slender make, as the seeds form it dries up, and the plant soon dies. Such plants are termed annuals, as the poppy, and most kinds of grass and corn. The crown, however, in some cases, by proper treatment, can be rendered so strong that annuals can be brought to grow two years, when they are termed biennials; or for three years, when they are called perennials. The fibrous root consists of a quantity of long thin fibres of different lengths and thicknesses, and having still finer ones springing from them, as in the case of wheat, barley, and most grasses. These small fibres or rootlets bear a resemblance to the branches and leaves of the stem. Fibrils consist of a central fasciculus of vessels, enclosed by a cellular cortex and cuticle. Like the leaves of trees that are not evergreen, they are annually produced; in some cases, dying and falling off like leaves; in others, becoming thicker, harder, and forming radicles or root-branches. The spongelets, as they are called, which take up nourishment from the soil, are situated at the extremity of these rootlets. They are minute spongey bodies of an oblong shape. We have an instance of rootlets falling off like leaves in those arising from bulbs—such as the lily, the onion, the tulip, &c. which are pushed off and perish like leaves, by buds containing the rudiments of the rootlets to be evolved next season. It is after Christmas that these root-buds become perfectly distinct. Professor Rennie observes—"The bulb is very similar to, if not identical with, what is termed a bud when found on a stem or branch, and is formed by the base " . . . e leaves becoming thick, and storing up a quan- . . . , of nourishment within them for future use." These base-leaves take different shapes in different plants: in onions they appear in the form of concentric circles, in the lily as scales placed somewhat like tiles. The stem and the branches of plants turn to the light; and some flowers, if planted in a position where light does not fall directly upon them, but upon a place a' some distance from where they are situated, will grow towards it. The reverse is the case with the root; it grows *from* the light, and in every case shuns it, and tends more or less to the centre of the earth. Besides taking in nourishment for the plant, the roots give off refuse, or what may be called excrement, as is seen in the case of hyacinths, which grow in water. The nature and qualities of the soil exert a powerful influence on the form and size of roots. If it be free and easily penetrated, the root often descends to a great depth in form of a top-root; but if obstacles opposing its descent be encountered, it then continues short, and splits into branches. Roots also extend into the richest portions of the soil, whilst the poorer parts are left nearly destitute of roots.

There are various other species of roots besides those described, but they must be passed over with the simple names which have been assigned to them, as already given. Some plants, instead of deriving nourishment directly from the ground, fix their roots into others, and subsist on the juices which they in this manner derive; hence they are termed *parasitical*—such are mistletoe, broom, rape-birds, and many lichens, fungi, &c.

THE STEM, STALK, OR AXIS.

The stem, with a few exceptions, is always above ground, and may be described generally as that thick perpendicular pillar from which various lesser growths, such as branches, shoot off laterally. There are exceptions to this definition, but it is true of by far the greatest number of plants. There are various classes of stems, the general physiological structure of which has already been given. Professor Rennie thus describes them:—"The stem is divided from the root by the crown or collar already described, which, though evident on all herbs and on young trees, cannot be recognised on trees of several years' growth. The space between the collar and the first leaf or bud is termed the bole, which is also applied to the space between two or more leaves or buds, whose base is called a node, from the Latin word *nodus*, a knot—by gardeners, an eye. The great body of a stem, whether divided into holes or not, is called the trunk. The stem of grasses, corn, and reeds, is termed the straw; the stem of palms, ferns, mushrooms, and sea-weeds, is termed the stalk; the stem of such flowers as the primrose, the daisy, the snowdrop, and the lily, is termed the scape, though flower-stalk is certainly better; the running stem, as in the strawberry and cinquefoil, is termed a runner; a shorter runner that does not root, as in the houseleek, is termed an offset; a longer one that does not root, as in the cucumber, a vinelet; and a small stem proceeding laterally from a root or stool, a sucker."

When a trunk bears permanent or perennial branches, the plant is termed a tree; when permanent branches arise, not from a trunk, but from the root, the plant is termed a shrub; when small and much branched, a copse shrub; when furnished with woody branches that are not permanent, as in the tree mignonette, it is termed an under-shrub; and when the whole stem is not woody, and dies down every year, at least as far as the crown of the root, the plant is termed an herb; when a trunk is formed like the underground stem of the iris, of the hardened bases of leaves which have withered and fallen, and is not taper, but all of one thickness, giving off no branches, as in the date and cocoa, the plant is termed a palm.

BUDS.

Buds, which have various forms, but are generally oval or roundish, consist of the young shoots, either of leaf, flower, or twig. They are usually formed either early in summer or in autumn, and are so contrived as to preserve from injury the delicate foliated structure within. The outside is composed of tough scales, which are frequently covered with a gummy resin, and they are internally kept warm by a downy substance interposed between the leaves. Buds are in most respects like bulbs, the scales being composed of cellular tissue, with distinct fasciculi running through it. This separation of the vascular fasciculi is the feature which distinguishes these scales from leaves. The inner scales perform the functions of leaves, until these are perfected and fully expanded, when they drop off; but in some trees, as in the apple and the almond, they are converted into leaves; whilst in others, as the rose, they are converted into the petioles, or footstalks of the real leaves which spring out of them. When the central part of a bud contains leaves only, it lengthens upwards as it expands into a branch; thus a leaf-bud and a branch-bud may be said to be the same. When it contains a flower, this is situated as in the bulb of the tulip, in which small bulbs are formed on the edges of the crown of the root between the scales, which gradually enlarge at the expense of the scales, are detached, become perfect bulbs, and send up leaves and flower-stalks. With respect to the manner in which the leaves are folded, they may be plaited, as in the palm and birch; doubled, as in the rose and oak; embracing, as in the iris and the sage; double embracing, as in valerian, teasel, &c.; double compound, as in carrot, mimosa, &c.; rolled inwards, as in grasses; tiled, as in pevet, lilac, &c.; rolled outwards, as in rosemary, primrose, &c.; rolled lengthways, breadthways, rolled from the tip to the base, or wrapped round the stalk.

Leaf-buds are more slender than flower-buds, and the latter are more or less bulged out and blunt at the point, but do not upon expanding lengthen upwards like the leaf-bud. As in the case of leaf-buds, the embryo of flowers is disposed in various forms within its envelope; it may be tiled, as in the rose and cherry; plaited, as in the potato; rolled up into a spiral, as in the wood-sorrel; rumpled, as in the poppy; five-fold, as in the pink; or valved, as in ginseng. Buds are usually found at the inner bases of leaves, but they occasionally occur in other places. Too many buds upon a tree are apt to cramp its growth, since it has to supply them with nourishment which otherwise would have been appropriated to itself. Leaf-buds generally contain only the rudiment of one axis or stem, but those of pine, fir, and other trees of that description, contain several, each enclosed in its own proper perula. When the plant has no stem, the buds are produced in the axillæ of the root-leaves, as in the daisy, primrose, &c.

Darwin was of opinion that every bud was a complete individual plant, and a tree an aggregate of buds. He reasoned thus from the fact, that when a bud is cut from one tree and inserted into another, it grows into a perfect branch—a circumstance which has given rise to the ingenious art of engrafting.

The buds of trees, being in a state of great sensibility, and feeling the first warmth of the sun, the vitality of the continued shoot is roused into action; it attracts the moisture contained in the neighbouring cells charged with nourishing matter; the rising sap also enters its vessels; it gradually swells, and bursting the enclosing scales, pushes into the light and air, unfolding its leaves successively as it advances, until the whole tree becomes green.

LEAVES.

With respect to leaves, we shall quote a passage from an eminent writer upon the subject:—"Much of the beauty and interest of the vegetable kingdom depends on leaves, whether we regard them as the clothing of a single plant, or of groups. To the plants themselves, they are the most important of the conservative organs, performing nearly the same functions in the vegetable economy which the lungs perform in that of the animal. Every leaf consists of two parts; the one thin and expanded, in ordinary language the leaf; the other, as thick as it is broad, the foot-stalk or petiole; these together constitute but one organ or proper leaf; and, with a few exceptions, when the leaf falls, it always separates from the twig at the base of the petiole. Leaves are more diversified in form and composition than any other of the vegetable organs; they are simple and compound; differ in situation and distribution on the branches; in direction and insertion; in respect of expansion, point or apex, or tip, base and margin; in surface, substance, composition, and appendages. In size they differ as widely; the leaves of *Hypnum trifarium* are almost microscopic objects, while those of the talipot palm (*Licuala spinosa*) have been known to exceed thirty feet in circumference. Leaves are either *caducous*, falling before summer is past; or *deciduous*, falling in autumn; or *persistent*, not falling until pushed off by the new leaves in the following spring; or *perennial*, of still longer duration.

Leaves are composed of three textures—a vascular, a cellular, and a cuticular tissue; and we expect to find these parts in the midrib and nerves, the parenchyma, and the surfaces of every leaf. When means, whether natural, as the atmosphere and the moisture contained in it, or artificial, as steeping in water, and exposure to the air, are employed to destroy the cuticle and the parenchyma of leaves, the fasciculi of vessels which constitute the ribs and nerves, as they are improperly called, remain, and constitute what is termed a skeleton leaf. In skeleton leaves we find the secondary ribs or nerves running either in straight lines from the midrib to the margin, or branching off in an infinity of divisions, so as to produce the appearance of a reticulated web. On a more close examination we find that these ribs, whether straight or reticulated, consist of fasciculi of conducting vessels, closely accompanied with proper or returning vessels. In those leaves, the ribs of which run in straight longitudinal lines, the fasciculi constituting these are united by transverse vessels at certain distances, which are not given off from the fasciculi, as Grew and others have supposed, but are distinct vessels, united with the fasciculi by insertion. In thick and succulent leaves, as those of aloe, thick cords of spiral vessels, accompanied by large bundles of proper vessels, separated only by a thin layer of cellular substance, are observed to traverse the leaf. This leaf is bordered by spines, into which cords of spiral vessels pass, given off from the fasciculus nearest to each of them. In leaves in which the costæ, or ribs, are transverse, the same communication between the costæ, by inosculating or inviting vessels, occurs, forming rhomboids; and this structure is common to all monocotyledonous leaves (or leaves of plants whose seed has only one seed-lobe). At the point of attachment between the branch and the petiole, if this be dilated, the vessels enter the petiole in distinct fasciculi, the number varying in different plants. The sap and the proper vessels are closely attached in the same fasciculus whilst in the leaf; but they separate at the point of attachment, the sap-vessels passing from the medullary sheath of the twig into the leaf, and the returning vessels passing from the leaf into the bark of the twig."

In the above extract the midrib and other terms have been employed which require explanation. Through the middle of a leaf there runs a stalk dividing it into two halves, and which has been denominated the midrib. From the sides or base of this, smaller ribs branch off, and which have been variously called veins and nerves. These tend towards the edge, and from them strike off still finer ribs, till the surface of the leaf appears like network, the meshes being filled with a green substance. Professor Rennie proposed to call what have hitherto passed under the name of nerves or veins, leaf-ribs, and their small branches ribists—a nomenclature which we think convenient, and shall accordingly follow. Grasses afford the simplest specimen of leaf-ribs. In these the bases of the leaves sheathe and embrace the stem. In some plants on each side of the midrib there is a leaf-rib nearly as large, and sometimes these ribs are more numerous, and radiate from the bottom of the leaf over its whole extent.

It would appear that the almost countless array of forms of ribs were determined by the character of the branching from the midrib. Leaves are either simple or compound: they are simple when laminæ are entire, or when, if separated into several divisions, these segments are not articulated with the petiole. Professor Rennie thus describes simple leaves:—"When the midrib and its branches form a simple leaf, it may be line-like, as in the juniper; awl-shaped, as in the jonquil; spear-shaped, as in ribwort; sword-shaped, as in the iris; riband-like, as in grass; spoon-shaped, as in navel-wort; oblong, as in the banana; egg-oblong, as in the marjoram; inversely egg-oblong, as in the cowslip; wedge-shaped, as in shrub-candy tuft; roundish, as in round-leaved mallow; or shield-shaped, as in the Indian cress or nasturtium.

When the pair of rib-branches at the base stretch farther than the others, the leaves become halberd-shaped, as in cuckoopint; heart-shaped, as in burdock; arrow-shaped, as in sorrel; kidney-shaped, as in ground-ivy; triangular, as in mercury; three-lobed, as in hepatica; four-cornered, as in the tulip-tree; fiddle-shaped, as in fiddle-dock; trowel-shaped, as in black poplar; or diamond-shaped, as in water-caltrops. Again, when more of the rib-branches besides the pair at the base are long, the plait of the leaf is often more or less regularly formed to correspond with this, and becomes five-lobed, as in the hop and sycamore; hand-shaped, as in the blue passion-flower; slashed, as in the long-stalked geranium; five-cleft, as in the spotted geranium; many-cleft, as in monkshood; cleft-cut, as in dandelion; wing-cleft, as in star-thistle; or comb-cleft, as in water-violet.

When the stalk bears more than lamina, and these are jointed to it, so that they can be separated without tearing, the leaf is said to be compound; each lamina, whether it have a stalk to it or not, is called a leaflet, and the joint is called an articulation. The horse-chestnut, rosetree, ash, sweet and common pea, laburnum, clover, and a multitude of plants, have compound leaves. When there is a common leaf-stalk supporting two or more leaflets, the compound leaf may be three-fold, as in clover; four-fold, as in four-leaved marsilea, and so on, the leaflets being termed many-fold when they are more than seven in number. They are also named according to their disposition; as umbelled, when they have the appearance of an umbrella. And when a number of distinct leaflets are placed along the sides of the common leaf-stalk, the compound leaf is said to be winged; which term is qualified by a discriminating term prefixed to it, descriptive of the peculiar combination, as unequally-winged, lyre-winged, and so on. When the small leaflets are again divided, the whole leaf is said to be doubly-compound.

In their circumference, leaves display a great diversity of characteristics. To facilitate to beginners the acquisition of knowledge on this part of the subject, the circumference has been divided into the tip, or apex, or more simply top, and the margin. The tip may be sharp, as in the lilac; spine-pointed, as in thistles; notched, toothed, and so on. The margin also displays the same diversity of form, being sometimes entire or plane; at other times waved, toothed, thorny, prickly, curled, and of various other forms; and it may sometimes be bordered by a substance different from itself, which may be gristly, horny, fringed, or glandular.

In the manner in which leaves project from the branches, the way in which they are inserted, and their distribution over the woody cylinder to which they are attached, every possible variety may be observed, of which any one may satisfy himself by casting his eye over the face of nature. The leaves of most plants possess a power of motion, which is the effect of what is termed irritability or vitality. Thus, some flowers close when night approaches, others open. The leaves of the sensitive plant, or *Mimosa pudica*, close themselves upon the slightest touch. All leaves after a certain time fall off, their place being supplied by other shoots. With respect to duration, leaves either drop off during summer, at the approach of winter, or are evergreen. When they wither, and remain without falling, they are said to be persistent, as in oak and beech.

Buds, we have already observed, give rise to branches, as well as leaves and flowers. The branch of a tree may be said to be a young stem, from which lesser shoots take their rise, and of course is in its structure similar to the stem. The solid contents of the whole branches are often a fifth more than those of the trunk which nourishes them; but trees in which branches are very numerous are stinted in their growth, and hence pruning becomes necessary. Branches, like leaves, may be opposite, alternate, whorled, irregularly dispersed, descending, drooping as in the weeping-willow, or possess various modes of bending.

OF SCALES, HAIRS, PRICKLES, SUCKERS, AND OTHER APPENDAGES.

The following account of these various growths is principally condensed from a small work on vegetable physiology, in the Library of Useful Knowledge. The term *appendages* is applied to certain organs attached both to roots and stems, which, as they are not general, are not classed with the common members of the vegetable body.

1. Scales (*squamæ*) are generally found on roots, as, for instance, on the root of toothworth. They consist entirely of cellular tissue, enclosed in a cuticle.

2. The sucker (*stolo*) is an underground bud, sprouting from the upper horizontal branches of the roots of trees; and, rising above the soil, it is converted into a stem resembling the parent-tree. Its organisation is exactly the same as that of the leaf-bud.

3. The knob (*tuber*) is a solid massive body, attached either closely or by means of a vascular cord, or wire, as it is usually termed, to the base of the stem of some plants; it is also sometimes produced on the stem. The tuber varies greatly in form and appearance; but it has in every instance nearly the same structure, and consists of a cellular parenchymatous mass, covered with an epidermis devoid of apertures, and furnished with vascular fasciculi, which either surround the central mass of cells, or are distributed through it, according as the plant which bears the tuber originates from seeds with one or with two cotyledons (or seed-lobes). The cells are filled with mealy grains; for tubers are merely reservoirs of nourishment for the young plants on their surface, which resemble the plantule in seeds, and are endowed with the same vitality, remaining latent until the tuber be placed under circumstances favourable for vegetation.

4. Radical bulbs (*bulbi radicales*) are, like tubers, reservoirs of nourishment for aiding the developement and the temporary support of the lateral progeny of a certain class of plants. They are either solid scaly, and laminated (or compounded of plaits).

5. Glands (*glandulæ*). The real existence of bodies which usually merit this appellation in the vegetable system is doubtful. There are, however, minute organs, differing in structure from the common texture of the part where they are situated, which separate some peculiar matter from the ordinary proper juice, and which may be regarded as glands. If this be admitted, these glands occupy the interior and exterior of stems and leaves, vary greatly in form and attachment, and perhaps in structure, although any attempt to demonstrate this can scarcely be depended upon. Internal vegetable glands are generally seated in the substance of leaves, with a small excretory duct or channel opening upon the surface of the leaf. These furnish the little drops of essential oil found on many leaves, as for instance that of the black currant. In some leaves, when the cells are swelled with fluids, these ducts are pressed upon and closed, so that the leaf exhales no odour, although a powerful odour is exhaled as soon as the withering of the leaf opens the ducts. This is the case in sweet-scented meadow-grass, whence new hay derives its odour. External vegetable glands are either with or without a foot-stalk; and all these glands are cellular, with the cells more regular than those in the substance of the leaf, and arranged in circles; a cord of vessels can generally be traced into the substance of the gland.

6. Pubescence, comprehending *down*, *hairs*, and *bristles*. The structure of the first is more simple than any other part of the vegetable body, consisting of tubular cells, so disposed as to form single, extended, or jointed hairs, with or without a globular point; or branched, or stellated, or uncinated, or hooked hairs. The structure of bristles is also cellular, but more condensed, and assuming a variety of forms; some of which, for instance the hooks in clivers, enable the plants to climb. Bristles are also sometimes the excretory ducts of glands, as exemplified in borage, the nettle, louse, &c.

7. Thorns (*spinæ*) are in general processes of the ligneous part of stems, and have nearly the same structure as branches. They are indeed sometimes abortive branches, as in the genus *prunus*; sometimes the lobes of the leaf hardened, as in the date; sometimes hardened stipules, as in erythryna.

8. Prickles (*aculei*) are productions of the bark and the cutis, as is well exemplified in the rose, with the bark of which the prickles separate. They consist of a mass of oblong cells, which become condensed towards the point of the prickle, and over which the common cutis of the part is thrown back.

9. Props (*fulcra*). Under this term are comprehended the tendril, the claw, the hook, and the bladder. The tendril is a long, cylindrical, slender, spiral organ, issuing from various parts of the plant. It consists of a cortex, which resembles that of the foot-stalk of the leaf, and of fasciculi of vessels imbedded in a cellular parenchyma. It has apertures on its surface, the same as the leaf; so that the tendril partakes of the nature of the petiole of the leaf, and of the cuticular system of that organ. The claw is of two kinds, the radicular and the cirrhal. The radicular claw is a small thread-like body, protruded from the stems of some flexible plants, which entering into the crevices of the bark of trees, and the cracks in rocks and walls, enables the plant to support itself perpendicularly upon such surfaces. The cirrhal claw is a combination of the tendril and the claw. It is well exemplified in the Virginian creeper. As far as regards the tendril-like portion, its structure is the same as that of the tendril; the claw itself consists of cellular matter, which being a continuation of the parenchyma of the other part of the organ, is here checked in its extension, and expands sideways, leaving the under surface almost devoid of cutis, but studded with minute warts or short fibrils. The warts and fibrils entering into the minute pores of stone, bricks, &c. swell there, and maintain the claw so firmly attached as to support the branch, and enable the plant to climb on the face of a perpendicular surface.

10. The bladder (*ampulla*) is a small membranous bag attached to the roots and leaves of some aquatic plants, containing a watery fluid and a small bubble of air.

11. Foliaceous appendages, as the name implies, have the form and structure of leaves, at least this is generally the case in the stipule (*stipula*), and in the floral leaves (*bracteæ*).

All the parts hitherto described only contribute to the growth and perfection of the individual plant, and have been named the nutritive or conservative organs. We come now to the other grand division of the subject, which treats of those organs by which the species is perpetuated, and hence called reproductive organs. It is in the flower of a plant that these are to be found; and we shall, in the first place, give a general description of that beautiful ornamental part of a plant.

OF THE STRUCTURE OF FLOWERS.

A flower consists of several distinct parts, which have obtained various and often very fanciful names. The term *inflorescence* has been given to the mode in which the flowers of a plant are distributed, or their manner of flowering, of which we shall afterwards speak. A flower is essentially constituted by the presence of sexual organs, either male or female. When there is only one of these present, the plant is termed unisexual; but more commonly these organs are both present in the same flower, which is in this case termed a hermaphrodite. In some instances, although the same plant bears both male and female organs, it is not hermaphrodite, as these organs occur in different flowers; in others, again, the male and female flowers exist only in different plants. Lastly, male, female, and hermaphrodite flowers, are sometimes found mingled together, either on the same or on different foot-stalks. Sometimes the male or female organs alone, protected in a small scale, constitute the flower; but in general they are surrounded and protected by others, named the corolla and calyx. All these are commonly borne on a stalk called the peduncle (from *pedo*, to prop or support), which expanding at its extremity, forms the receptacle or torus, as it has been called, upon which the whole of the parts above mentioned are supported. By reference to the plate on the first page, the sexual organs of a flower will be seen. *a*, fig. 3, is the calyx or flowercup, affixed to the top of the flowerstalk or peduncle *s*. Into this is inserted the corolla *b* (from *corolla*, a little crown), which is also variously called the blossom or flower, although it is not in all cases agreed what part is to be called the cup, and what the blossom. The leaves into which the blossom may be divided are termed petals, the base being called the claw, and the rest the limb. Within the blossom are situated the sexual male and femal organs, corresponding to those of animals.

INFLORESCENCE.

It must always be remembered that regular buds are formed in the axillæ of leaves, that is, at the angles of their junction with the stem, otherwise called bracteæ; and that the centre of a bud grows into an axis or stalk, bearing the leaves enclosed in that bud, the innermost of which constitute the flower; whilst other buds giving birth to new stalks, leaves, and flowers, may or may not be produced in the axillæ of the outermost, as they are unfolded on the original stalk. The inflorescence of plants is very various, and depends entirely upon the power of developing the flower-buds in the axils of the bracteæ. Inflorescence, however, may be reduced to two kinds; it is called simple when formed by the developement of one bud and one branch; and compound, when formed by the developement of several buds and branches. Professor Roeper, of Bale, has introduced the most recent arrangement of flower-stalks; and as his nomenclature is simple, and has been adopted by Professor Rennie, we shall employ it. Roeper considers the modes of flowering as consisting of an evolution, which may be centripetal, centrifugal, or mixed.

Centripetal Evolution.—Flower-stalks are either simple, supporting only one flower, or compound, supporting more flowers than one, upon stalklets. In centripetal evolution, the flowers blow first in the circumference and last in the centre, the flower-stalk always growing from the inner base or axilla of a leaf, and the stem having always a leaf-bud at the summit. Various names, very puzzling to a beginner, have been given to the various kinds of inflorescence. When there is only one flower, it is said to be terminal and solitary. When the principal stem grows past the flower-bud, and the bractea retains the form and size of a leaf, the flower is called axillary and solitary. When the buds which grow upon this elongated stem unfold into flowers, each supported by a peduncle, that is, simply a stalk, the inflorescence is called a *raceme*; if the flowers are sessile, that is, without a peduncle, and seated in the axil of the bracteæ, a spike is formed, of which there are many varieties, as corn, lavender, &c. When the bracteæ on the principal stalk are close, and overlap one another, or are imbricated, as this is called, with flowers reposing (sessile) in their axillæ, the spike is termed a catkin, or, in Latin, *amentum*. The difference then between a raceme and a spike is, that the stalks upon which the flowers blossom are longer in the former than in the latter. When these peduncles or stalks shoot so as to bear bracteæ, from which other stalks strike out, what is called a *panniele* is formed. Usually in these two, the lower peduncles are only slightly longer than the others; but when they are very long, and the upper ones very short, it is technically termed a *corymb*, from *korus*, a helmet. When all the flowers are placed together in a globular head, we have a *capitulum*, from *caput*, the head. When the principal axis is but little lengthened after the opening of the bud, and the other flowers which it contained have stalks, an *umbel* is formed, from *umbella*, a fan or screen. This is called simple when the stalks springing from the same part of the principal one bear but one flower, and compound when the stalks of the secondary buds bear smaller umbels, into which these open. These are all specimens of simple inflorescence, and as the lower flowers are first expanded, this mode of flowering is called centripetal.

Centrifugal Evolution.—"In the centrifugal evolution," says Professor Rennie, "each branch or flower-stalk terminates in a flower-bud, never in a leaf-bud; and consequently it cannot be prolonged farther, as in the centripetal, though it may shoot out fresh flower-buds from the side when nourishment is afforded. Instead of a single floral leaf, each top-flower has two or more, and from the inner base of these two or more new branches spring, each again ending in a central flower and two or more side-branches. They proceed forking off in this manner, till the supply of nourishment is exhausted. All the flowers in the centre open first. The form under this division may not inappropriately be termed in general a bouquet (in Latin, *cyma*); but when the branches from the flower-stalk are wanting, or very short, it is termed a ball (in Latin, *glomus* or *glomerulus*), though differing only from the tuft in its evolution. The bouquets crowded together are termed a fascicle (in Latin, *fasciculus*), as in sweetwilliam. The bouquet is in some instances only simply forked, as in silene and some of the pinks; triply or oftener forked, as in spurge; or not forked at all, no flowers being evolved on one side, as in bugloss and scorpion-flower. Sometimes the bouquet resembles an umbel, and sometimes a bundle, but is always distinguished by its peculiar evolution.

Mixed Evolution.—In the mixed evolution there are two leading forms—one where the central axis of the plant flowers according to the centripetal evolution, and the side-branches to the centrifugal, which is termed a bunch (in Latin, *thyrsus*), as in the lilac and the butter-burr; and also in the plants whose flowering was formerly termed the whorl (in Latin, *verticillus*), as in mint, balm, thyme, and sage; and of this there are many varieties, according as it resembles a pannicle, a cluster, or a spike; another, when the central axis follows the centrifugal evolution, and the side-branches the centripetal, which is termed a bundle (in Latin, *corymbus*), as in yarrow."

TORUS, OR RECEPTACLE.

The outer envelope (in Latin, *perigonium*) of flowers presents very different forms in different plants, and a multitude of names puzzling to the beginner have been introduced by botanists to distinguish them. The receptacle of the flower, or *torus* as it is entitled, is an expansion of the pedicel, from which spring the petals and stamina, and seems to be formed by an abortion or partial developement of one or both of these parts. Although not, properly speaking, an organ, it is of great use in the vegetable economy. It is generally inconspicuous, and is reduced to a narrow circular space between the calyx and the pistil; and according as it is placed with reference to these, and to the stamens, petals, and ovary, it is variously named. The receptacle is called proper when it corresponds with a single flower, as in the tulip. What is called the berry in strawberries, appears to be nothing more than the receptacle bearing the naked seeds on its surface. It is called common when a number of florets rest on one receptacle. The round bottom which is exposed when the downy seeds are blown from the head of the dandelion, is an instance of the common receptacle.

CALYX.

The following descriptions of the calyx and corolla are condensed from an able article upon botany in the Encyclopædia Britannica:—

The calyx is usually of a green colour and foliaceous; each segment is termed a *sepal*. These like leaves are sometimes articulated at their base, when they are either quite distinct from each other, or cohere in the form of a lid (as in *eschscholzia*) during the flowering of the plant. But they are often continuous with the peduncle, and consequently persistent. In such cases they are either distinct, or are united together by their margins. When the sepals are distinct, the calyx is said to be bi, tri, or polysepalous, according as there are two, three, or many leaves; and when soldered, it is called *gamosepalous*, or, by the strict followers of the Linnæan nomenclature, *monophyllous*; when only slightly united at the base, it is *partite* (bi, tri, quadripartitus, &c.); when united to the middle, it is termed *divided* (bi, trifidus, &c.); and when soldered till near the apex, it is called *toothed* (bi, tridentatus, &c.) If no teeth be perceptible, it is then entire; and in that case the number of parts must be determined analogically, or by other means. The cohering portion is termed the tube. Some sepals in the same calyx may cohere together in a greater degree than the others, and this gives rise to a *bilabiate* calyx. In a few genera with articulated sepals, the divisions cohere together, but separate from the tube in the form of a lid or operculum. Sometimes the calyx is reduced to a mere ring round the base of the corolla. In the valerian, this ring is afterwards developed into a *pappus*, formed of numerous long and fine radiating segments. In many *compositæ* the margin of the calyx also constitutes a pappus, appearing either in the form of a ring, or bristles, or scales, or rough hairs, or feathery hairs. The calyx may be free from or unattached to the fruit, or the tube may be closely incorporated with it, or adherent (*calyx adhærens*). This organ varies without end, and it were vain to attempt a description of all its peculiarities. One great distinction arises from its situation. When close to the fructification, it is called the perianth (from *peri*, about, and *anthos*, a flower); when distant, it has various other names: but in general, under these circumstances, it is not considered a legitimate calyx.

COROLLA.

The corolla is for the most part more or less coloured; and it exists in the greater part of the exogenous plants. (Exogenous is the name given to a large class of plants, which will be alluded to afterwards.) Sometimes it is very small, and reduced to the appearance of mere scales, and even in some genera is quite abortive; and when this happens, we must proceed with the greatest caution, and depend much on analogy, so as not to confound those groups of plants in which it ought to be present with those furnished with a perianth, in which a true corolla is always supposed to be absent. The divisions of the corolla are called petals. They are almost always articulated at the base, and consequently fall off; and when this happens at a very early stage, they are said to be caducous. When the petals have no articulation, as in campanula, they either remain for a long time, or are persistent; or are marcescent, when they wither away without falling off. When the petals are quite distinct from each other, the corolla is polypetalous; or when more or less united by their margins from the base upwards, monopetalous, an incorrect term, which ought to be exchanged for gamopetalous; and then it may be partite, divided, toothed, or entire, in the same way as in the calyx. But petals may also unite in their upper parts, though distinct below. When the lower part of a petal, as the petiole of leaves, is narrow, and consists of the union of all the vessels that expand and ramify in the upper portion, the contracted part is the claw or unguis; the dilated, the limb or lamina. If the ungues be long, straight, and closely approached to each other, even though distinct, a kind of tube is formed; but, properly speaking, it is only a tube when the claws are united. The orifice of the tube is termed the throat or faux; and this may be naked (nuda), or furnished with little scales or appendages, called sometimes a crown. The shape of the corolla is frequently of importance in distinguishing natural groups of plants. When all the petals are equal, it is said to be regular; when a monopetalous regular corolla has no tube, but swells out gradually from the base to the summit, it is bell-shaped or campanulate; and urceolate if it is swollen at the base, and contracted at the top; when there is a tube, and when it is narrow below, but dilates upwards, so that the limb is campanulate, the corolla is infundibuliform or funnel-shaped; it is rotate or wheel-shaped if the tube be very short, and the limb spreading and nearly plain; hypocrateriform, when the tube is long, narrow, and cylindrical, and the limb spreading like a star; and tubular when it is almost entirely composed of a narrow elongated tube, slightly dilated upwards. When the petals are of unequal size, or cohere unequally, the corolla is irregular; and if such petals unite, the result will be an irregular monopetalous corolla. Of the various other kinds of corolla which arise from the nature of the tube or the pistils and their relations, we cannot give an account in this place.

STAMENS.

From one to many small bodies, varying very much in form and size, lie immediately within the blossom, and these are termed the stamens, or the male organs of reproduction. In general, a stamen consists of two parts, in most cases, of a filament *d*, fig. 2 (from *filum*, a thread), which is usually white, and always of an anther, *e*, fig. 2, which is usually yellow or purple. It has been shown that the stamens are always next to the petals, that is, between their base and the base of the seed-organ. It is upon the number and arrangement of the stamens that systematic botanical arrangements have principally been founded. The following are a few characteristics of the number, length, position, direction, &c. of the stamen. The number of stamens in each flower varies from one to twenty, or more. In length, they are equal or unequal, and this disproportion is sometimes symmetrical, sometimes not. In position they may be opposed to the divisions of the petals, or they may alternate with them. Sometimes they protrude beyond the corolla, at other times they are wholly included within it. Their direction may be erect, pendent, or horizontal, and their summit is variously inclined to or reflected from the centre of the flower. The filament which supports the anther is most commonly straight and filiform; sometimes, however, it is otherwise. It varies, from being as small as a hair, to be large and flat like a petal, and its summit is either pointed or obtuse. On the summit is that essential part the anther, which is generally formed of two small membranous sacs, attached immediately to each other, or united by an intermediate connecting body. In form, anthers are subject to great variety, and, like the filaments, they sometimes cohere so as to form a sort of tube. Their colour is often yellow, orange, violet, white, &c., but never green or truly blue.

The pollen contained in the anthers consists of numerous regularly figured small particles, which possess in different plants a very different figure, size, and colour. The number of particles in a cell, which is very small, sometimes amounts to many thousands. In some flowers the pollen consists of transparent grains; in others they are of a white, purple, blue, or brown, and more frequently of a yellow colour. When a grain of pollen is dropped into water, it swells and bursts, and a minute quantity of matter escapes, which is supposed to confer the fecundating property to the pollen.

THE PISTIL.

Between the base of the filaments of the stamens and the seed-bag, there is an expansion which Linnæus entitled a nectary, but which has since been called a disc, because it is generally of a roundish form. In the centre of the flower, and always surrounded by this disc, when there is one, and when there is not, by the stamens, there may be observed from one to many small bodies, varying much in length and form; these are the pistils, and they are considered the female organs of the plant. A pistil consists of three parts, the style, the seed-organ (called the germen or ovary), and the stigma or summit, which may be seen by referring to fig. 2. *a* represents the seed-organ, *c* the style, and *b* the stigma or summit. The seed-organ or ovary occupies almost always the inferior part of the pistil. It is here that the seed is produced. When cut open, it exhibits one or more cavities or cells, in which are contained the rudiments of the seeds or ovula; and it is in it that the change of the ovula into perfect seeds is effected. It is of various forms, but most commonly ovoidal. It is generally seated upon the receptacle together with the stamens, but frequently it is placed below the flower. Its cavity consists sometimes only of one cell or loculament, in which one or more ovula are found. Fig. *d* is a representation of an ovary, in which there are several cells. The style is a prolongation from the summit of the ovarium, and supports the stigma. It is generally so situated as to be surrounded by the stamens, but sometimes it is entirely wanting, and the stigma is then said to be sessile. Any part of a plant which commonly is borne on a stalk, when it has none, is said to be sessile (Latin), *seated*. In some plants there are several styles to one ovary, in others there are several ovaries to one style. The most common form of the style is filiform; but frequently it is thick, angulated, or club-shaped. It is commonly a hollow tube communicating with the ovary, and sometimes so connected as to fall after fecundation. The stigma, which forms the summit of the pistil, sometimes terminates the style by an open mouth. Sometimes it has the appearance of a small bud, and in other instances it is variously divided or forked. Sometimes it is smooth, and sometimes covered with hairs. The number of stigmata is determined by that of the styles or divisions of the styles, and therefore varies from one to six, or more in different plants. In form and consistence the stigma varies considerably, being in the latter respect thick and fleshy, or thin and membranous, or formed of small glandular bodies.

Before entering into particulars regarding germination and reproduction, we shall give an account of vegetable nutrition, a branch of the subject too much neglected by botanical writers. In treating of this department, we shall principally follow Dr Roget, who has admirably elucidated it in his Bridgewater Treatise upon Animal and Vegetable Physiology.

FOOD OF PLANTS.

Water may be considered as the general vehicle through which nutriment is received by the vegetable kingdom; but it has been demonstrated that plants cannot live upon pure water alone, as *was* at one time believed. When plants are contained in close vessels, and supplied regularly with water, but to which no carbonic acid gas is allowed to enter, they are developed only to a very limited extent. They moreover quickly die, unless fresh supplies of water be regularly furnished. The water which goes to the nourishment of the vegetable kingdom is never perfectly pure; for besides containing air in which there is constantly a portion of carbonic acid gas, by percolating through the soil it has imbibed saline matter, as well as decayed vegetable or animal remains, which substances are soluble in a very minute quantity of water, or are so finely pulverised as to be suspended in the fluid, and carried with it into the vegetable system. From chemical experiments, it appears that the principal matters taken up by plants, besides water, are carbonic acid gas, nitrogen, chiefly in the form of humic acid, together with a few salts, such as potass, and metallic ingredients. Out of these, and the hydrogen and oxygen of the water, and the carbon supplied by the carbonic acid, all vegetable products seem to be principally elaborated. The peculiar fertility of each kind of soil depends chiefly on the quantity of vegetable and animal remains which it possesses in a state capable of being absorbed by the plant, and of contributing to its nourishment.

ABSORPTION OF NUTRIMENT.

The greater number of plants which are composed of cellular tissue absorb water with nearly equal facility from every part of their surface. This is the case with a class of aquatic plants called the algæ. On the other hand, lichens and some other plants absorb it only at particular and variable parts of the surface, whose situation appears to be more determined by mechanical causes than by any peculiarity of structure. Some, however, are said to be furnished in certain parts with stomata, which may act as sucking orifices. In plants having a vascular system—and they are by far the most numerous and important—the roots are the special organs which absorb nourishment; occasionally, however, the leaves and stems of plants absorb moisture, but this is not their natural action, the root being the proper organ. Roots are provided with suckers, called spongioles or spongelets, which De Candolle describes as resembling a minute sponge full of pores, inferred, when they cannot be detected, from the fact of fluids actually passing into them. The spongelets are always placed on the extreme tips of the rootlets or smallest fibres of the root, and are composed of an expanded tissue of small roundish cells, often as soft as pulp. They imbibe the fluids that are in contact with them, partly by capillary action, and partly also by what has been termed a hygroscopic power. But though these principles may sufficiently account for the simple entrance of the fluids, they are inadequate to explain its continued ascent through the substance of the root, or along the stem of the plant. The most probable explanation of this phenomenon is, that the progressive movement of the fluid is produced by alternate contractions and dilatations of the cells themselves which compose the texture of the plant; these actions being themselves referable to the vitality of the organs.

The absorbent power of the spongioles is limited by the diameter of their pores, so that if fluids be thick or glutinous, they are apt to block up the passage altogether. Thus, if the spongioles be surrounded by a solution of viscid matter, such as gum or sugar, its pores will be clogged up, scarcely any of the fluid will be absorbed, and the plant will decay; but if the same liquids be largely diluted, the watery portion will enter, while the greater part of the thicker materials will be left behind. The same apparent power of selection is exhibited when saline solutions of a certain strength are presented to the root, the water of the solution, with only a small proportion of the salts, being taken up; and if the remaining part of the fluid be examined, it will be found to be more strongly impregnated with the salts than before this absorption had taken place. It has been found, however, that if perfect liquidity exist, the plant will take in the liquid with equal avidity whether it be salubrious or otherwise, so that the action of the plant is mechanical, and not the result of discrimination at all.

ASCENT OF THE SAP.

The various matters held in solution by the fluid enter the plant in a perfectly crude state. The liquid rises in the stem of the plant, undergoing little or no perceptible change in its progress, and is in this state conducted to the leaves, where it experiences various important modifications. By causing the roots to imbibe coloured liquids, the general course of the sap has been traced with tolerable accuracy, and it is found to traverse principally the ligneous substance of the stem; in trees, its passage is principally through the alburnum, that is, the wood last formed, and not through the bark, as was at one time believed.

The course of the sap varies under different circumstances, and at different periods of vegetation. At the time when young buds are preparing for their developement, which usually takes place after the genial warmth of spring has penetrated beyond the surface of the earth, and expanded the fibres and vessels of the plant, there is created an urgent demand for nourishment, which the roots are actively employed in supplying. As the leaves are not yet completed, the sap is at first applied to purposes somewhat different from those it is destined to fulfil at a more advanced period, when it has to nourish the fully expanded organs; this fluid has, accordingly, been called the nursling sap. It does not rise through the alburnum, but through the wood, which is immediately contiguous to the pith, and thence passes, by unknown channels, through the other layers of wood to the buds, which it nourishes. In this circuitous circulation it is supposed to undergo a change, or becomes assimilated, in which state it is fitted for entering into combination with the plant, or becoming incorporated with the new organisation. This nursling sap has been compared to the milk of animals, which is prepared for a similar purpose at those times only when nutriment is required for the rearing of their young.

Philosophers are at variance with regard to the channels through which the sap passes in its ascent along the stem, and in its subsequent progress to its ultimate destination. De Candolle is of opinion that it passes along the intercellular spaces; and he adduces a number of arguments in support of his views. In order to ascertain the velocity with which sap rises, Hales cut off in the spring a vine branch, and enclosed the cut surface of the stump in a bent tube, when the sap flowed so abundantly, and with such force, that it sustained a quantity of mercury equal in weight to a column of water forty-three feet high, which indicates a force of propulsion considerably greater than the pressure of an additional atmosphere, or five times greater than the current of the blood in a horse. Various circumstances, however, contribute to influence the rapidity of circulation in vegetables. In experimenting upon blanched plants with coloured fluids, Bonnet found that they rose from two to three inches per hour. Heat has a very considerable influence in raising the sap, and very probably electricity may be another important agent. Perhaps they, in some mysterious manner or another, may excite the vital movements of the cellular structure already alluded to. There is no evidence that there is any thing like muscular power exercised. The simplest idea, says Roget, is, that these actions take place by means of a contractile property belonging to the vegetable tissue, and exerted under certain circumstances, and in conformity to certain laws, which we have not yet succeeded in determining.

EXHALATION.

The nutrient sap, which, as we have seen, rises in the stem, and is transmitted to the leaves without any change in its qualities or composition, is immediately, by the medium of the stomata, or orifices which abound in the surface of those organs, subjected to the process of exhalation. The proportion of water which the sap loses by exhalation in the leaves is generally about two-thirds of the whole quantity received; so that it is only the remaining third that returns to nourish the organs of the plant. It has been ascertained that the water thus evaporated is perfectly pure, or at least does not contain more than a 10,000,000th part of the foreign matter with which it was impregnated when first absorbed by the roots. The water thus exhaled, being dissolved by the air the moment it escapes, passes off in the form of invisible vapour. Hales made an experiment with a sunflower, three feet high, enclosed in a vessel, which he kept for fifteen days, and inferred from it that the daily loss of the plant by exhalation was twenty ounces; and this he computes is a quantity seventeen times greater than that lost by insensible perspiration from an equal portion of the surface of the human body.

The comparative quantities of fluid exhaled by the same plant at different times are regulated, not so much by temperature, as by the intensity of the light to which the leaves are exposed. It is only during the day, therefore, that this function is in activity. De Candolle has found that the artificial light of lamps produces on the leaves an effect similar to that of the solar rays, and in a degree proportionate to its intensity. As it is only through the stomata that exhalation proceeds, the number of these pores in a given surface must considerably influence the quantity of fluid exhaled.

By the loss of so large a portion of the water which in the rising sap had held in solution various foreign materials, these substances are rendered more disposed to separate from the fluid, and to become consolidated on the sides of the cells or vessels, to which they are conducted from the leaves. This, then, is the first modification in the qualities of the sap which it undergoes in these organs.

ORGANS OF AERATION.

The following account of the process of aëration is from Professor Rennie's work:—

"Though plants have no organs analogous to lungs or gills, nor even, I think, to the air-pipes of insects, to which the spiral vessels have been mistakingly, it should seem, compared, yet they cannot live without air any more than animals, and they die when deprived of it. The air being thus indispensable to vegetable life, must act on the plant in some manner; and experiments have accordingly proved that the leaves of plants perform some function similar to that of the lungs of animals. In animals, the air taken into the lungs in breathing through the nose and mouth becomes decomposed (in the dark it may be remarked) by giving up part of its oxygen, which combines with the blood, and receiving in turn from the blood a portion of carbonic acid gas and watery vapour. In plants this process is reversed; for the sap, which has mounted into the leaves and young green shoots, and which is composed of water, carbonic acid gas, potass, and a few other ingredients, either derived from the soil or taken up on passing up through the plant, becomes partly decomposed in the light; a portion of the oxygen being set free from the carbon which remains in the leaf, while the oxygen is given off into the air, at the same time that the large portion of the water is given off undecomposed, in the form of vapour.

The quantity of water thus exhaled by a cabbage has been proved to be seventeen times greater than that transpired by a man in what is termed insensible perspiration. The exhalation of water takes place through the pores already described of the green parts, but not the decomposition of air, which is effected, as De Candolle remarks, where there are no pores.

It is important to remark, that light is indispensable in effecting what may be called the aëration of plants, that is, in decomposing the sap in the leaves, and condensing the carbon, potass, and other matters indispensable to nutrition, while watery vapour is at the same time exhaled; none of which take place in the dark. Heat may cause a trifling evaporation, but nothing in proportion to that caused by light. It is on this account that plants exposed to much light are greatly harder and tougher than when grown in more shady places: a mountain oak, for example, more than a forest oak; or a wild carrot on an exposed bank, more than a garden one shaded by the leaves of its fellows. The green colour of leaves, as well as the varied colours of flowers, though very imperfectly understood, may be plausibly explained from the same principles.

Sennebier thinks that the real colour of carbon is dark blue rather than black, while the tissue of the cells and vessels of which the body of plants is composed, is yellow; consequently, when the blue carbon is lodged in these yellow translucent cells, a green colour is the result. Hence, in the spring, the newly expanded leaves, before they have had time to prepare much carbon, are yellowish; and when plants are kept from the light, so that no carbon can be prepared by their leaves, they become white, and also crisp and succulent from the same cause, as is seen in blanched celery and endive.

In autumn, when the leaves assume various tints, it was found by Macaire to arise from their taking in oxygen during the night, and being too feeble to open their pores for its escape during the day. The oxygen thus confined unites with the materials of the pulp, producing various acids, whose known action is to change blues to reds; and, consequently, when the blue carbon becomes thus tinged, it produces various shades of orange, and other combinations of red and yellow. Macaire was led by his researches to attribute the various colours of flowers chiefly to oxygen accumulated in the petals producing acids to combine with the other principles. It may be well, however, to caution the young beginner not to take these statements for more than an ingenious and plausible theory.

It might be supposed, as plants seem to feed chiefly on carbon, that they would thrive well in smoke, or in an atmosphere of carbonic acid gas. But it is found not to be so; for the particles of carbon in smoke are too large to enter their pores, and too much undiluted carbonic acid gas gorges them, and they will become brown, and die. Plants, it would appear, then, are destined by providence to purify the air, which is loaded from the lungs of animals with carbonic acid gas, and to give out a fresh supply of oxygen to replace what is taken up by the lungs. During the night, however, the green parts of plants take up oxygen, which is retained, and give out a small portion of carbonic acid gas; and hence it is not proper to keep plants during the night in a bedroom. When plants, indeed, are kept in an atmosphere deprived of oxygen, they soon lose their colours, and perish.

Plants can neither germinate nor live in nitrogen or azote, which kill some species almost instantly, though it is often found in small proportions upon analysing plants. Priestly imagined hydrogen to furnish nutriment to plants, but this has been disproved by experiment.

The decomposition of the air in the lungs of animals evolves heat, but this is less observable in the decomposition of air by plants. Desfontaines found, however, in the cuckoopint, that during the formation of the seed the thermometer was raised fifteen degrees. The origin of the various odours given off by plants is no better understood than that of their colour, and I shall not therefore detail mere conjectures."

RETURN OF THE SAP.

After the sap has undergone in the leaves the double processes of exhalation and aëration, it is now more abundantly charged with nutriment. It is now elaborated into a fluid corresponding to the blood of animals, and fitted for becoming incorporated with the vegetable organs. The crude fluid which enters the leaves is called the ascending sap; and after it leaves them in order to be distributed throughout the plant, it has been called the returning sap. It still contains a considerable quantity of water, but a large proportion of that which has not been exhaled by the leaves, and its elements, oxygen and hydrogen, has combined with certain other substances, so as to form proximate vegetable products, of which gum is the simplest, and generally the most abundant. The returning sap descends from the leaves through two different structures. In exogenous plants, the greater portion find a ready passage through the liber, or innermost layer of bark, and another portion descends through the alburnum, or outermost layer of the wood. With regard to the exact channels through which it passes, the same degree of uncertainty prevails as with regard to those which transmit the ascending sap. De Candolle maintains, that in either case the fluids find their way through the intercellular spaces; other physiologists, however, are of opinion that particular vessels are appropriated to the office of transmitting the descending sap. The nature of the forces which actuate the sap in its descent from the leaves, and its distribution to different parts, as well as those powers which contribute to its motion from the roots to the leaves, are involved in equal obscurity. The hypothesis that it resulted from capillary attraction is now generally abandoned.

SECRETION AND EXCRETION IN VEGETABLES.

The modifications which the returning sap undergoes, and its conversion into gummy, saccharine, amylaceous, or ligneous products, are effected by the simpler kinds of cells. But there are other cellular organs in which greater changes take place in its nature, the agents for effecting which are unknown, and are therefore referred generally to the vital energies of vegetation. The process is termed secretion, and the organs by which it is conducted, glands. The matter secreted is sometimes retained in the cells, and sometimes appears on the outside as an excretion, for the plant has the power of throwing out by the root those superfluous or noxious matters which, if retained, would injure it. This explains the fact why plants render the soil where they have long been cultivated, less suitable to their continuance in a vigorous condition than it originally was; and also why plants of a different species are frequently found to flourish very well in the same situation where this apparent deterioration of the soil has taken place. Hence the importance in agriculture of a rotation of crops in the same field.

The vessels in which the fluid secretions are contained are of a peculiar kind, and exhibit ramifications and junctions resembling those of the blood-vessels of animals. We may also discover, by the aid of the microscope, that the fluids contained in these vessels are moving in currents with considerable rapidity, as appears from the visible motions of their globules; and they present, therefore, a remarkable analogy with the circulation of the blood in some of the inferior tribes of animals. This curious phenomenon was first observed by Schultz in the chelidonium, in the year 1820; and he designated it by the term Cyclosis, in order to distinguish it from a real circulation, if on further inquiry it should be found entitled to the latter appellation.

The circular movements which have been thus observed in the milky juices of plants, have lately attracted much attention among botanists; but considerable doubt still prevails whether these appearances afford sufficient evidence of the existence of a general circulation of nutrient juices in the vegetable systems of those plants which exhibit them; for it would appear that in reality the observed motions of the fluid are in every case partial, and the extent of the circuits very limited. The cause of these motions is not yet known; but probably they are ultimately referable to a vital contraction of the vessels, for they cease the moment that the plant has received an injury, and are more active in proportion as the temperature of the atmosphere is higher.

ORGANS OF REPRODUCTION.

These have already been mentioned in our description of the parts of a flower; a more minute account of their functions will now be given, for which we are principally indebted to Professor Rennie's able little work on Botany. The essential part of a stamen is the anther, which has usually two chambers filled with a peculiar matter termed pollen, the fructifying principle of the plant. When the pollen arrives at maturity, it bursts from the cells of the anther, and sheds itself upon the summit of the pistil; either from the stamens being near it, or by the winds or insects, when they are at some distance on the same plants, as in the hazel; or on different plants, as in the hop. M. Lecoq, however, appears to have proved by experiment, that fertile seeds may be produced in the female hop-plant without the intervention of the male; and we have a similar example among animals in aphides, of which the hop-fly is a species.

The summit is well contrived for retaining the pollen that may fall upon it, from being without any rind to cover it, and in all cases moistened with a clammy fluid, which causes the grains of pollen to swell, burst, and discharge their minute granules. Some suppose that these are taken up by spongelets in the summit similar to those of the root, while others allege that the fluid matter in which the granules float is sucked up. It has been discovered that the grains of pollen, when shed on the summit, in a few hours shoot out one or more delicate tubes, which by some philosophers are supposed to extend down as far as the seed-organs, and to expand around and between the nascent seeds. Some believe them to convey thither the granules, which at least enter into the tubes; others, however, deny that this is the case. The seed-organ lies at the base of the pistil, and contains the seeds either nascent or advanced to maturity. It bears a very strong resemblance to the egg-organ of birds and insects, and its parts have accordingly received from naturalists the same scientific names. The seed-organ is usually of an egg-oblong form, and is always composed of an outer membrane, a middle membrane, and an inner membrane, all intimately united. As every seed derives its nourishment from the inner membrane, there must be a communicating point; and this point being always on the verge of the membrane, may be so termed; that on the seed being termed the seed-scar, but popularly, though improperly, named the eye. In some species the verge bears a number of smaller verges, to each of which a seed is attached, by what is named the navel-string by those who pursue animal analogies to extreme minuteness, but is better termed the verge-cord or seed-stalk. All these parts are obvious in an unripe pea or bean.

The verge of the seed-stalk sometimes occurs in the form of an expansion surrounding the seed in a greater or less degree, which has been mistaken for a part of the seed. It is this expansion in the nutmeg which forms the mace of commerce. The centre of the seed-organ is sometimes formed of a sort of support, round which the seeds are ranged, termed the pillar, and theoretically represented as consisting of several verges united in a whorl with a space between.

The structure of seeds is no less curious than that of the seed-organs. The regions of a seed are named from the position of the seed-scar, which is placed at the base; the point opposite, the tip; the upper part, the back; the opposite to that, the belly; and between, the two sides. In curved seeds, such as in mignionette, the base and the tip become opposite. The outer coat of the seed has been called the shell, and consists in most of a single membrane, which is fitted to protect the seeds, or most essential part, the kernel, from extremes of heat and cold. The embryo of a seed consists of four parts—the radicle, the seed-lobe or lobes, the neck, and the gemlet; all of which are important to be noticed in the progress of germination, and with regard to the foundation of modern systems. The radicle forms that extremity of the embryo from which the root springs in the progress of germination; and before, it is always simple and undivided, but afterwards it may divide into branching radicles, as in grasses and mistletoe. The radicle may be naked, or it may be enveloped in a sheath, or it may be incorporated with the seed-pulp, and upon these three distinctions Richard founded a system of classification. The seed-lobe is very various in form and in size; it may be divided, or it may not be divided, into lobes; upon this principle Jussieu founded his system. But it is inconsistent with this system that the lobes may be three, as in drooping cypress; five, as in larch; six, as in deciduous cypress; and even ten or twelve, as in pine fir. In some cases during germination the seed-lobes remain below ground, as in the horse chestnut, in others they appear above ground in the form of seed-leaves.

The neck is the point of junction of the root and the stem; when it is distinctly marked, it forms the crown of the radicle, and the base of the seed-lobe, and it is by the lengthening of the neck that the seed-lobes are raised above ground, as in the cabbage, radish, and mustard. The gemlet or plume is a small body, often formed like a feather, situated in the cavity between the seed-lobes, when there is but one, and between the lobes when there are but two. The number of sorts of seeds and fruits which various plants produce require to be methodically disposed in order, but the best arrangements are yet defective. Seed may be either close, or may be dehiscent, of both of which kinds of seeds there are several varieties. Fruits are considered by botanists as the ripened seed-organ, and, as every one knows, present almost endless varieties of appearance.

GERMINATION.

After the seed has been duly fecundated by the pollen, and then perfectly ripened, it must be kept from extreme degrees of heat or cold, else the proper evolution of a young plant will not take place. The external circumstances necessary to germination depend on water, heat, and air, and, as connected with these, on soil and situation. The time required for germination varies much in different species; thus mustard takes little more than one day, whilst the rose, the hazel, &c. require two years. When a seed begins to germinate, it enlarges until it bursts its shell. Whenever the embryo begins to grow, it is termed the plantlet, and consists of two parts, one descending and the other ascending; the first being the embryo root, the second the embryo stem. As soon as the embryo stem or gemlet has reached the open air, its leaflets are expanded, and begin to perform all the functions of leaves.

There are two grand classes of seeds, those having only one seed-lobe, and those having two or more seed-lobes; and each class germinates after a certain manner. Wheat may be taken as an instance of the first, and the pea of the second; but for a detail of these we must refer to larger works upon the subject. The various opinions entertained relative to the growth of a plant may all be referred to three general heads. 1. That growth in diameter is carried on by the annual change of the inner bark into pulp wood, and of pulp wood into hard wood, and by the successive renewal of the inner bark. 2. That the successive formation of the layers of wood is produced by the evolving of buds. 3. That the annual formation of woody layers is owing to the pulp, which every year forms at one and the same time a new layer of pulp wood, and a new layer of inner bark. There is a great difference amongst plants with regard to the age at which they arrive. There are some which live only a few hours, or at most a few days, whilst some trees exist many centuries.

An important part of the subject remains to be discussed, namely, the classification of plants, or the arrangement of the numerous species in some regular order. Many schemes or systems have been as various times in use to facilitate the acquisition of knowledge respecting the varieties of the vegetable kingdom, and these have been successively abandoned, as insufficient, after new species were discovered which required classification. Two systems, however, at present prevail—that of the great Linnæus, which is called the sexual or artificial system, and that of Jussieu, which is denominated the natural system. Neither of these fully answer the purposes for which they were propounded, but we shall give a brief view of each.

SYSTEM OF LINNÆUS.

The basis of the Linnæan distribution of plants rests almost entirely on the male organs or stamens; and where no sexes could be distinguished, the author termed the plants Cryptogamous; and the class including such, the last of his arrangement, Cryptogamia. The other classes, which amount to twenty-three in number, are called Phanerogamous vegetables. Some of them have the flowers hermaphrodite, or containing both sexes; others have them separate, or are declinous. To the former belong twenty classes, to the latter three. Again, hermaphrodite or bisexual flowers may have the stamens either free from the pistillum or united to it; and hence arises another division: only one class, however, belongs to the last; so that there are nineteen to the first. These nineteen are farther divisible according as the stamens are free from each other or united together. The former may be equal or unequal in length; and those again which are equal may either be definite or indefinite in number. The classes are divided into orders, each class consisting of two or more, and these orders are determined by the pistils. The botanist has merely to count the stamens to find what class it belongs to, and to count the pistils to know the division of the class where it is placed. Unfortunately for the perfection of this system, all plants have not been formed upon this principle, but it holds in a very considerable number. Professor Rennie gives the following outline from Lamouroux, as a

First Linnæan Lesson.

When a plant in flower is found, it must furnish an answer to one of the following questions:—

		Class
I. Has it stamens and pistils?	No.—Then it belongs to	24
	Yes.—Then see question II.	
II. Are the flowers with only stamens, or only pistils, and also with both stamens and pistils?	Yes.—Then it belongs to	23
	No.—Flowers with only stamens on one plant, and flowers with only pistils on another, belong to .	22
	Flowers severally with only stamens, or only pistils on different parts of the same plant, belong to . .	21
	Flowers with both stamens and pistils included in the same flower, see question III.	
III. Do the stamens adhere to the pistil?	Yes.—Then it belongs to	20
	No.—Then see question IV.	
IV. Are the stamens united by the anthers?	Yes.—Then it belongs to	19
	No.—Then see question V.	
V. Are the stamens united by the filaments?	Yes.—In more than two bundles, it belongs to	18
	In only two bundles, it belongs to	17
	In only one bundle, it belongs to	16
	No.—Then see question VI.	
VI. Are there only six stamens, four being longer than the others?	Yes.—Then it belongs to	15
	No.—Then see question VII.	
VII. Are there only four stamens, two being longer than the others?	Yes.—Then it belongs to	14
	No.—Then see question VIII.	
VIII. Are the stamens more than 12?	Yes.—Inserted upon the receptacle, it belongs to	13
	Inserted upon the flower-cup, it belongs to .	12
IX. How many stamens are there under thirteen?	Twelve.—Then it belongs to	11
	Ten.—Then it belongs to	10
	Nine.—Then it belongs to	9
	Eight.—Then it belongs to	8
	Seven.—Then it belongs to	7
	Six.—Then it belongs to	6
	Five.—Then it belongs to	5
	Four.—Then it belongs to	4
	Three.—Then it belongs to	3
	Two.—Then it belongs to	2
	One.—Then it belongs to	1

The following presents a view of the various classes, with their technical names; and although part of what is stated above be repeated, it will serve in this tabular form to give a clearer view of the classification:—

1. MONANDRIA, with 1 stamen, ...	*Ginger.*
2. DIANDRIA, — 2 —	*Olive.*
3. TRIANDRIA, — 3 —	*Valerian.*
4. TETRANDRIA, — 4 —	*Holly.*
5. PENTANDRIA, — 5 —	*Nightshade.*
6. HEXANDRIA, — 6 —	*Snowdrop.*
7. HEPTANDRIA, — 7 —	*Chestnut.*
8. OCTANDRIA, — 8 —	*Spurge Laurel.*
9. ENNEANDRIA, — 9 —	*Rhubarb.*
10. DECANDRIA, — 10 —	*Senna.*
11. DODECANDRIA, — 11 to 19	*Asarabacca.*
12. ICOSANDRIA—20 or more stamens inserted into the calyx (perigynous), . .	*Sweet Almond.*
13. POLYANDRIA—20 or more stamens inserted under the ovary (hypogynous), . .	*Opium Poppy.*
14. DIDYNAMIA—4 stamens, 2 long and 2 short, ...	*Purple Foxglove.*
15. TETRADYNAMIA—6 stamens, 4 long and 2 short, ...	*Scurvy-grass.*
16. MONADELPHIA—stamens united in 1 fasciculus or tube, ...	*Marsh Mallow.*
17. DIADELPHIA—stamens united in 2 fasciculi, ...	*Broom.*
18. POLYADELPHIA—stamens united in 3 or more fasciculi, ...	*Orange.*
19. SYNGENESIA—anthers united,	*Chamomile.*
20. GYNANDRIA—stamen and pistil united,	*Snake-root.*
21. MONŒCIA—unisexual flowers growing on the same plant, ...	*Oak.*
22. DIŒCIA—the male and the female flowers growing on different plants, . .	*Hop.*
23. POLYGAMIA—hermaphrodite, male, and female plants, growing on the same plant or on separate plants, ...	*Fig.*
24. CRYPTOGAMIA—flowerless plants,	*Iceland Moss*

The second Linnæan lesson of Lamouroux, by which the orders are determined, proceeds thus:—

Flowers with stamens of a fixed number, and equal in length

FIRST CLASS, or Monandria, having one stamen.—If they have one pistil, they are of the first order, or Monogynia; if two pistils, they are of the second order, or Digynia.

SECOND CLASS, or Diandria, having two stamens.—If they have one pistil, they are of the first order, or Monogynia; if they have two pistils, they are of the second order, or Digynia; and if three, they are of the third order, or Trigynia.

THIRD CLASS, or Triandria, having flowers with only three stamens.—If they have one pistil, they are of the first order; if two, they are of the second order; and if three, of the third order.

FOURTH CLASS, or Tetrandria, having flowers with only four stamens equal in length.—If they have one pistil, they are of the first order; if two, of the second; three, of the third; and if four, of the fourth order, or Tetragynia.

FIFTH CLASS, or Pentandria, having flowers with only five stamens.—Those having from one to four pistils are named as in the preceding classes; those having five pistils belong to the fifth order, or Pentagynia; and if they have many pistils, to the sixth order, or Polygynia.

SIXTH CLASS, or Hexandria, having flowers with six stamens.—As they have one, two, or three pistils, they belong to the first, second, or third orders; if they have six pistils, to the fourth order; and if many pistils, to the fifth order.

SEVENTH CLASS, or Heptandria, those having only seven stamens.—If they have one or two pistils, they are classed as before; if four pistils, they belong to the third order; and if seven pistils, to the fourth order.

EIGHTH CLASS, or Octandria, having flowers with only eight stamens. If they possess from one to four pistils, they rank in the order corresponding to the number.

NINTH CLASS, or Enneandria, those having only nine stamens. If they have one pistil, they belong to the first order; if three, to the second; and if six, to the third.

TENTH CLASS, or Decandria, having only ten stamens.—If they have one, two, or three pistils, they belong to the first, second, or third orders; if five, to the fourth; and if ten, to the fifth order.

Flowers with stamens of rather uncertain number, but of fixed insertion.

ELEVENTH CLASS, or Dodecandria, having flowers with from eleven to nineteen stamens inserted into the receptacle.—If they have from one to five pistils, they belong to the orders corresponding to these numbers; and if they have about twelve pistils, they belong to the sixth order.

TWELFTH CLASS, or Icosandria, having flowers with twenty or more stamens inserted into the flower-cup or the blossom.—If they have one, two, or three pistils, they belong to the first, second, or third orders; if five, to the fourth order; and if many pistils, to the fifth order.

THIRTEENTH CLASS, or Polyandria, those having flowers with from twenty to one hundred stamens inserted into the receptacle.—If they have from one to six pistils, they are classed as before; if they have many pistils, they belong to the seventh order.

Flowers with two of the stamens shorter.

FOURTEENTH CLASS, or Didynamia, having flowers with four stamens, two longer and two shorter, inserted on a one-petalled blossom.—If the four seeds appear not to be in a seed-vessel, they belong to the first order, or Gymnospermia; but if they appear to be concealed in a seed-organ, they belong to the second order, or Angiospermia.

FIFTEENTH CLASS, or Tetradynamia, having flowers with six stamens, four longer and two shorter, the blossom with more petals than one.—If the seed-organ is a short pod, they belong to the first order, or Siliculosa; and if a long round pod, to the second order, or Siliquosa.

Flowers with stamens united by their filaments.

SIXTEENTH CLASS, or Monadelphia, having flowers with the filaments of all the stamens united at the base into one bundle.—If there are three stamens, they belong to the first order, Triandria; if five stamens, to the second order, Pentandria; if seven stamens, to the third order, Heptandria; if eight stamens, to the fourth order, Octandria; if ten stamens, to the fifth order, Decandria; if eleven stamens, to the sixth order, Endecandria; if from twelve to twenty stamens, to the seventh order, Dodecandria; and if more than twenty stamens, to the eighth order, Polyandria.

SEVENTEENTH CLASS, or Diadelphia, having flowers with the filaments of all the stamens united into two bundles. If they have five stamens, they belong to the first order, Pentandria; if six stamens, to the second order, Hexandria; if eight stamens, to the third order, Octandria; and if ten stamens, to the fourth order, Decandria.

EIGHTEENTH CLASS, or Polyadelphia, having flowers with the filaments of all the stamens united into three or more bundles. If there are from twelve to twenty-five stamens unconnected with the flower-cup, they belong to the first order, Dodecandria; if the bundled stamens are inserted in the cup, to the second order, Icosandria; and if there are more than twenty-five stamens unconnected with the flower-cup, to the third order, Polyandria.

Flowers with stamens united by their anthers.

NINETEENTH CLASS, or Heptandria, having flowers composite, with all the anthers in a floret united into a tube, whilst their filaments are not united. If all the florets are equal, they belong to the first order, Polygamia æqualis; if the florets of the circumference have pistils without stamens, to the second order, Polygamia superflua; if the florets of the circumference have neither florets nor pistils, to the third order, Polygamia frustranea; if the florets of the circumference have pistils without stamens, and those of the centre stamens without pistils, to the fourth order, Polygamia necessaria; and if the florets have a partial flower-cup all within a general flower-cup, to the fifth order, Polygamia segregata.

Flowers with the stamens and pistils united.

TWENTIETH CLASS, or Gynandria, having flowers with the stamens inserted upon the style or seed-organ. If they have one stamen, they belong to the first order, Monandria; if two stamens, to the second order, Diandria; if three stamens, to the third order, Triandria; if four stamens, to the fourth order, Tetrandria; if five stamens, to the fifth order, Pentandria; if six stamens, to the sixth order, Hexandria; and if eight stamens, to the eighth order, Octandria.

Flowers of only one sex.

TWENTY-FIRST CLASS, or Monœcia, having flowers, some with pistils only, and some with stamens only, on the same plant. There are nine orders, taken from the number and bundling of the stamens as before.

TWENTY-SECOND CLASS, or Diœcia, having flowers with pistils only, or with stamens only, on two separate plants of the same species. There are nine orders founded as in the preceding class.

TWENTY-THIRD CLASS, or Polygamia, having flowers with both stamens and pistils, and also with only one of these, both on the same and on separate plants of the same species. There are three orders.

No flowers apparent on the plants.

TWENTY-FOURTH CLASS, or Cryptogamia. Stamens and pistils, if present, cannot, from being very minute, be ascertained. The class contains five orders, ferns, filices; mosses, musci; liverworts, hepaticæ; seaweeds, algæ; and mushrooms, fungi.

Such is a plain view of the Linnæan system of classification. It is certainly imperfect; for instance, in the twenty-fourth class, it fails altogether in assisting the student. But it does not seem to be less so than the natural system, which, however, is rapidly gaining ground in Britain, and is very generally followed up on the Continent. We shall now present a brief view of it also.

JUSSIEU'S CLASSIFICATION, OR THE NATURAL SYSTEM.

The author of this system, viewing the seed of a plant as a more important organ than the stamens and pistils, devised a classification which takes its leading divisions from the seed-lobes. His system has been variously altered and improved; and although in many instances the plants are more congruously associated together in it than they are in the other system, yet it is also still imperfect. In the first lesson on Jussieu's system, the learner procures the seed, and examines the seed-lobes, when an answer to the following questions must be furnished:—

1. Has it any seed-lobes? { No.—Then it belongs to division I. / Yes.—Then see question 2.

2. How many seed-lobes has it? { One.—Then it belongs to II. / Two or more.—Then it belongs to . . III.

Or if the seed cannot be found, the stem or the leaves must furnish answers to the following questions:—

1. Are there any sap and pulp vessels? { No.—Then it belongs to division . . I. / Yes.—Then see question 2.

2. Is the stem tapering upwards, covered with bark, and the wood softer on the exterior than in the interior? { No.—Then it belongs to I. / Yes.—Then it belongs to . . . . III.

De Candolle terms the first class Cellular (Cellulares), because the plants have cells but no vessels, and the two others Vascular (Vasculares), because they have both vessels and cells. The vascular plants he again divides into ingrowing (Endogens), and outgrowing (Exogens). After a knowledge of these three great divisions is acquired, the beginner then commences with the fifteen classes and their orders.

Plants without seed-lobes, or sap and pulp vessels.

FIRST CLASS, or Acotyledones. The seed when it can be discovered is simple and without parts.—There are ten orders—sea-weeds, mushrooms, &c.

Seeds with one seed-lobe; Plants with sap and pulp vessels (Monocotyledones).

SECOND CLASS, or Monohypogynæ. Flowers with the stamens inserted under the seed-organ.—There are seven orders—pond-weeds, grasses, &c.

THIRD CLASS, or Monoperigynæ. Flowers with the stamens inserted around the seed-organ.—There are ten orders—palms, rushes, &c.

FOURTH CLASS, or Monoepigynæ. Flowers with the stamens inserted above the seed-organ.—There are ten orders—black bryonies, gingers, &c.

Seeds with two or more seed-lobes (Dicotyledones).

Without Petals, or Apetalæ.—FIFTH CLASS, or Epistamineæ. Flowers with the stamens inserted above the seed-organ.—There are three orders—asarabaccas, cytini, and santali.

SIXTH CLASS, or Peristamineæ. Flowers with the stamens inserted around the seed-organ.—There are seven orders—eleagni, laurels, &c.

SEVENTH CLASS, Hypostamineæ. Flowers with the stamens inserted below the seed-organ.—There are two orders—amaranths and marvel of Peru.

With one-petalled blossoms (Monopetalæ).

EIGHTH CLASS, or Hypocorolleæ. Flowers with the petal inserted below the seed-organ.—There are twenty-one orders—plantains, primroses, &c.

NINTH CLASS, or Pericorolleæ. Flowers with the petal inserted around the seed-organ.—There are four orders—heaths, &c.

TENTH CLASS, or Epicorolleæ synantheræ. Flowers with the petal inserted above the seed-organ and the anther united.—There are two orders—chicories and boopidias.

ELEVENTH CLASS, or Epicorolleæ corisantheræ. Flowers with the petal inserted above the seed-organ, and the anthers not united.—There are five orders—woodbines, teasles, &c.

With many-petalled blossoms (Polypetaleæ.)

TWELFTH CLASS, or Epipetaleæ. Flowers with the stamens inserted above the seed-organ.—There are three orders—rhizophoras, &c.

THIRTEENTH CLASS, or Hypopetaleæ. Flowers with the stamens inserted below the seed-organ.—There are thirty-nine orders—ranunculi, rues, &c.

FOURTEENTH CLASS, or Peripetaleæ. Flowers with the stamens inserted around the seed-organ.—There are twenty-six orders—rupturesworts, gourds, &c.

With the stamens and pistils in separate flowers.

FIFTEENTH CLASS, or Diclineæ. Flowers without petals.—There are eight orders—spurges, nettles, &c.

DISTRIBUTION OF PLANTS OVER THE GLOBE.

Almost every region of the globe has its own peculiar vegetables, and these are so suited to the climate, soil, and height at which they flourish, as in most instances not to bear a change, without the fostering care and art of man. Fortunately, however, from a careful provision of nature, those vegetables which are most necessary as the food of man will be found to bear a variety of climate better than most others; this is the case with the various kinds of greens, carrots, the grains, and that invaluable article of food, the potato. Altitude, or the height above the sea at which plants grow, has an effect somewhat similar to the heat and cold of climate; and thus we find, in some of the high mountains of the tropical regions, that a beautiful succession of vegetation takes place from their bases to the summit. Thus, below, where the heat is greatest, plants of warm climates prevail; as we ascend to the middle regions, those of a temperate climate grow and flourish; and towards the top, plants only fit for a frozen clime make a partial appearance, till at last we gain a point of ever-during snow and frost, where no vegetable product dare raise its tender head. In warm climates the profusion of vegetation is much more abundant than in cold; thus, within the arctic circle, or region of the pole, only a few flowering species of plants are to be found, although the number of mosses is considerable; whereas, in the warm regions of the West Indies, in Madagascar, and the coast of Coromandel, one botanist alone enumerates from four to five thousand different kinds of plants. In warm moist climates, too, the progress of vegetation is amazingly rapid, and it is no unusual thing for reeds and palm-plants to shoot up 12 inches in 24 hours. By cultivation, and the arts of agriculture, vegetables are greatly improved, and rendered more suitable to the uses of man, and in some instances their natures are altogether changed. According to Buffon, our common wheat is an artificial production, improved to its present state by the assiduous cultivation of man; and it is most likely that rice, rye, barley, and oats, were originally but insignificant grasses, till improved by cultivation, for we nowhere meet with any of these grains vegetating in a state of nature. Thus, too, the common garden celery, which in its original state is an acrid poisonous plant, is converted by blanching into an agreeable and healthy salad. The colewort in its natural state, a plant with very scanty leaves, has been reared, by cultivation, into the different kinds of cabbages, cauliflowers, broccoli, &c. Potatoes have no doubt undergone great improvements in quality since first made known as an eatable root, and the engrafting of fruit-trees has already been spoken of. One great means of the improvement of vegetables seems to be the frequent changing of the soil in which they grow. All vegetables more or less exhaust the soil of the peculiar nourishment which they require; thus, if wheat be sown for two or three years in the same field, it will degenerate so as to be of no value as a grain; and it is the same with almost any other vegetable product. On the contrary, when changed into a well-prepared and richly-manured soil, every vegetable improves greatly in quality and size, and in the vigour of its growth.

DISEASES OF PLANTS.

Vegetables being organised substances, are, like animals, liable to various kinds of disease. This proceeds from a vitiated state of their juices, from a derangement of the minute structure of their porous organs, from the variations of the atmosphere, the attacks of minute animals, and other parasitic plants fixing on them and absorbing their proper juices. Blight is a disease brought on extensively in growing fields, or supposed to arise from a particular state of the air; perhaps it is mainly owing to its electric condition. It generally occurs about the end of July, in hot sunny weather, and after a shower. Fields of wheat, hop plantations, &c. are often blasted by it; sometimes only a part suffering, while at other times a whole field is destroyed. A kind of minute *fungus* is often found attacking the leaves and stems of our grasses and grains, such as wheat, barley, and oats. It is in appearance a brownish-looking powder: hence the appellation of rust given it by agriculturists. Upon close inspection it will be found to consist of thousands of minute globules, arranged in groups below the skin or covering of the plant. Sir Joseph Banks ascertained them to be a kind of fungus, or minute moss-plant, the seeds of which, floating about in the air, enter the pores of the leaf, especially if the plant is sickly; or they may exist in the soil or the manure, and may be taken up by the absorbent vessels of the roots. There is another kind of fungus, called the red gum, which attacks the ear of the plant, and of course is much more destructive than the former. *Smut* is a disease which attacks the seed or grain itself, converting it into a black substance like soot; and this also is supposed to be a minute fungus, or some diseased condition of the farina or mealy part of the seed. Minute animalcules and worms produced from flies also infest the grain crops in particular seasons; and many plants are preyed upon by myriads of a small insect, the *aphis*, or plant-louse, which, piercing the skin of the plant, extracts its nourishing juices. There are also mildew and honeydew, attacking the leaves of trees and vegetables, coating their surface with a thin whitish covering. A dropsy of plants also occurs from too great a profusion of juices, and this particularly happens in bulbous-rooted plants. Another similarity that plants have to animals is the power of renewing lost substances, and of entirely renovating parts of their structure. Thus, when a cut or wound is made in the bark of a tree, it is speedily filled up with new matter, and the edges completely closed up and reunited in a very short period; and the periodical decay and reproduction of leaves, and buds, and blossoms, are well-known operations of nature, thereby affording perpetual variety, and renewed freshness and beauty. When trees are entirely deprived of their bark, they immediately die; they will bear large pieces to be stripped off lengthwise; but if a complete circle be cut in the bark round the trunk, it is destructive of vegetable life.

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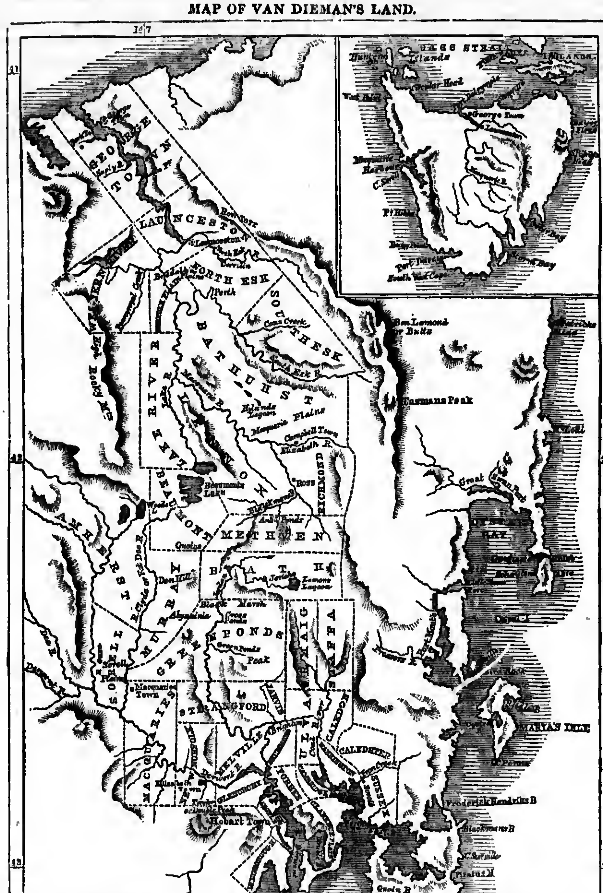
EMIGRATION TO VAN DIEMAN'S LAND.

MAP OF VAN DIEMAN'S LAND.



GEOGRAPHICAL POSITION AND GENERAL HISTORY.

This island, which, from its extreme remoteness alone, furnishes us with a remarkable instance, amongst many others, of the restless and daring spirit of British enterprise, is situated in the Southern Ocean, and is the first land of any extent, some very small islands only intervening, which occurs on the outward voyage after rounding the Cape of Good Hope. It is situated between lat. 41° and 44° south, and between long. 164° 40′ and 148° 20′ east of Greenwich. The length of the island is about 210 miles, and its breadth 150. It is thus about 34 miles less in length than Scotland, and about three miles more in breadth, and is therefore altogether considerably less in size. It is separated from New Holland by a strait of about 100 miles in breadth, the island lying this distance south of the most southern point of the former. The strait alluded to is called Bass's Strait, in honour of its discoverer Dr Bass, who, in the year 1797, first ascertained that Van Dieman's Land was an island, and that it was separated from New Holland by the channel which now bears his name. Previous to this it had always been considered as a part of the former, and was so laid down in all maps and charts.*

The island itself was first discovered in the year 1642, by Abel Jansen Tasman, a Dutchman, and was by him called Van Dieman's Land, in honour of Anthony Van Dieman, at that time governor-general of the Dutch possessions in the East Indies. Nothing, however, immediately resulted from this discovery, and for upwards of a hundred years the island was again lost sight of. In 1773, it was visited by Captain Furneau, the first English navigator who had ever touched at it; after this it was visited from time to time by several celebrated navigators, and amongst those by Captain Cook, in the year 1777. It was not, however, until 1803, that any settlement was made upon the island; in that year, it was formally taken possession of by Lieutenant Bowers, as a receptacle for convicts, with a party from Port Jackson, in New South Wales, where a penal establishment had been already fixed; and to this purpose Van Dieman's Land was exclusively devoted until the year 1819, when it was thrown open to free settlers. It is thus only since the very recent period just named that it has exhibited the character of a colony. Its progress, however, has been since then extremely rapid. With a feeling which does credit to the colonists of this island, as well as those of New South Wales, there is a strong disposition with both to call the island Tasmania, in honour of its first discoverer Tasman, in place of Van Dieman's Land, the name of its adopted godfather. Tasmania, therefore, is the favourite name by which the island is recognised, as well by its own inhabitants as by those of the adjoining land of New Holland.

GENERAL DESCRIPTION.

Van Dieman's Land has an exceedingly picturesque and beautiful appearance from the sea, presenting an endless succession of lofty mountains, covered to their summits with wood; while tall rocks and precipices, glens and hills, contribute to increase the interest of this romantic island. Nor does a nearer inspection materially alter this general character of the scene.

On traversing the island, it is found to present a constant alternation of hill and dale, with occasional flats or plains; but these are comparatively few in number, though some of them are of great extent, consisting in several instances of not less than from 8000 to 10,000 acres, and one in particular is said to be six miles in length, and from two to three in breadth. These plains are in general exceedingly fertile, and being often but thinly interspersed with trees, present a most delightful appearance. There are some of them again, however, very poor, presenting a cold thin soil, of little value.

Van Dieman's Land, though it cannot be called a well-watered country, is yet much superior in that respect to New South Wales. Besides several extensive lakes scattered throughout the interior, it possesses a considerable number of rivers; and in almost every district of the island water is to be found. The names of the two largest rivers are the Derwent and the Tamar.

In another important particular, this island is peculiarly fortunate, that is, in the number and capacity of its harbours, no place of similar extent in the world probably being equal to it in this respect. The principal of these are, the Derwent on its southern side, Port Davey and Macquarrie Harbour on the western, Port Sorrel and Port Dalrymple on the northern, and Oyster Bay and Great Swan Port on the eastern coast. Besides these, there are many other harbours, bays, and creeks, distributed all alongst its shores. The coast is in general high and rocky, particularly on the south, east, and western sides of the island; on the north, however, it presents a line of low alternate sandy beaches, on which the surf rolls with great impetuosity during the prevalence of northerly winds. From the extremely hilly nature of the country, there is but a comparatively small proportion of it adapted for the plough, though presenting abundance of excellent pasturage. The extent of really available land throughout the known part of the island, has been

* Besides the authorities consulted in the composition of the paper on New South Wales, we have been indebted for facts for the present article to a variety of colonial newspapers; the Van Dieman's Land Almanacks for 1830-31-32; Evans' Description of Van Dieman's Land, &c., as well as official documents.

estimated at one-third of the whole, and this again divided into four parts, giving one for the plough, and the other three for pasture: thus, out of 1000 acres of land, about 100 will be found fit for cultivation, and from 300 to 400 for grazing. This is, of course, a rough estimate, and will be found not to hold good in many instances, but in general we believe it will not be far from the truth.

CLIMATE, SOIL, AND NATURAL PRODUCTIONS.

The climate of Van Dieman's Land is exceedingly pleasant and salubrious, and is especially adapted to the constitutions of the natives of Great Britain; the heat in summer is not so intense as that of New South Wales, not often much surpassing that of London or the southern parts of England; while the mornings and evenings, even at the hottest periods of the year, are always cool and agreeable. The cold in winter, however, though mild when compared to what we experience at that season, is more intense and of longer duration than that of the neighbouring land, snow lying frequently on the higher mountains throughout the greater part of the year; but in the vallies and lower districts it seldom remains more than a few hours. There have not yet appeared any diseases which can be said to be peculiar either to the climate or to the island, and, on the whole, the chances of life are estimated to be considerably more in favour of Van Dieman's Land than of Britain, or any other of the most healthy parts of Europe. It is not subject to any extremes of heat or cold: the seasons are regular, mild, and agreeable; the atmosphere constantly pure and elastic; and the sky clear, unclouded, and brilliant. The average number of days on which rain falls throughout the year, is from 50 to 60. The soil of this island, generally speaking, presents a diversity equal to that of New South Wales, but, on the whole, there is a much less proportion of indifferent soil in the former than in the latter, and it is probably less encumbered with trees and brushwood. Such tracts of land as are good, are invariably of the very best description. The land of this kind in Van Dieman's Land has been represented, or at least spoken of, on the one hand, in such terms as might lead us to suppose that it was of unequalled fertility, and on the other as if it were worth nothing at all; but the truth appears to be, that it is neither the one nor the other—neither remarkably productive nor the reverse, but is in this particular much about what we are accustomed to at home. As might be expected, this mild and delightful climate is exceedingly favourable to vegetation, producing a constant verdure and the most luxuriant herbage on its plains and undulating hills, and exhibiting frequent instances of vegetable growth altogether unknown in less favoured regions, and almost surpassing belief. Trees are here found measuring 63 feet in circumference, and often stretching up to the height of 180 feet before throwing out a single branch; but it is remarkable, that with all this extraordinary power of vegetation, this universal activity of vegetable life, there is not one natural production of the island which affords the smallest subsistence to man. There is little variety in the description of its trees, the whole of them being nearly of one sort: all tall, straight, and branching only at the top—a circumstance which gives to the forests a peculiarly solemn, but not unpleasing, character. The bark of the trees is in general of so white a complexion as to give them the appearance of having been peeled, and their leaves are long, narrow, and pointed. The tropical productions which attain such perfection in New South Wales, do not thrive here, in consequence of the greater degree of coldness which prevails; but all the vegetables and fruits known and cultivated in England and Scotland, are raised without difficulty: apples, pears, plums, gooseberries, &c., to which the warmer temperature of New South Wales is unfavourable, are produced here in great abundance, and of excellent quality. Both the climate and soil are sufficiently favourable to the production of most descriptions of grain; wheat is found to thrive remarkably well; potatoes are in general a good crop, and of good quality. The island is altogether, in short, fit for all the purposes of agriculture aimed at in this country, being neither more nor less favourable to them, but in all respects nearly the same; its climate being ours, only somewhat modified, and its soil in general not materially differing in quality. Its animal productions are nearly the same with those of New South Wales, consisting of the kangaroo, opossum, squirrel, &c. The native dog, however, so well known in the former country, is not to be found here; but in its place there is an animal of the panther tribe, which, though it flies from man with the timidity of a hare, is yet extremely destructive to the flocks of the settlers, amongst which it frequently commits the most dreadful havoc. This animal attains considerable size, having been found in many instances to measure six feet from the snout to the extremity of the tail. The birds of Van Dieman's Land are the emu, or Australian ostrich, parrot, cockatoos, herons, swans, pelicans, &c. There are here, too, a considerable number and variety of poisonous reptiles, but these, on the whole, are neither so numerous nor so venomous as in the sister colony.

The seas around Van Dieman's Land abound with whales, dolphins, and seals, and its shores with shell-fish, particularly the mussel, these last literally covering the rocks on its coast, and in its bays, creeks, and harbours.

There is one remarkable circumstance attending almost all the Australian and Van Dieman's Land quadrupeds, which deserves to be noticed, because it distinguishes them from all other animals on the face of the globe. This is their being provided with bags, or pouches, on their bellies, in which they carry their young. It is not yet known how the latter get there at the first stage of their existence—every inquiry which has yet been made into the subject having failed to discover any channel of communication between the interior parts of the animal and the pouch—but it is certain that there they are found immediately after they have begun to exist, and that there they continue until they have attained sufficient maturity to shift for themselves. The parent animal has a nipple within the pouch, from which the young one draws its nourishment in the usual way; and, when somewhat advanced, it is an amusing and interesting spectacle to see the creature leaping out of and into this bag, as its humour or any alarm prompts it; nor is it less amusing to see it peeping out of the pouch, with a look expressive at once of curiosity, and a feeling of safety and comfort. It is pretty well known that this peculiarity belongs to the kangaroo, many of which have been exhibited in this country, but it is by no means confined to them: with very few exceptions, the young of every quadruped in that quarter of the world is brought up in the same way, the mothers having all pouches. The wonders in the vegetable world, in this region of the earth, are not less remarkable than those of the animal. We have already spoken of the prodigious size to which its trees attain; they have also the singular peculiarity of those of New South Wales, of being nearly all evergreens, few of them shedding their leaves, as ours do, once a-year; the consequence is, that they want that freshness which belongs to the latter, and are incapable of presenting the pleasing process of renovation so delightful in our spring, and which is scarcely compensated by their immunity from decay. In this land of contradictions, wher our cold winds are their best, our nights their days, our summer their winter, where their swans are black, and where nettles grow to the size and assume the shape of trees, we find its pears composed entirely of wood, and its cherries growing with the stones on the outside; the first are of course uneatable, being nothing better than the wooden imitations of that fruit, made for curiosity or ornament in this country; their stalks, too, as if nature took a pleasure in reversing here, in every particular, her own laws, grow from the broad end. This fruit, if it can be so called, has nevertheless a tempting appearance on the tree, and it is not until you have bitten it, or applied a knife to it, that you discover the deception.

The ornithology of this singular country, too, presents us with some curious deviations from the ordinary laws of nature: here is a bird without feathers or wings, and as tall as a man; these are the emus: they are of immense size, and are covered over with a coating of a substance between hair and feathers, but neither absolutely the one nor the other; they are provided with two short flaps instead of wings: these are incapable of lifting them from the ground, but enable the animal to run with amazing speed. The emus afford excellent pastime by hunting them, but are not easily approached, as they readily take alarm, and go over the ground with a rapidity which a horse cannot always equal. Their hind-quarters, often as much as a man can carry, is the only part of the emus that is eaten, but their eggs are reckoned delicious. These are, as might be expected from so large an animal, of great size; they are of a beautiful dark-green colour, and the shell is strong enough to admit of its being converted into a drinking-cup. This species of food is in great request by the natives, who live upon them almost exclusively at the season when they are to be had. With all the variety of birds, however, which Van Dieman's Land possesses, and the splendour of the plumage in which they are decked, there are few "wood-notes wild" to be heard amongst them—none of the music of the English groves. Few of the birds here sing, and those who do are not very melodious.

ABORIGINES, OR NATIVE INHABITANTS.

The natives of Van Dieman's Land are in complexion perfectly black; their hair is woolly, with flat features, and remarkably thin limbs; altogether, they are an exceedingly ugly race. They wear no covering of any sort, nor do they erect any huts or dwellings, but live wholly in the woods, with as little dependence on and seeking as little aid from mechanical contrivances as the beasts of the forest. They have no rites or ceremonies, either religious or otherwise, of any description, but are in every respect exactly in the same condition in which nature first placed them—affording perhaps as striking a specimen of man in the opposite extreme to that of his civilized state as the world can produce. Their numbers in the whole island are not thought to exceed 2000. All attempts to induce them to leave their native woods, and to mingle in a friendly manner with the colonists, have been yet more decidedly ineffectual than in the case of the natives of New South Wales; and no part of the internal policy of the island has been found more puzzling than that which relates to the aborigines. Hovering around the settled districts, they committed, from time to time, the most shocking atrocities, firing houses and corn-ricks, and frequently murdering the proprietors or their servants. This hostility, however, on the part of the blacks, was not without adequate provocation. The male native was shot without mercy by the settler, and the female, when taken, met but too often with the most infamous treatment at the hands of her brutal captors: mothers were torn from their children, and fathers were murdered before the eyes of both; while the whole were hunted from place to place with the most savage and unrelenting ferocity. The wretched native, then, had—we say had, because there now appears to be a better understanding between the two parties—a sufficient apology for the crimes which he committed; but as this state of matters could not be permitted to continue, it was necessary to fall upon some method of putting an end to it. One of the methods adopted was to drive the blacks into a particular corner of the island by a simultaneous movement of the whites. 4000 of the colonists volunteered their services on this occasion, and, together with the whole of the military on the island, proceeded to carry the design into execution. After keeping the field, however, for upwards of two months, and enduring in that time much privation and fatigue, the scheme was found to be impracticable, and was in consequence abandoned. Rewards were also offered for the capture of hostile blacks—L.5 for every adult, and L.2 for each child that should be taken, and delivered alive at any of the public establishments. Some late indications, however, of a better temper on the part of the natives, have induced the colonial government to withdraw this offer. The reason is thus announced in the Hobart Town Gazette of 8th June 1832, "that the present tranquil state of the colony has rendered it unnecessary longer to hold out any pecuniary reward for the capture of the aborigines."

Though sufficiently savage in their nature as well as habits, the natives of Van Dieman's Land are but a weakly race, possessing very little physical strength, and still less personal courage. Their intellectual powers, however, are not at all of so mean an order as might be expected from their condition and appearance—many of them have discovered an acuteness of sense and a quickness of perception which are not often to be met with amongst their civilized brethren. Their principal food is the kangaroo and opossum, but they readily eat any other native animal they can lay hold of. They merely warm the flesh on a fire, then devour it with the most savage eagerness. Their arms are the spear and waddy, a short club, both of which they use, it is said, with great dexterity. The spear, as with the natives of New South Wales, is merely a pole reduced to a sharp point at one end.

Although the unhappy natives of Van Dieman's Land have received much cruel treatment at the hands of some of the settlers and their servants, it is but justice to say that it has been far otherwise on the part of the colonial government, all of whose orders regarding them breathe a spirit of the utmost humanity and forbearance. The colonists are strictly enjoined, not only to refrain from offering them the slightest violence, but to treat them on all occasions, excepting of course when they come with hostile intentions, with kindness and gentleness, and on no account, but in the last extremity, to have recourse to fire-arms, either in capturing or resisting them; and that, when taken, or when they may have delivered themselves up voluntarily, it is enjoined that they be treated with the utmost care and humanity. The captured natives are sent to Gun Carriage island, situated in Bass's Strait, at the distance of 11 miles from the mainland, where they are furnished with ample means of supplying themselves with food and clothing.

The hostility which the natives evince towards the colonists, has in a great measure, if indeed not wholly, originated in an unfortunate occurrence which took place at the first formation of the colony. An officer of the New South Wales corps, who had been left in command of the military during a temporary absence of the governor, being alarmed by the approach of a large body of the natives, whom he perceived advancing towards his station, ordered the discharge of a cannon amongst them, loaded with grape and canister shot. The havoc was dreadful: numbers of them were killed and mangled by this murderous proceeding; and to add to the regret which the circumstance ought to inspire, it was afterwards ascertained that the natives were approaching with the intention of paying a friendly visit to the strangers who had come amongst them. They appear, however, never to have either forgotten or forgiven it. The tale is handed down from father to son, for it is now many years since, and to revenge it seems a part of their inheritance. Previous to this, they had always evinced the most friendly disposition towards the whites—a disposition which the latter were themselves the first to interrupt, and that in the tragical manner just spoken of.

The spirit of hostility which that unfortunate occurrence naturally engendered, has been since fostered by the wanton cruelties perpetrated from time to time on individuals of their unhappy race by the colonists, and more especially by the bush-rangers, of whom we shall speak hereafter. These ruffians have been accused of treating those of the poor, miserable, defenceless natives who fell into their hands, with a brutality and inhumanity which is scarcely paralleled in the annals of human depravity. The female aborigines are treated with great harshness by their husbands, who compel them to carry heavy loads, to perform all kinds of work, and to hunt for their subsistance. To escape from this state of bondage and servitude, they readily desert from their tribes, and place themselves under the protection of Europeans, and express great delight at the change of circumstances which attends it. Relieved from the drudgery to which they were subjected while in their original condition, they acknowledge the improvement which they perceive in their situation, and make it matter of contrast with their former state. Thus, many of them have attached themselves to the sealing parties stationed on the coast. They are said to be exceedingly gentle and affectionate in their manners and disposition, and capable of the warmest attachments. There is nothing which those who have connected themselves with the whites dread more than coming again in contact with their countrymen, the latter never failing to treat them with the utmost barbarity on every occasion of their getting them within their power. The fear, therefore, of being abandoned by their protectors, and left to the mercy of their native tribes, is constantly present to them, and makes them extremely jealous of any rival in the affection of their protectors.

The first child born by a native woman to a white man in the island, and who was taken under the protection of and brought up by a gentleman and his lady at Launceston, is thus described by Wentworth: "She is called Miss Dalrymple, and like all the other children since produced by an intercourse between the natives and the Europeans, is remarkably handsome, of a light copper colour, with rosy cheeks, large black eyes, the whites of which are tinged with blue, and long well-formed eye-lashes, with the teeth uncommonly white, and the limbs admirably formed." The women altogether of Van Dieman's Land are described as being much handsomer, and possessing a much more interesting appearance, than those of New South Wales, especially those in the neighbourhood of Port Jackson.

DIVISION, DISTRICTS, &c.

The island was originally divided into two counties, Buckingham and Cornwall, both of nearly similar extent, the former occupying the northern, and the latter the southern part of the island, but without any definite limits interiorly. They include, however, the whole line of coast on the east from South Cape, on the south, to Cape Portland, at the north-eastern extremity of the island. These counties are again subdivided into districts, and it is by the latter partition that it will be most convenient and most satisfactory to speak in detail of the various localities of the island. The districts into which the county of Buckingham is divided, are, Hobart Town district, New Norfolk, Richmond, Clyde, Oatland, and part of Oyster Bay district. The subdivisions of Cornwall, again, including part of the last-named district, are Campbelltown, Norfolk Plains, and Launceston. The first of these districts, beginning at the southern end of the island, is

HOBART TOWN DISTRICT.

This district, though the smallest in extent of any in the island, is yet the most important in the colony, as well from the circumstance of its including Hobart Town, the capital of the island, as from its possessing many superior local advantages; and, amongst these, that of its being accessible by water on three different sides—by the Huon river, which forms its southern boundary, by the Derwent on the north and east, the sea on the east. The whole district, including the island of Bruny, which lies off the mouth of the Huon river, and forms part of it, comprises 400 square miles, or about 25,000 acres. The country in this district, however, is in general so hilly, that out of these 25,000 acres there are not above 1600 under tillage; and it is said that the first cost of clearing and preparing these lands for the plough greatly exceeds what they would now bring altogether if put up to public sale. The best and principal farms here are situated on the banks of the Derwent, and south of Hobart Town in the direction of Fairlie's Cove; behind this interiorly there are but few locations, nor does the appearance of the country tend much to invite future settlers, the soil being in general so thin, and so heavily encumbered with trees, that even its vicinity to the capital is scarcely an inducement sufficient to any one to attempt its cultivation. The farms here are, in general, of a very small size, averaging little more than 50 acres each. The whole number of inhabitants in this district, exclusive of Hobart Town, does not exceed 800, or about two persons to each square mile; and of these, 220 are convict-servants, leaving only 580 freemen settlers and others. The number of live stock in the beginning of 1831 was estimated at—horses, 400; cattle, 2000; sheep, 1200.

In this district, Hobart Town, the capital of the colony, as we have already said, is situated. Hobart Town is built on the left bank of the river Derwent, at the head of a beautiful cove or bay, distant about 20 miles from its junction with the sea. The town is pleasantly situated on a gently rising ground, which, gradually retiring, terminates ultimately in hills of considerable height, covered with wood, and presenting a most romantic appearance. These, again, are overlooked by one of still greater altitude, called Mount Wallington, which rises to the height of 4000 feet above the level of the sea. Hobart Town is thus happily placed between highly picturesque hills on the one hand, and a beautiful bay or arm of the sea on the other; for, though the Derwent be here called a river, it can be so called only in a very extended sense, the water being still salt, and of considerable width. The view, then, altogether, of the bay, with its ships, the town rising gradually from its shore, and the wooded hills in the distance, with a clear Italian sky over all, is one of the most interesting and striking that can well be conceived. The town itself covers somewhat more than a square mile of ground; the houses are constructed mostly of wood, though many of them are of brick and freestone. The streets are regularly laid out, and those of them that have been completed are macadamised, and present on either side long rows of large and handsome shops—sufficiently singular this, when we consider the very short space that has elapsed since this remote spot was tenanted only by the roaming savage and the kangaroo. The town derives a peculiar and highly pleasing character, too, from the circumstance of the houses in general standing apart from each other, each having a small plot of ground, from a quarter to half an acre in extent, attached to it. Its public buildings are numerous, and many of them of such a description as would, even here, be considered handsome. Here are breweries, tanneries, distilleries, flour-mills, two or three banks, hospitals, churches, schools charitable and stipendiary, inns, taverns, hotels, and grog-shops, *ad infinitum*, and every thing else which bespeaks a thriving, bustling, industrious, and civilized community. Nor are they behind in this department of literature: two or three newspapers are here published weekly, besides a yearly Almanack,* containing a great deal of statistical and other interesting information regarding the colony, and an official gazette. The total number of inhabitants is estimated, including the immediate suburbs, the prisoners, and the military, at from 7000 to 8000. House-rents are here immoderately high, L.60 and L.80 being very common for a house of only three or four rooms and a kitchen. Houses of this and lower rental are generally paid for weekly, or once a-quarter. Altogether, Hobart Town is an exceedingly expensive place to live in; provisions are high, most of them much higher than in this country, and all articles imported from England bring a most extravagant price. It has been, therefore, reckoned that the living of each individual in Hobart Town will average L.50 per annum, exclusive of house-rent. The next district to that of Hobart Town is

NEW NORFOLK DISTRICT.

This district lies immediately behind the former, and is entirely inland, no part of it approaching the sea; its extent, from east to west, is about 50 miles, and from north to south about 30—thus comprising 1500 square miles, or 960,000 acres. This district is in general much more fertile than that of Hobart Town, returning on an average from six to eight bushels of wheat per acre more than the latter. The farms, too, are of much larger extent, many of them amounting to 2000 acres, some of these delightfully situated on the banks of the Derwent and Jordan, a small river, which, after passing through an exceedingly beautiful tract of country, ultimately falls into the latter at a place called Herdsman's Cove. In this district there is also a large proportion of rich sheep pasture. New Norfolk is intersected, in a north-westerly direction, by a chain of lofty mountains, covered with the most magnificent timber, and exhibiting snow on their summits throughout the greater part of the year. The average returns of the cultivated lands in this district are—of wheat, 20 bushels; barley, 28; oats, 30; peas, 20; beans, 15; potatoes, 3; turnip, 7. Of the 960,000 acres which this fine district contains, there were not, up to the year 1831, more than 60,000 located, and of these not more than 3000 were cleared and brought under the plough. From its vicinity to Hobart Town, and the advantage of water carriage which the lower part of the district possesses, there is a greater proportion of agricultural produce raised in it than many of the other districts. It is remarkable, however, that, with all its superiority of soil, its crop of potatoes is about one-seventh less than that of the Hobart Town district. The live stock of this district is estimated at—horses, 250; cattle, 6400; and sheep, 60,000. Here is a pleasantly situated little town or village, bearing the name of the district, viz. New Norfolk, and distant from Hobart Town about 22 miles. There are here two excellent inns, besides three or four public houses; and a coach and van, the former with four horses, and the latter with two, run daily between it and Hobart Town; besides these, there is a steam-boat plying on the Derwent between the two places. The total population of this district only amounts to 1200; and of these, 450 are convicts, in the employment of the government and of the different settlers. North-east of the Hobart Town district, and nearly directly east of that of New Norfolk, lies

RICHMOND DISTRICT,

Extending on the eastern side, or sea-coast, from Prosser's river to Tasman's peninsula, a tract of uninterrupted sterility, being rocky, mountainous, and barren to the last degree. The ridge of bleak and unproductive hills which run through this whole length are heavily timbered, and never can be made in any way available to the purposes of man. On the side next the Derwent, however, which bounds it on the south, though still hilly, there are a number of beautiful and fertile vallies; and around Pitt Water, a salt-water lake of six miles in length, and three in breadth, there is a considerable portion of comparatively level land of the first description, and well adapted for agricultural purposes. In this district there are two towns or villages, Richmond and Serrel; the first 14, and the second 22 miles distant from Hobart Town. In the latter there are several good inns, a parsonage house, church, jail, &c.; in the former there is just now only one inn, but there are several respectable private houses. Serrel is situated in the fertile locality of Pitt Water, and is surrounded on all sides with rich and highly cultivated farms. This district contains altogether about 672,000 acres, or about 1050 square miles; the total number of the former in cultivation does not exceed 12,000, and, notwithstanding that it possesses many of the finest farms in the island, the average return of its crops ranks very low; wheat, 12 bushels per acre; barley, 14; oats, 20; peas, 10; beans, 10; potatoes, 3½ tons; and turnips, 8. The whole population of Richmond district amounts to 2800; of these, 1100 are convicts. Coal and limestone have been found in this district, but neither of them has been yet wrought. The number of its horses is estimated at 420; cattle, 14,200; sheep, 95,000. Next to the district of Richmond, and bounded by it on the south, is

OATLANDS DISTRICT,

Separated from the sea by part of the Oyster Bay district, and bounded interiorly, or on the west, by the district of Clyde, and on the north by that of Campbelltown. This district is comparatively but of small extent, and forms a square of about 30 miles on each side, and contains, therefore, 900 square miles, or about 576,000 acres. Though one of the smallest subdivisions of the island, Oatlands is one of the best, possessing, perhaps, a greater proportional extent of cultivatable and grazing land, and these of the finest quality, than any other locality of similar bounds in the island; its beautiful open and extensive downs afford the richest pasturage, and its arable lands are equally fertile and productive with the best in the colony; it is besides most advantageously situated, occupying a central position between Hobart Town and Launceston, the next town on the island in extent and importance to the former. The advantages which this district presents have been duly appreciated, and a greater proportion of it, taking its limited extent into account, has been located than that of any other district in the colony. Its average return of produce is—wheat, 20 bushels to the acre; barley, 22; oats, 25; peas, 20; potatoes, 3½ tons; and turnips, 6. The town of Oatlands, situated in this district, and 51 miles distant from Hobart Town, contains a military barracks, a jail, an inn, and several extensive stores. The total number of acres in cultivation is 2700. Its live stock consists of 250 horses, 10,000 horned cattle, 90,000 sheep, and 240 goats. Coal is also found here, but in too remote a situation to afford any profit in the working. Within this district are situated what are called the Salt-pans Plains, a beautiful level tract of fertile country, of many miles in extent, terminated in the distance by lofty ranges of the most magnificent hills. These plains derive their somewhat singular name from three small lakes, or ponds, which are so strongly impregnated with salt, that they yield, by a natural process, many tons of that essential article of life annually. This salt is not equal in quality to English salt, but, nevertheless, brings 10s. a hundred-weight in the colony. The population of this district amounts to 930 souls; of these, 480 are convicts, and 450 free persons.

Next to Oatlands, on the interior, or western side, lies the

CLYDE DISTRICT,

Bounded on the south by New Norfolk, by Campbelltown on the west, Norfolk Plains on the north, and terminating in unsettled tracts on the west. It comprises about 1700 square miles, or 1,088,000 acres. This district is in general hilly, but affords excellent and extensive pasturage. Its remoteness from Hobart Town, and the difficulty of transporting agricultural produce to that market, from want of good roads, has tended to keep it almost exclusively a pastoral district. The proportion of cultivated land here is exceedingly small. Some of the best grazing farms, however, in the island, are to be found in this district, many of them covered with the immense flocks and herds of the various settlers. This district has the advantage of many of the others in the colony in the essential article of water, no less than five different rivers running through its bounds; these are the Dee, Ouse, Shannon, Clyde, and Jordan. From its elevated situation, the climate here is considerably colder than in the districts nearer the sea; and even in summer, slight hoarfrosts are not unusual at a very early hour in the morning. This circumstance has particularly affected the crops of potatoes which have been attempted to be raised there, and which in consequence exhibit such a poor return, as almost amounts to a total failure. The principal township in the district is Bothwell, distant 45 miles from Hobart Town: there is an excellent inn here, a court-house, church, and a considerable number of respectable private houses. An assistant clergyman, called there a lecturer, and who is paid by the government, performs divine service in the town every Sunday. The whole cultivated land in this district is estimated

* When speaking of these publications, we cannot refrain from noticing, in an especial manner, a little work entitled "The Van Dieman's Land Anniversary, and Hobart Town Almanack," for the year 1831, edited and printed by the ingenious Dr James Ross, Hobart Town, and to which excellent colonial production we have to express ourselves particularly indebted in the composition of the present article.

at 2600 acres; the average return of produce is—wheat, 16 bushels per acre; barley and oats, 17; peas, 20; potatoes, 2½ tons, and turnips eight. The numbers of its live stock are—horses, 250; horned cattle, 11,000; sheep, 82,000; and goats, 600. Its total population amounted, in 1831, to no more than 760 souls, and of these 400 were convicts.

OYSTER BAY DISTRICT.

This district is bounded by Richmond on the south, Oatlands and Campbelltown on the west, and the sea on the east. Oyster Bay district takes its name from a beautiful bay situated within its limits, and which affords excellent anchorage for ships, and is reckoned altogether one of the finest harbours in the island. It is separated from the adjoining districts by a lofty range of mountains, which run from north to south throughout its whole length on its interior side. This district is about the same extent with that of Oatlands, comprising 900 square miles, or about 576,000 acres. It does not exhibit any general traits of character differing from the others. In common with these, it possesses large tracts of fine pasture lands, but there is little yet under the plough. The whole of the located land here does not exceed 36,000 acres, and of these there are only about 1200 cleared and in cultivation. Its average returns of crop are nearly the same with those of the Oatlands district. From the small portion of it which is yet located, its population and amount of live stock is very small, the former amounting only to 320 souls, and of these 170 are convicts. The latter are represented to be—houses, 25; cattle, 2500; and sheep, 17,000. A great portion of the wealth of this district is derived from whale-fishing, a considerable number of these being every year taken in Oyster Bay. There are no towns nor villages yet within its bounds, nor any civil or religious establishments of any sort; it possesses, however, the usual accompaniments of a military station and a police magistrate.

CAMPBELLTOWN DISTRICT,

Lying between Oyster Bay district on the east, and Norfolk Plains on the west, comprises about 1260 square miles, or 85,000 acres. This is one of the finest districts in the whole island, and is every day increasing in prosperity and importance. The peculiar richness of its herbage adapts it in an especial manner for the rearing of cattle, and this is so well known and so universally acknowledged in the colony, that the butchers of Hobart Town come hither to make their purchases of fat stock, though at the distance of 70 miles, in preference to drawing them from the more immediate districts of less celebrity in this particular. Amongst other delightful tracts of grazing land which this district presents, there is one of superior fertility, called formerly the Ross Reserve, from its having been kept possession of by the crown for its own purposes. In June last, however, this reserve was exposed to sale by the government, and sold readily in lots of 4000 acres each—the whole tract comprising about 32,000 acres—at from 16s. to 20s. 1d. per acre. One lot sold as high as 39s. per acre. Each of these lots has a frontage to the Macquarrie river, from which they run backwards about six miles. At Ross there is an annual cattle-market, and a yearly display of horse-racing. The agricultural produce of this fine district is equally remarkable with its pasturage, and for barley especially it seems to be singularly well adapted, the average return of that crop being not less than 40 bushels per acre. Wheat exhibits 20; oats, 28; peas and beans, 11; potatoes, however, only 2½ tons per acre; and turnips, 6. More than one-third of the district is already located, nearly 300,000 acres being in the possession of settlers, and of these 6800 have been cleared, and are now under the plough. The quantity of live stock on this district is fully proportioned, when compared to others, to its superior fertility. Its number of horses has been estimated at 450; cattle, 13,500; and sheep, 160,000—all of them of the best description.

In Campbelltown, the emporium of this district, there are two excellent inns, storehouses, &c. Notwithstanding its extent, however, its amount of population is comparatively small, comprising in all only about 650 souls, and of these no fewer than 550 are convicts, leaving only 150 free settlers for the whole district—a proof, though probably otherwise disadvantageous, of the great individual wealth of its inhabitants, who can thus afford to hold in their hands such a vast extent of fine pastoral and cultivated land.

NORFOLK PLAINS DISTRICT.

By includin[illegible] district, we have now crossed the island from n[illegible] south, and arrived at the shores of Bass's Str[illegible]ch separates Van Dieman's Land from New So[illegible]les. Norfolk Plains district comprises 2250 s[illegible]iles, or about 1,500,000 acres. This division [illegible]land presents a very different aspect from that o[illegible]ch we have just been speaking, being generally mountainous and barren; and when it is not absolutely either, the soil is often poor, thin, and comparatively unproductive. About 123,000 acres have been here located, and of these 5500 are under cultivation: the average returns of the latter are—wheat, 18 bushels per acre; barley, 32; oats, 33; peas, 30; potatoes, 6 tons; and turnips, 6. From the great extent of this district, though not at all remarkable for its fertility, its amount of live stock is very considerable. These are—horses, 400; cattle, 23,000; and sheep, 75,000. The extremely bad state of the roads in some of the most important parts of the district, operates seriously against its interests;—so wretched indeed are they, that carts laden with wool, and each drawn by six bullocks, have been unable to make farther way than five miles in one day. The population of this district amounts altogether to about 1000 souls—580 free persons, and 420 convicts. There is here a boarding-school establishment, situated nearly in the centre of the plains, and which, having been lately advertised for sale, was stated to have realised to the proprietor and teacher, one and the same person, from L.900 to L.1000 per annum!! It has a lecturer, who performs divine service every Sunday to the surrounding settlers.

LAUNCESTON DISTRICT.

This district completes the catalogue of the political divisions of Van Dieman's Land, and is the largest of them all. It occupies the north-eastern corner of the island, ending at Cape Portland, having Bass's Strait on the north-east, and the Pacific Ocean on the east, with a coast-line on the former of about 70 miles, and on the latter of about 55. It is estimated to contain 3900 square miles, or about 2,500,000 acres. The greater part of this extensive district is wholly useless for any of the purposes of man, being barren, sandy, rocky, and mountainous, and in many places altogether inaccessible. Notwithstanding of this, however, it is considered the next in importance to the Hobart Town district, from the circumstance of its possessing the second largest town in the island, viz. Launceston, situated at the head of the navigable portion of the river Tamar, which discharges itself into Bass's Strait, about 45 miles below the town. Launceston contains about 2100 inhabitants, many of them enterprising merchants and traders. The number of its buildings amount to about 500 or 600, and amongst these are some very handsome public edifices; an elegant and capacious church, government house, military barracks, jail, court-house, school, &c. There are here, besides, several spacious stores and warehouses, together with a great many well-stocked shops. From the favourable nature of its situation for commercial purposes, the river being navigable for vessels of 400 tons burthen up to the town, its maritime trade is very considerable, and is every day increasing. The chief exports from Launceston are wheat, bark, wool, and whale oil. Of these, L.60,000 are shipped annually. The custom-house revenue of the port, for the quarter preceding July 1832, amounted to about L.12,000. With all its prosperity, however, Launceston does not appear by any means to be a cheap place to live in. Potatoes sell for 1½d. to 2d. per lib. in retail; butchers' meat—beef and mutton "scarcely eatable," says the Launceston Advertiser—5d. per lib.; prime joints, 6d.; and pork, 8d.; and candles, so wretchedly bad that they are next to useless, 1s. 6d. to 2s. per lib.

Amongst its other public establishments are a bank, post-office, several good inns, and two weekly newspapers. A direct communication having been established between this port and London, its inhabitants, and those of the surrounding country, are thereby saved the great expense to which they were before subjected, of bringing their imports by the circuitous route of Hobart Town. Of the extensive district in which Launceston is situated, consisting, as we have already said, of two millions and a half of acres, there are only about 63,000 located, 7000 of which are under cultivation. Its average returns of crops are estimated at—wheat, 20 bushels per acre; barley and oats, 30; peas and beans, 20; potatoes, 3½ tons; and turnips, 6. Its amount of live stock is in the following proportions:—Horses, 380; cattle, 30,000; and sheep, 65,000.

SUMMARY CHARACTER OF THE ISLAND.

The several districts of which we have just spoken in detail, include the whole colonised portion of Van Dieman's Land, with the exception of the tract belonging to the Van Dieman's Land Company, to be afterwards spoken of, and three penal establishments.

On looking at the map on the first page of this sheet, it will be perceived that these districts occupy nearly the whole of the eastern coast of the island, and that their interior line passes nearly through the centre of it; or, in other words, it will be perceived that about one-half of the island, on its eastern side, is included within their limits; beyond these, in the interior, the country is yet but little known, and, indeed, there are many tracts within the districts themselves not only unlocated, but even unexplored. From the local details alluded to, we gather, on the one hand, that, on the whole, Van Dieman's Land is decidedly mountainous and hilly; that it is much encumbered with wood; that a large proportion of it is entirely useless as regards human purposes; that much of it is sterile or unproductive; and that its best lands are not more than usually fertile. On the other hand, we learn that it possesses a large proportion also of the finest and most luxuriant pasturage; that it is, on the whole, comparatively a tolerably well-watered country; and that its cultivatable lands are, if not more than ordinarily productive, at least sufficiently so to reward any care or labour that may be bestowed upon them.

The statistical portion of the preceding local details gives us again the following results, with regard to its live stock and located lands: Of the former we find the numbers in the whole island to be, of horned cattle, about 113,000; sheep, about 666,000; horses, 3000; goats, 840; and that of the latter there is in the possession of private individuals an extent of land amounting altogether to about 763,000 acres, of which there are 42,400, or about an eighteenth part, under cultivation. But as these estimates refer to the year 1830, and as it has been computed that 200,000 acres are now annually located, with, of course, a proportional increase of live stock, we may add, for the time which has elapsed between the period named and the present moment, one-third to each; that is to say, there will now be in Van Dieman's Land one-third more cattle, sheep, &c., and one-third more of located land, with an eighteenth part more for each year since of cultivated land. Of the whole island, then, which comprises 15,000,000 of acres, there will be about 1,018,000 located, or little more than one-fifteenth part, and of these there are about 50,000 in cultivation, or about a three-hundredth part of the whole island.

PENAL ESTABLISHMENTS.

We at home here are apt to conceive, that, if a criminal be banished to New South Wales or Van Dieman's Land, that particular description of punishment ends there, and can be carried no farther; we are not, all of us at least, aware that in the lowest depth there is a lower still; that, in short, a man may be banished from the place of his banishment: this, however, is the case. There are three places set apart, and exclusively appropriated for those incorrigibles who continue to offend after they have reached their first destination. Their original sentence sends them merely to the island; but when they commit crimes there, they are again brought to trial, and, if the offence be not capital—in which case, of course, it is death—they are again sentenced to a further banishment. The places set apart for this purpose are Macquarrie's Harbour, Maria Island, and Port Arthur, all of them unapproachable excepting by water. The first, Marquarrie's Harbour, is situated on the west coast of the island, and is by sea the only way in which it can be reached—distant about 250 to 260 miles from Hobart Town. The harbour runs up into the land about 20 miles, and it is to an island called Sarah Island, near the head of this harbour, that the convicts are banished. The country around Macquarrie's Harbour is wild, desolate, and barren, exhibiting nothing but continuous rocks and precipices, and ranges of bleak rugged mountains. No part of the neighbouring country is located, or worth locating, for fifty miles round the settlement. Upon the whole, Macquarrie's Harbour seems to have been admirably chosen for the purpose to which it is made subservient, for a more dreary or more miserable place of abode could not be readily found any where. The next penal establishment is upon a small island situated on the east coast, called Maria Island, about four miles distant from the shore. It is a very beautiful romantic-looking little spot, covered in some parts with wood, and exhibiting several lofty hills. The convicts here are chiefly employed in sedentary pursuits, such as weaving cloth, making shoes, &c. The establishment is situated at the northern extremity of the island, where there are spacious barracks for the accommodation of the prisoners. The third and last penal establishment is at Port Arthur, on Tasman's Peninsula, half-way between Cape Pillar and Cape Raoul, and about 50 miles distant from Hobart Town. The country around this settlement is also rocky and barren, and that part of it which might otherwise be made available is so covered with stones, that it would not repay the labour of clearing it. The timber, however, which is in great abundance, is of very superior quality, and it is in felling and cutting up this timber that the convicts here are chiefly employed. Port Arthur is celebrated for the variety and abundance of its fish, as also for its beautiful basaltic rocks.

VAN DIEMAN'S LAND COMPANY.

This company was formed during the joint stock mania of 1825, and is incorporated by a royal charter of that date. A grant of 350,000 acres, situated on the north-western extremity of the island, with an allowance of one-fourth more for bad lands, was conceded them by government, for the rearing of sheep and agricultural purposes, these being the leading objects of the company. Its affairs are conducted on the island by a manager and several sub-agents, who are still actively and vigorously pushing forward its interests, forming roads, building steadings, stores, and farm-houses, throughout its territory. The company annually ship large quantities of agricultural produce to New South Wales, and send a great deal of wool to the English market. Their dairy produce, which is also very considerable, is mostly, if not entirely, sold in the island. The affairs of this company are but little known in the colony, their lands and establishments being all situated in a remote part of the island, with an almost impassable territory between them and the settled portion of the country. There is scarcely any intercourse with them, and the little that is, is by water. There are said to be from 250 to 300 people employed at the various stations of the company. Their capital at the outset was represented to be L.250,000. Their expenses on the colony in the year 1830 amounted to L.8857, 6s. 0d., and the returns from their agricultural and dairy produce sold in the island at L.2305, 19s. 5d.—leaving an actual outlay of L.6551, 7s. 1d. Their possessions there have been valued—Land at L.125,000—live stock, shipping, &c., L.50,000—annual produce, L.10,000. Total, 185,000.

This company have just issued a series of "preposals," for the encouragement of emigrants as tenants to their settlements in the island. These will be found spoken of at length under the head "Emigration," to which we refer the reader for this particular description of information.

TRADE AND REVENUE.

The principal articles of export from Van Dieman's Land to the mother country are wool and oil. For their agricultural produce they have to look for a nearer market, and this they find, although only to a limited extent, and but occasionally, in New South Wales and the Swan River—the latter at all times inconsiderable, and the former uncertain, as Van Dieman's Land grain can be in demand there to any extent, only when their own crops have fallen short—a circumstance which has indeed more than once happened, to the great benefit of some of the settlers on the latter island.

Until, therefore, some new outlet for the agricultural produce of the country presents itself, it does not appear that it would be advisable that they should raise more of these than is sufficient for their own consumption. In 1831, they exceeded in this way, and were then at a loss to discover how the surplus was to be disposed of. The whole quantity of wheat grown upon the island in that year was estimated at 383,000 bushels, with an excess over the consumption of the preceding year of 70,000 bushels, making in all a stock of 453,000 bushels, while the consumption was not reckoned at more than 250,000, thus leaving a surplus of 253,000 bushels. These difficulties, however, neither apply to wool nor oil, both of which will always find a ready market in the mother country, and to any extent. It is evident, therefore, that, in the meantime, the farmer of Van Dieman's Land must betake himself chiefly to the growing of wool, and the merchant to the trading chiefly in both—in so far at least as regards the position of the country with that of others, its internal commerce being of course a totally different thing. In this colony, we find a much greater disproportion between the exports and imports than in New South Wales; the latter, in 1830, amounted to L.300,000, and the former to L.170,000, leaving a balance against the island of no less than L.130,000. The principal items which compose this amount of exports are—wool, L.48,000; wheat, L.40,000; and oil, L.17,000; but it must be observed, with regard to the wheat, that the comparative largeness of the amount exported this year, was in a great measure owing to an unusual failure of the crops from excessive droughts in New South Wales, throughout the whole of the three or four preceding years. It must farther be observed, on the other hand, that the imports are by no means always adjusted to the real wants of the colony; on the contrary, they often exceed it by two or three years' consumption. By taking this circumstance, then, into account, the actual difference in value between what the colony really wants, and what it has to spare, would not be found nearly so great as it appears to be by the returns of its exports and imports; since the latter is not regulated by demand, but by a spirit of speculation, and that not on the part of the colonists themselves, who know better, but of merchants at home here, who, hearing that 100 puncheons of rum are wanted in the colony, send 1000, and so on in proportion with almost all other things. The consequence has been, with regard to manufactured articles, that they have in many instances sold in Hobart Town for less than the first cost in London, with freight, insurance, commission to agents, &c., all to pay besides. It is true that this will in time cure itself; the thing will by and bye find its level; but, in the meantime, what we have stated is the case.

The colonial revenue for the quarter ending 31st March 1832, amounted in all to L.18,844, 1s. 9½d., and its expenditure to L.14,093, leaving a difference in favour of the former of L.4751. Here, too, as in New South Wales, the principal source of revenue is spirits, licences, &c. Out of the L.18,844, L.10,648 is derived directly or indirectly from spirituous liquors and wines; and of this, again, L.9785 is from duties on spirits alone, imported into the colony, and L.385 from licences to retail it; and in considering this amount of duties, it must be observed, also, that these are not, in most instances, above the one-half that they are here; and that, therefore, it requires double the quantity to produce the same amount of revenue. In the statement from which these items are taken, we observe, among others, in the department of the colonial expenditure, the sum of L.1710, 17s. charged under the head aborigines; thus it would appear, that besides being troublesome neighbours, they are also very expensive ones. The revenue of the colony seems to be gradually, though perhaps not very rapidly, increasing. In 1830, the annual amount was L.65,000, and in 1832, supposing each of the quarters to be as productive as that given above—and there is no reason to conclude that they will prove less—it will amount to L.75,376; thus showing an excess in the year 1830 of L.10,376, or a yearly increase of upwards of L.5000. The expenditure, however, of the colony seems to be keeping pace with its receipts, as in the year just named, the latter exceeded the former by L.20,000; and in 1832, presuming, as in the former case, that the remaining three-quarters will be equal in amount to the first, it will do no more, or rather scarcely so much.

GOVERNMENT AND POPULATION.

Up to the year 1825, Van Dieman's Land was formerly a dependency on the colony of New South Wales, and was then governed by a kind of deputy-governor. All its colonial laws, orders, and regulations, proceeded from the parent colony, and were generally mere counterparts of those promulgated there, without a due consideration, in every case, of their fitness or unfitness for the neighbouring land. In the year above named, however, on an earnest petition from the inhabitants to the home government, the colony was declared free and independent of New South Wales, and amenable only to the mother country. Its internal policy, therefore, is now conducted by a lieutenant-governor, as in the case of the former, endowed with similar authority and similar powers, and an executive and legislative council, the former a sort of privy council, for assisting and advising with the governor on all important matters, and the latter for framing and promulgating colonial laws, and imposing duties. There is also here a chief justice, attorney-general, and all the other appendages of a supreme court of judicature, courts of requests, attorneys, barristers, solicitors, proctors, sheriffs, justices of the peace, and the whole of the paraphernalia of civil and criminal jurisprudence known in this country. There are besides, as in New South Wales, a number of police magistrates, each having a separate and distinct district under his judicial authority; these are, as in the former case, stipendiary. The laws here are the same with those in England, in so far as the circumstances of the colony will admit. The members of all the civil institutions are appointed by the crown, consisting, in the executive council, of four in number, including the governor, and in the legislative of fifteen, also including that officer. The expense of the judicial department amounts to about L.13,000 per annum, and the ecclesiastical to about L.6500. The military and convict establishment are paid by the mother country. The governor's situation is reckoned worth L.5000 per annum, although his net salary is only L.2500; the difference is made up by taking into account various items, such as furnished houses, gardens, farms, servants, horses, cattle, sheep, pigs, poultry, fish, &c.; and a colonial newspaper says, that "five times five thousand pounds may be saved or made during the usual term of governorship." The salary of the governor's private secretary is L.500 per annum. The population of the whole colony, including the convicts, is estimated at 25,000, of which about from 10,000 to 12,000, or nearly one-half of the whole population of the island, are convicts. It is to be observed that this amount of the latter will not be given by taking the numbers which are to be found in each district alone, because to these there fall to be added the convicts in Hobart Town itself, besides the district, amounting there alone to nearly 3000, and the various penal establishments, houses of correction, and chain-gangs, none of which are taken into the account of convicts in any of the districts.

CONVICTS.

We have stated, under the preceding head, that the convict population of Van Dieman's Land amounts altogether to from 10,000 to 12,000; and it might be thought that this was quite enough, if not even an alarming proportion to the free inhabitants, the whole military force in the island not amounting to more than 1000 men; but so far from this being considered the case by the colonists themselves, who ought to be the best judges of the matter, there is just now a much greater demand on the colonial government for assigned servants from that class than can be complied with: so great, indeed, is this demand, that the superintendant of convicts there intimated by public notice (July 9, 1832), "that, from there being upwards of 1000 applications for assigned servants registered in his office, and as there will be no possibility of doing more than supplying the urgent wants of new settlers, the governor has directed it to be notified, that no farther application for convict labour will be received until the existing list of application has been very considerably reduced."

The average expense of transporting each convict to New South Wales or Van Dieman's Land, has been estimated at L.20. Their treatment while on shipboard is such as many an honest man would envy: each convict is allowed three-quarters of a pound of bread every day, a basin of gruel, with butter or sugar, to breakfast, and as much beef, pork, or plum-pudding, as he can eat to dinner, and pea-soup four times a-week, with three or four gills of wine at different times during the same period. Their bedding, clothing, &c., are of the best description, so far as mere comfort goes; and every thing that can be done to secure them in health during the voyage is carefully attended to. On reaching Hobart Town, whither all the convicts intended for Van Dieman's Land are first sent, they are, as in New South Wales, immediately marched to barracks, and thereafter assigned over to settlers, or employed in the government works. Though under a very strict surveillance, and severely punishable for comparatively slight offences, every inducement, consistent with the ends of justice, to amend their lives, is held out to them by government, and, with this view, the whole convict population on the island has been classified. The first are those who, from especial good conduct, are permitted to sleep out of barracks, and are allowed the whole of each Saturday to work for themselves. The second are allowed the latter, but not the former. The third are those employed on the public roads, and are relieved from work every Saturday at noon. The fourth are the refractory, who work in irons, under the sentence of a magistrate. The fifth the incorrigibles: these are also worked in irons, but, as a farther punishment, are kept entirely separate from the other prisoners. The sixth and seventh are those sent to the different penal settlements, where they are again classified by the respective commandants of these establishments. When assigned to a settler, each convict is furnished with a complete suit of slop clothing, which the former is obliged to pay for, at the rate of one guinea for each suit: his master must afterwards furnish him with two suits of slop clothing, three pairs of boots of a particular description, four shirts, and one cap or hat, per annum, with comfortable lodging and medicine, and medical assistance when necessary. In case of illness, the convict is removed to the colonial hospital, or, by his master paying 5s. per annum to the district assistant-surgeon, the services of the latter can be demanded for him at any time, if not at a greater distance than 15 miles from the place of his residence. The convict is also allowed ample rations of flour, meat, &c. Sugar, tea, and tobacco, are at the option of his master, to be given as a reward for or stimulus to industry, these being deemed a full equivalent for the convict's services: he is not allowed to claim any wages in money, or any other shape, from his employer, nor is any convict allowed to acquire any property, either in sheep, cattle, or lands; and what money they may be possessed of on their arrival in the colony is taken from them, and placed in a saving's bank at a rate of five per cent. interest, clear of all deductions, and cannot be withdrawn during the currency of their sentence without the consent of the government. The convict servant must also be furnished by his master with sufficient bedding, a palliass stuffed with wool, two blankets, and a rug, all of a quality equal to those issued from the public stores. Masters are enjoined to make a yearly return of all the convicts in their employment, with an account of the general conduct of each, that the deserving may receive the indulgencies due to them for good conduct; and in the event of that being so remarkable as to entitle them to a ticket of leave, or licence to work for their own benefit, and wherever they please, the master on whose recommendation such an indulgence is granted, is considered as having a peculiar right to be furnished with another convict with the least possible delay, seeing that, to do an act of justice, he deprives himself of a valuable servant. All memorials and petitions of convicts to government, with the exception of those confined to penitentiaries or chain-gangs, are drawn up for them when unable to do so themselves, or to procure another to do it for them, at a reasonable charge; if in town, at the colonial secretary's office, on payment of 1s. 2d. per page, which includes every expense, as materials, trouble, &c.; and, if in the country, at the office of the police magistrate of the district in which they happen to be. In the case of the former, the penitentiary and chain-gang prisoners, who are not supposed to be able to command this sum, they are prepared without any charge or fee whatever by their respective superintendants.

With regard to female convicts, these are either sent to factories, where they are kept at work suited to them, or are also assigned as servants to married settlers, this last being an express condition in their assignment. Their weekly rations are less than those of the men, being eight and a half pounds of flour, five and a quarter pounds of meat, two ounces of tea, half a pound of sugar, two ounces of soap, and one and a half ounce of salt; the indulgence of tea is imperative on the master in the case of females. The bedding to be furnished them by their employer is the same with that furnished to the men. He is also bound to supply them yearly with one cotton gown, two bed-gowns or jackets, three shifts, two flannal petticoats, two stuff do., three pairs of shoes, three calico caps, three pairs of stockings, two neck handkerchiefs, three check aprons, and one bonnet. The bed and bedding in both cases are considered the property of the master, and are retained by him on the discharge of the servant.

BUSH-RANGERS.

These are convicts who have run away from their employment, and, taking to the woods, live by plundering the settlers, whom they often murder as well as rob. The great improvements which have taken place in the police regulations of the island, and the superior footing on which it is now placed to what it was formerly, have now nearly put an entire stop to this desperate trade. At one time, however, it was carried to such a fearful height as threatened the entire ruin of the colony. The most atrocious murders and robberies were daily committed by these desperadoes, who prowled about the country in large gangs, with regular captains at their head. They were generally well armed, and well provided with ammunition, and seldom committed a depredation without adding to it the crime of murder. The most celebrated of these wretches was one Michael Howe, who arrived in the colony from England in the year 1812, under a sentence of seven years' transportation. Soon after his arrival, Howe absconded, and, joining a gang already in the woods, or in the bush, as they prefer saying in the colony, commenced his career as bush-ranger. Being a man of a fierce and relentless disposition, and withal of daring courage, capable of every enormity, and of facing any danger, he was soon chosen leader of the gang with which he had connected himself, and continued in that capacity for nearly six years, the terror of the whole island. At one period of his career, Howe, distrusting the faith of his party, left them, and formed the design of giving himself up to the government, on a chance of mercy being extended to him. On this occasion he wrote to the deputy-governor—Van Dieman's Land being then dependent on New South Wales—stating that he was prepared to surrender himself, provided that an assurance was previously given him of personal safety in the meantime, and that such a favourable representation should afterwards be made to the governor-in-chief as might procure his ultimate pardon. The conditions were immediately agreed to, and the desperado yielded himself quietly to the authorities.

Either a dread, however, of the result, or a longing for the joys of the bush, having come over him, he shortly again absconded, and recommenced, with additional vigour and ferocity, the career of crime which he had so temporarily resigned. Howe was accompanied in all his wanderings by a native girl, who followed his footsteps with the most persevering attachment, sharing his hardships and fatigues, and incurring with him all the dangers of his desperate trade; yet, on one occasion when hard pressed by a party of soldiers, the ruffian suddenly turned round and fired on the unfortunate girl, who, worn out with fatigue, was struggling to keep up with him. Considering her as only an incumbrance in his flight, though intending to have killed her outright, he succeeded only in wounding her slightly. Howe was at length entrapped and killed by some of his own associates: he was enticed into a hut by being told that ammunition was to be had in it. On his entrance, one of the conspirators suddenly discharged a musket at him, but missed him. "Is that your game?" said the desperado, coolly, and he levelled his piece at his antagonist, and fired in his turn, but also missed his object. He now rushed out of the hut, but was instantly pursued by the persons who had allured him in, and, being soon overtaken, a savage combat took place with the butt-ends of muskets, and Howe, after defending himself with great courage, at length fell and expired on the spot, his head being battered to pieces by the blows with which it had been visited. The bush-rangers have had many leaders of note, though none of equal celebrity with Howe. One Peter Geary, a deserter from the 73d regiment, seems to have ranked next to him as a bush-ranger captain; this man also himself committed, and encouraged his gang to commit, the most horrid atrocities. Geary was at length shot by a party of the 40th regiment, after maintaining with his gang a smart engagement with the latter.

These days of bush-ranging are now, however, almost entirely over, both in Van Dieman's Land and the sister colony. Depredations of this kind are but of extremely rare occurrence, and have no longer the sanguinary character which they formerly had, acts of violence being now seldom perpetrated. The establishment of the police magistracy was one of the most effective measures adopted for the extinction of this scourge of the colony, as its local operation laid every part open, as it were, to the light, lessening the coverts of the marauder, or driving him at any rate to a greater distance.

SOCIETY.

It has been said by one writer (Henderson), that the British character in both colonies, New South Wales and Van Dieman's Land, has deteriorated. It may be so; but in both there is still to be found a great deal of highly agreeable, if not highly refined society. In the more remote settlements of the colony, society of any kind is scarce, and indeed this would be found one of the greatest wants of which a well-educated grown-up family would have to complain in locating in the interior; but even this would not certainly be greater, nor even so great, probably, as occurs in the Highlands of Scotland, where many miles of almost inaccessible country often intervene between house and house. There are, besides, a number of boarding-schools and seminaries of various kinds, throughout the colony, and in particular in and about Hobart Town and Launceston, conducted by persons of the highest respectability, and equally well adapted for their purposes, both with regard to accommodation and arrangements, with any similar institutions in the mother country. Though society of any thing like a superior kind is scarce in the interior, and throughout the more remote portions of the various districts, yet it is to be met with. There are now a great number of well-educated persons amongst the settlers in Van Dieman's Land—people of property, who have been accustomed to all the elegancies and refinements usually attained by the better classes here. These are scattered over a great part of the colony, living on their estates in handsome cottages, or more stately edifices, with gardens, parks, lawns, shrubberies, &c. around them, and all the other characteristics of snug genteel English country residences. It has been remarked, too, and with truth, that the latter settlers have brought more money with them than the first; that, in short, there is now a better class going out than went before. Emigrants with L.10,000 or L.12,000 are now by no means uncommon there, and there have been several instances, both from India and England, of fortunes from three to five times that amount having been brought into the island. In Hobart Town the most select society is to be found, and certainly, perhaps, also the worst on the face of the earth. The former, however, is not only select, but, being situated in the very heart of the enemy's country as it were, the very metropolis of roguery, the emporium of petty larceny, and other little peccadilloes, it is hedged in and defended with triple walls of brass. Candidates for admission are examined from head to foot with the most anxious and scrupulous inquiry—they are carefully weighed in the balance, tried, tested, squeezed, and hot-pressed. If they stand all this, they may walk in; if not, they must turn to the right about. An intelligent correspondent, whose letter now lies before us, thus speaks of Hobart Town:—"The town is wonderfully enlarged—fine streets, wharfs, and shops. We have three steamers almost ready for a start, coaches on the various roads, and *lots of private carriages*." It is this last assertion which has induced us to make this quotation here, as it may give some idea of what society is to be expected where these indications of property, wealth, and refinement, are so numerous.

The convicts in this country are under similar surveillance with those in New South Wales, and are not permitted, either by the government or the colonists themselves, to approach the precincts of society. The emancipats, again—those whose term of banishment has expired—though afterwards becoming wealthy, and supporting a good moral character, are, nevertheless, always considered inadmissible to good society; and though there is no objection to the maintaining a mercantile connexion with them, it is rarely allowed to extend further. Several of this class have here, as well as in the sister colony, acquired extensive and valuable property, and many of them have become wealthy by other lawful pursuits, and at this moment one of the finest estates in Van Dieman's Land, comprising 2200 acres, is the property of an emancipated convict.

EMIGRATION.

As in the case of New South Wales, which was the subject of a former paper, the persons most suitable to emigrate to Van Dieman's Land are—farmers, farm-servants, mechanics, labourers, and unmarried females. As the circumstances, therefore, under this head are nearly similar in both cases, we shall adhere to the same classification, but pointing out, as we go along, whatever differences *do* exist as regards the emigrant between the two colonies.

Before proceeding, however, to the details of "emigration," as it refers to the island generally, we shall run over the "proposals" made by the Van Dieman's Land Company to emigrants for their own particular territory, which, as we have elsewhere said, is situated in the north-western part of the island, and comprises altogether about 350,000 acres, including three small islands. This company proposes to let their lands in farms of 50 acres each, or more, in proportion to the capital of the emigrant; and although less will certainly do, it would yet seem that about L.200 would be necessary to commence with a fair prospect of success. The outlay on a farm at the outset is calculated to be somewhat less than L.90; and as it will take some time before any return can be expected, the means of subsistence until then must also be taken into consideration, besides other incidental expenses, so that an emigrant ought not to count on less than probably double this sum being necessary. The first indispensable outlay is thus estimated:—

Eight bullocks, at L.6 each .	L.48	0	0
One cart or dray . . .	15	0	0
Two ploughs	7	0	0
Two pair of harrows . . .	3	10	0
Bullock-chains, bows, and yokes .	3	10	0
Various small implements . .	10	0	0
	L.87	0	0

The company offer many important advantages to their settlers, which those going to other parts of the colony are wholly without. They propose to grub out and cut up the trees of ten acres on each farm at their own expense, leaving to the tenant the trouble only of bringing them together and burning them. They put fences round each farm, the farmer carting the materials, as also those necessary for building a house or cottage, which they will also erect for him, furnishing doors, windows, fastenings, &c.

The rent of their forest lands they propose receiving in produce, giving the first year gratis to the tenant; and of their grass lands they demand but half rent for the first year. They will also have no objection, under particular circumstances, to receive payment in labour, as well as in money or produce.

They farther propose to advance money to tenants, for the purpose of improving their lands, when it shall appear that these improvements are calculated for the general interests of the company, as well as the particular interest of the tenant. Seed-corn will be lent to the tenant, to be repaid out of the first crop; clover and grass-seeds will be supplied to him gratis for his pastures; and timber carriages will be lent him to assist in clearing his finest lands: in short, every encouragement and assistance which can tend at once to place the tenant in a comfortable situation, and promote the interests of the company, will be afforded him; and all their regulations and proposals are justly founded on the principle, that these are inseparable without injury to both. On the whole, this scheme of the Van Dieman's Land Company seems one of the most eligible that has yet been suggested with regard to emigration, whether it be to America or Australia, or any other quarter of the world. One of its best features remains yet to be exhibited, and we cannot do this better than in the language in which it is given in the company's prospectus. It includes, indeed, by far the most important and interesting part of the subject of emigration, so far as the emigrant is personally concerned. "Tenants will have the advantage," say the company, "of knowing, when they leave England, where they are going to; that they *will be received when they land by persons interested in protecting them*, and passing them to their occupancies as speedily as possible, and with little expense to themselves—an advantage which settlers with small capital will know how to appreciate. They will also have the disinterested and valuable advice as to their proceedings, which the company's agents will be enabled to give them before they can have the benefit of their own experience."

These are considerations of the last consequence to the emigrant, and are worth all the others connected with the subject put together. When once settled, and when ready to come to market with his produce, the tenant is promised that he shall at all times have the assistance and advice of the company's agent as to its sale; and the latter will farther be ready, it is said, to make such arrangements for the general body, regarding the sale of produce and markets, as may be beneficial to the whole. Holding out such prospects as these, the Van Dieman's Land Company are now inviting emigration to their territories,* and we think them well worthy the consideration of all those who would seek to improve their condition by migrating to a foreign land.

Without recapitulating, as we think it unnecessary, the description of persons best suited to emigrate to Van Dieman's Land on the ordinary footing, we now proceed to speak of them in the order originally proposed, beginning with the

FARMERS.

From all the accounts which we have of the agricultural state of Van Dieman's Land, it appears that *good* farming, at least until very lately, was not by any means common there; and when we consider how much depends upon a thorough knowledge of that science, and perceive, at the same time, how much has been done in that country with a very slight acquaintance with it, it will be evident how greatly the chances of ultimate success are increased on the part of the emigrant by his being experienced in husbandry before going out. As we have had occasion to remark before, however, the growing of wool will be, or at least ought to be, the principal object of the settler. For a certain proportion of grain, and other agricultural produce, he will always find a ready and remunerating market in the island, say—for wheat, about 5s. 6d. to 5s. 9d. per bushel; but this, in the meantime at least, must be limited, and he cannot count on any other demand than what arises from the immediate wants of the colony itself; he ought to cultivate land, therefore, with this prospect alone in view, and proportion it accordingly. With regard to wool, again, it is otherwise: he cannot have too many sheep, provided he takes care that they are of the right sort. He may grow any quantity of wool, and he will always find a ready sale for it at Hobart Town, or he may ship it to England, if he prefers it, or sees it for his advantage. But let him pay every attention to the breed, and the improvement of his flocks in the quality of their wool, for on this, of course, depends the price which he will receive for it. On this subject we quote the following extract of a letter from a highly respectable settler, dated the 18th July 1832:—"I am happy to say that the settler's prospects are as favourable, indeed more so, than they were some time since. Sheep keep up their price—12s. to 15s. per head, and wool has much advanced. I sold ours this season for 10d. per pound; it is our intention to send it to England for sale after another year. We are getting rid of our coarse flocks, and improving the wool with Saxony rams. I have no doubt, in the course of three years, that the wool in the London market will yield us 2s. per pound." And there is no doubt, that, if due attention is paid to the quality, and to the preparing of the wool for market,† in the washing, sorting, packing, &c., that this price will be realised, for in the London sales of New South Wales and Van Dieman's Land wool for December 1831, the latter brought even then, the better sorts from 1s. 3d. to 2s. 2d. per pound, and the former, some of it, as high as 2s. 11d.; and we have no doubt that the improvements which have since taken place in the cultivation of this article, will entitle it now to still higher prices, provided no unforeseen change for the worse takes place in the wool market. Besides the growing of wool, there is another exceedingly promising source of wealth open to the settler—this is the dairy, which seems to be strangely neglected in the colony, although the demand for this species of produce is great, and the prices even extravagantly high; butter readily bringing 2s. 6d. to 3s. per pound, and colonial cheese 1s. to 1s. 3d. per pound. Yet, with all its vast extent of rich pasturage, and its innumerable flocks and herds, Van Dieman's Land imports both of these articles from New South Wales and the Cape of Good Hope. Indeed, in the former country, there is more than one

* For farther particulars on this subject, we refer the reader to the "Proposals" themselves, published in the form of a pamphlet, by Richardson, 91, Royal Exchange, London, 1833.

† See our article on New South Wales, for a set of "Directions" on this important subject.

person who, wisely devoting themselves to this profitable branch of farm produce, are rapidly realising fortunes. Any person, therefore, going out with a thorough knowledge previously of dairy matters, would assuredly find his account in it. The cattle there are certainly much inferior in general to what they are in this country, and therefore a similar return as to quantity could not be expected, but still that return would be amply sufficient to realise a very handsome yearly profit to the dairyman. The person going out there, or indeed any other who intends grazing cattle, would do well to take with him a quantity of English grass-seeds of various kinds, and particularly Dutch clover, which, when once settled, he should always carry about with him, sprinkling it here and there as he goes over his pasture lands, as the sameness of the grasses in Van Dieman's Land, notwithstanding of their richness, has been found injurious to the health of the cattle. On reaching his destination, he will learn that a little salt also placed in situations where it may be at once kept dry, and be within the reach of his cattle, will be exceedingly beneficial to them.

Land is obtained in this island precisely on the same terms as in New South Wales, viz. either by the purchase of crown lands from the government, or of private property from individuals; the lowest price of the former is 5s. per acre, rising higher in proportion to its value as regards local situation or natural advantages. A deposit of ten per cent. must be paid on making the purchase, and the whole amount in one month thereafter. In the case of private property, it is, of course, impossible to say what the price may be, since that will depend upon circumstances, on which we cannot found any previous presumption; but good land, already under cultivation, may be had here, as in the sister colony, at from 10s. to 15s. per acre; and, as in the case of the Ross Reserve already spoken of, even unlocated crown lands will bring this sum and a good deal more—in one instance nearly double—but these were particularly fine lands, the very pick and choice of the island. There are few other uncultivated tracts that would bring any thing like these prices. The intending agriculturist emigrant must not think of going out to Van Dieman's Land, any more than to New South Wales, without capital; or rather, it is, if possible, still more necessary, or at least a larger amount is necessary in the former than in the latter case, for the expense of clearing and bringing the land into cultivation is greater. A farm of a hundred acres in New South Wales requires, upon an average, an outlay of about L.700 to make it fit for the plough, while in Van Dieman's Land it will cost L.1000, or L.10 per acre. This difference arises from the greater expense of maintaining convicts in the article of clothing in the one colony than the other. In Van Dieman's Land, this item costs the settler from L.7 to L.8 per head, while in New South Wales it will not average more than L.5; this is of course a difference in the price of labour, operating against the Van Dieman's Land settler. Neither the one colony nor the other, then, are places for a ruined man to go to; without being in possession of some capital after he lands there, he can do nothing: he cannot move a single step—no, none—nay, less easily than he could probably do at home. There, at the outset, he will get no credit; no honesty of intention, no integrity of character, will avail him; nothing but the money, and of this, too, he had as well have a pretty round sum, or he had better remain where he is, wherever that may be. Even in the best case, all idea of making a fortune must be abandoned. There is no such thing as fortunes being made, either by agriculture or grazing, in either Van Dieman's Land or New South Wales; but a competency, and a great degree of comfort and independence in circumstances, are readily acquired in both, much more readily than here, by industry and perseverance, when aided at the outset by a little capital; and, indeed, if it be allowed that wealth may assume another shape than that of money, that to have abundance of all the necessaries and comforts of life, with a certainty of your children inheriting, if not forfeited by their own misconduct, all these blessings—if this be wealth, then wealth *is* to be acquired in both Van Dieman's Land and New South Wales; but accumulations of mere money are entirely out of the question.

The following "advice to emigrants," that class of which we are now speaking, viz. farmers, comprises nearly all that can interest him with regard to his situation, and the conduct he ought to pursue after landing in the colony. It is from the Van Dieman's Land Almanack, 1832:—"In several respects, the situation of a newly-arrived emigrant is peculiar. Every action, thought, and word, are for the moment influenced by the spirit of excitement, which is inevitable to all who have left their native land in order to settle in a new and very indistinctly-understood country. With expectations highly raised, a strong feeling of self-consequence, and being keenly alive, too, to whatever is likely to affect the success of the enterprise, the emigrant is apt frequently both to overrate and to underrate difficulties; to form opinions upon light grounds, and afterwards pertinaciously adhere to them; in short, altogether to go wrong, merely for want of having been set right at starting.

One of the chief things to be impressed upon the emigrant, is, that the sooner he reaches his ultimate destination, wherever he purposes this should be, the better will it prove for him. Every shilling expended at intermediate places, every hour passed at hotels or lodging-houses, is an abstraction of capital, which he will bitterly repent before he has lived one year in the colony; for it is idle to conceal from him, that upon his own *frugality* and *industry*, more than upon any other cause whatever, will his success depend; and he should besides be told, that money is of so much more value here than in England, that if he purpose relying upon such aids as are common there, and should thus be led into an outset that is in the least beyond his own resources, or beyond such means as he has immediately at command, independent of any other quarter whatever, he will be preparing the way to his own certain destruction. Once let him be in the hands of the money-lenders, and the rapid manner in which an interest of fifteen to thirty per cent. (which is the least he will find he has to pay) swallows up principal and every thing he has besides, will astonish him. Houses, land, possessions of every sort, all become swept away by the fell hand of the sheriff's officer; and years of anxiety, toil, and deprivation, finish by placing him in a prison. But all this may be avoided by attending to a few plain rules or guides of conduct, upon entering the colony, and among them may be enumerated the following:—

1. Beware of what acquaintances are formed. It sometimes happens that emigrants are thrown, upon arrival, among classes who have formed a jaundiced opinion of every thing around them—of the colony—of its administration—its resources—its general state or condition—and whose chief delight now is in gaining proselytes to their own notions. Whatever information these communicate, will be tinged by the state of their own minds; and, as a general rule, therefore, every thing that so reaches the ear of the emigrant should be received with extreme caution. Equally to be guarded against are another class, or those who always view things in their brightest colours—for a young colony presents of itself a peculiar field for the man of enterprise and speculation; and if these be nourished by too much encouragement, they will bring ruin upon the projector.

2. Beware of becoming a politician, or of belonging to a party—an emigrant should leave all things of this sort in the country to which he has bid adieu. He cannot afford to have his mind or his time divided between what his new avocations demand of him, and such pursuits as these. Delightful as they may be also, they are perfectly out of place in a young colony, the governing principle of whose inhabitants should be, the moral conveyed in the fable of the bundle of sticks.

3. Never forget that you are in a country where, for a few years at least, prudence requires that the veil of oblivion should be drawn over many of the comforts, and still more of the luxuries of life, to which, perhaps, you have been accustomed for many years. Whatever may be your circumstances, things of this sort cannot be indulged in for a time, without departing from those maxims of prudence which have been already inculcated.

4. Be extremely cautious how you are led to make purchases, or forming bargains of any sort. Almost every one you meet will have the best horse, the best cattle, sheep, &c., the island produces, for sale; but let the second best be good enough for you; or rather remember that there is nothing so good that something else may not be found which will equally answer the purpose; or again, that it is better sometimes to be without a thing a week, than to have it one day too soon.

The settler should never forget that his independence—his true comfort—will depend upon his being able to obtain, without money, the greater part of those necessaries of life which money is elsewhere required to purchase. He should aim to produce every thing within himself—to raise all from his own ground. He who does so, although his income may be small, may still be a wealthy man if he be true to himself; but, as before said, much depends upon how he sets out.

A few words will now be added by way of acquainting the emigrant with certain routines that may assist him upon first landing in his search for land. His most important business, generally speaking, is the selection of land—desirableness of the early settlement upon it, of himself and family, has been already mentioned. The piece of information that will prove most useful to him with respect to the selection of land, is, that infinitely more depends upon his own energy than upon any thing else whatever. His first business, after landing in the colony, is to obtain from the survey department a printed form of application; and, having filled it up, and forwarded it to its proper destination, he will soon receive an answer, acquainting him with his excellency the lieutenant-governor's determination upon his case. Presuming this to be favourable, his next step is to fix upon the land he may desire to have; and here, it must be confessed, a most difficult task is before him. He will, no doubt, have been permitted to examine the charts of the island that are in the surveyor's office; but what information do these afford?—what can be learnt from them, even by persons who fancy they know every corner of the colony?—and what, then, do they impart to the newly-arrived emigrant? However, he will, of course, have studied them a little previously to departure for the interior—a measure that is imperative, personal inspection being the only dependence whereon he can reasonably ground any hopes of success. But here, again, obstacles will be his lot at every step. The district-surveyors will be unable, in consequence of the backwardness of the surveys, and other similar causes, to give him half the information, with respect to lands in their immediate neighbourhoods, upon which he had perhaps calculated. Again, it is no easy matter to discriminate, by natural marks, a piece of land which may remain ungranted, from other portions or tracts in the vicinity which may have been selected, although they have remained unimproved; or, again, from those parcels that have been marked off as *reserves*, or for the church, or for future villages, townships, &c. Besides, the person in quest of land has always to expect to be misled by persons who are in the habit of assuming a right to crown land to which they have no pretension, merely because they have found it convenient as a pasturage for their sheep and cattle. In addition to all these, it must not be overlooked that there is really very little good land, except in remote situations, remaining ungranted; so that, upon the whole, the task of searching for it may well be termed difficult and perplexing.

Still the active energetic searcher of land need not despair; but, as before said, much, very much, depends upon himself: in fact, he may be considered either the maker or the marrer of his fortune throughout his whole career in the colony, for it is the vere worst place in the world for the idler, the spendthrift, or the lounger; whilst, on the other hand, it presents ample—although perhaps he may at first consider it slow—encouragement for the man of sober and industrious habits."

The greatest difficulty which the new settler will have to encounter in preparing his land, is from the trees with which he will find it encumbered. To free the land from these is an expensive, tedious, and exceedingly laborious process, but as it of course must be done, it had best be set about with cheerfulness, and [illegible] at with unremitting perseverance. The settler [illegible] now cast his coat, and set fairly to work with his assistants. A great many settlers have contented themselves with cutting the trees a little way above the ground, leaving the stumps and roots to decay of themselves, without grubbing them out entirely, as they ought to be. This is a saving of labour and expense in the first instance, but it will not be found so in the long-run. These stumps take ten or twelve years to decay; and even in the state of decomposition to which they are then reduced, they still require to be taken up, and not having the tree to act as a lever in tearing them from the earth, they are often found more troublesome to root out than the whole tree itself would have been; while in the ground too, they interfere sadly with the operations of both plough and harrow, deform the ridges, interfere with proper draining, rendering it more expensive by making it more circuitous; and as neat and regular husbandry is always the most profitable, and as a crowd of blackened stumps sticking up in a field must entail the reverse, so must the farmer's profits be proportionally lessened, to say nothing of the ungainly appearance which they must present in a cultivated field.

The manner of feeding and rearing cattle is in every respect exactly the same in Van Dieman's Land as in England and Scotland, and their farming is also nearly the same, differing only in so far as a greater degree of heat in summer requires that it should. There is an idea gone abroad, that all the good land in Van Dieman's Land is already located in the possession of settlers, and that there is none there worth having to be had. This is untrue: there are many millions of acres of fertile country there still to dispose of: probably by much the greater part of the best situated lands, in so far as a contiguity to market or to points of embarkation is concerned, are already in the possession of private persons; but there is much valuable ground in the interior unoccupied, particularly a fine newly-discovered tract at the back of Mount Wellington, which will alone afford excellent locations to all who may seek them for some years to come.

MECHANICS.

The demand for this class is equally great here as in New South Wales, and the encouragement the same. Wages from 5s. to 8s. per day; sometimes as high as 10s. for first-rate workmen. Living, however, is considerably higher here than in the sister colony, especially in the article of animal food, as will be seen from the list of prices in the last page of this sheet, and by which it will be perceived that beef and mutton are 5d. to 6d. per lb., and hams the enormous price of 1s. 9d.; while in New South Wales the former does not exceed 4d., and may be bought at 3d. Tea, sugar, &c. are the same price in both places. The encouragement which the government of this country offers to emigrants of this class, viz. an advance of L.20 to married mechanics taking their wives along with them, and for farther particulars regarding which we refer our readers to our sheet on New South Wales, applies equally to Van Dieman's Land as to the former colony. On the whole, New South Wales seems to be the most desirable place of the two for both the mechanic and the labourer, since wages are not higher in Van Dieman's Land than in the former, while provisions are cheaper; besides, the other being the elder country, every thing there is more matured, and placed on a firmer and broader basis; the extent of country is all but unbounded; the population is nearly double to what it is in the former; and, in short, it must always be considered, from these and other circumstances, as the principal colony, notwithstanding it is no longer recognised as such in a political point of view. It is the wealthiest, and, as a necessary consequence of its being the first established, and as being long held as the chief settlement, it is several steps in advance of the other in various important particulars. The description of mechanics most in demand here is much about the same as in New South Wales, viz. coopers, ship and house carpenters, cabinetmakers, joiners, wheelwrights, brickmakers, and sawyers; stone-quarriers, cutters, and masons: all kinds, however, will be made welcome; nor will any be at the smallest loss to find employment; and the liberality of the home government relieves them, until they shall be long enough there to repay it, of one-half of the passage-money for themselves and wives; in other words, they have only to advance L.20 for this purpose, the state advancing the other L.20, the whole amount of passage-money being about L.40 for each married couple.

FARM-SERVANTS AND LABOURERS.

These are also greatly wanted in the colony, and readily obtain employment on the same terms as in New South Wales—the former from L.10 to L.15 per annum, with ample weekly rations of provisions; and the latter 1s. per day, with fully as much bread, meat, &c. as they can consume, and in some instances still better terms may be had; but as the government does not afford assistance to them in any shape, they are left to find their way out as they best can; and there is no other way but by paying L.20 for a passage, a sum which very few indeed of the latter class in particular are able to command; and if burdened with a wife and family, which would considerably more than double this amount, the idea of such going either to Van Dieman's Land or to New South Wales, seems entirely out of the question; that is, the idea of going out as mere labourers, and without any capital. It might be thought that where the want of labour is so much felt, and the demand for it so great as it is in these colonies, that the remuneration would be proportioned to this scarcity and demand; but this is not a necessary consequence, and, in fact, in these very instances does not follow; for this reason, that however much they want labour, they cannot afford to go beyond a certain price for it; and if it cannot be had upon such terms as will make it worth the colonist's while to perform certain work, he must just leave that work undone: this operates seriously against the colony, but is nothing in favour of the labourer, or rather it is ultimately equally injurious to him.

Both the mechanic and labourer should be informed, also, that the colonists pay as little in money to any of their workmen as they possibly can, always stipulating for a portion of their wages being taken in produce. This does not apply so much to their principal towns, such as Sydney, Hobart Town, Launceston, &c.; but in the country it is the universal practice. Money, in short, is an exceedingly scarce commodity in the colony, and its place is as far as possible supplied with the produce of the soil.

UNMARRIED FEMALES.

Free servants of this description are also greatly wanted in Van Dieman's Land. The government bounty offered to these equally applies to both colonies, viz. a gift of L.12, to enable them to pay their passage out, to all between the ages of fifteen and thirty years, who form part of a family about to proceed thither, that is, under the protection of parents or relations; and a similar sum to all unmarried females between the ages of eighteen and thirty, who intend going out alone. In both these cases, certificates of good moral character from the minister of the parish in which the applicant resides, and from a respectable householder, are required, before any female can be admitted as a candidate for this bounty. Printed forms of certificate and applications, both for unmarried females and mechanics, may be had at any emigrant ship-agents in London, Liverpool, or Leith. Farm-servants of this class are particularly wanted; these, and stout active servants of other descriptions, are just now obtaining L.15 per annum of wages.

The preferences given by government to candidates are of three different kinds—the first, to those who go out in company with their families; the next, to those who can make themselves useful in a former's family; and the third, to those who offer to pay a larger proportion than others of the cost of their passage. In the absence of these claims, priority of application is the only guide. The form of application contains blanks, to be filled up—the first, with the name of the applicant; the second, with her age; the third, with the amount she proposes to contribute towards the expense of the voyage; the fourth, the name and address of the minister of the parish in which she resides; and fifth, the name and address of any respectable householder to whom she is known. The female going out upon these terms is in no way bound to the government, but is perfectly free to go where she chooses on landing in the colony, and to follow after whatever employment she thinks fit; she is, in short, in every respect, as free then as she is before leaving Britain.

There is yet another mode by which single women, between the ages of eighteen and thirty, if possessing good health, and good moral character, may get out to the colonies of either New South Wales or Van Dieman's Land, at a small cost. At our sea-ports offers are made, including provisions during the voyage, to take out women of the description above named, on payment of L.6; or if unable to make this advance, on payment of L.3, they coming under an obligation to pay the further sum of L.5 out of their earnings after their arrival in the colony. The difference of the passage money, which is altogether L.18, is in these cases made up by the colonists, and is a free gift; none who avail themselves of it being placed under the smallest restraint in consequence of their acceptance of it.

PASSAGE.

Although, when looking at a map of the world, the distance from this country to Van Dieman's Land and New South Wales seems to be much the same—and, indeed, when compared to the whole space between, it is but as a mere point—yet the actual distance between Hobart Town and Sidney, the capitals of the two colonies, is considerably upwards of 400 miles, the latter being much farther away than the former. On this account the amount of passage-money to Hobart Town is in general several pounds less than to Sidney. For a single man in the cabin, including provisions, it is about L.50 to the former, and L.55 to the latter; and in the steerage about L.21 and L.23; the difference, in short, is about L.5 in the case of a cabin passenger, and from L.2 to L.3 in that of a steerage passenger—in both, the passage-money for a married couple is somewhat less than double. Each passenger is allowed a certain quantity of luggage freight free, generally about half a ton each, although in this particular there is a considerable difference with different ships, some giving more, but a greater number less.

With the prospect of such a long voyage before him, it would be well for the intending emigrant, both for his own sake and that of his fellow-passengers, to make up his mind, before embarking, to put up, as far as he possibly can, with any little disagreeables which may occur during the voyage. He should determine neither to give nor take offence on slight occasions, but keep on good terms with all about him, overlooking little inadvertencies and hasty expressions on the part of his fellow-voyagers. He should rather try how pleasant a companion he can make of a man than quarrel with him because he does not find him so ready-made to his hands. Let this experiment be fairly tried, and it will be found, in nine cases out of ten, that unfavourable appearances or first impressions are not criterions of character. Above all things, keep upon good terms with the captain of the ship. He has it much in his power to make your situation comfortable, or otherwise, during the voyage, and most assuredly you will make very little by placing yourself in an attitude of hostility with regard to him. You will gain nothing by getting upon your high horse, and talking big about what you have a right to say, or to do, or to expect; for though really a disagreeable man, he will take care not to go the length of doing any thing which can bring him within the reach of the law, or regarding which you could have any good hold of him; but how miserable can he not make your situation, and yet keep short of this! How many things can he not do to annoy you, for which, though giving you much unpleasant feeling at the time, you could scarcely afterwards find a name!—annoyances, in fact, which, though painful enough to feel, appear exceedingly trifling in relation. All this, however, may be easily avoided: be at some pains to study the man's character; humour his foibles, if he have any; and be not ready to take offence at any thing he may say or do, though it may not appear to you at the time altogether what it ought to be. By doing this, you will consult your own comfort, and with ninety-nine chances to a hundred in favour of your finding your captain a very honest fellow.

VAN DIEMAN'S LAND PRICES CURRENT—1832-3.

Ale, English, per doz.	L.0	18	0	Meat, beef, per lb. 4d. to	0	0	6
—— Colonial, hhd.	4	0	0	—— mutton, do. 3d. to	0	0	4½
Bark, per ton	3	0	0	—— bacon, do.	0	0	9
Biscuit, best, per cwt.	1	14	0	—— hams, do.	0	1	0
—— seconds ditto	1	0	0	Milk, per quart	0	0	0
Bread, per 4 lb. loaf	0	0	8	Oil, sperm, per gallon	0	10	0
Bricks, per thousand	1	15	0	—— black, do.	0	3	0
Butter, fresh, per lb.	0	3	0	Potatoes, per cwt.	0	7	6
—— salt	0	9	0	Poultry, fowls, per pair	0	3	0
Candles, per lb.	0	1	6	—— ducks, do.	0	4	9
Cheese, Sydney, lb. 1s. to	0	1	3	—— geese, each,	0	7	0
—— V. D. L. do. 1s. to	0	1	0	—— turkeys, do.	0	8	0
Cape wine, per pipe, L.16				Salt, Colonial, per cwt.	0	7	0
to	10	10	0	Cigars, Manilla, per box	3	10	0
Coals, N. S. W., per ton	2	8	0	—— Chinsurah, do.	0	7	6
Eggs, per doz.	0	3	0	Straw, per load	1	15	0
Firewood, per load	0	6	0	Sugar, per ton	91	0	0
Flour, first, 100 lbs.	0	18	0	Spirits, rum, in bond,			
—— seconds, do.	0	10	0	per gallon	0	4	0
Grain—wheat, best, per				—— brandy, do. do.			
bush. 4s. 9d. to	0	5	3	4s. 3d. to	0	4	0
—— light, do.	0	4	0	—— gin, do. do. 4s 3d to	0	4	0
—— barley,	0	5	0	—— (Towers') duty			
—— oats, do. 4s. 3d. to	0	4	6	3s. 6d. do.	0	0	0
Gum Pino, per lb. (noto.)	0	1	0	Soap, Eng. per lb. (box)	0	1	0
Hay, English seed, per				—— Sydney do.	0	0	10
ton, L.6 to	6	0	0	Tea, per chest	3	5	0
—— Colonial, ditto	5	0	0	Tobacco, Brazil, in bond			
Hides, 5s. to	0	0	0	per lb.	0	1	9
Lime, shell, per bushel	0	9	8	Wool, per lb. 8d. to	0	1	0
—— stone, do.	0	9	0				

THE COLONIAL GARDEN.

The seasons of the year in these colonies being very different from what they are in this country, we beg to offer the following observations on the proper periods and mode of planting in the kitchen garden, abridged from the Appendix to the work of W. C. Wentworth. The observations apply to New South Wales in particular, but may with a reasonable allowance be also useful as regards Van Dieman's Land:—

Potatoes, for a general winter crop in field or garden, should be planted from the end of January to the end of February, or even the beginning of March, rather than lose the planting; and they will come into use in winter, when cabbages and other vegetables run to seed. The ground should if possible be prepared a month before the planting, and a preference given by the country gardener to new ground, or dry wheat stubble, where the soil is light. The town gardener should keep his ground in a good state by frequent light manuring. In July the ground should be prepared for the summer crop, at which time the winter crop will be fit for digging; in which process every care should be taken to prevent their being bruised; and if possible, they should be dug in cloudy weather, to avoid exposure to the sun, which would rot them; whereas, if carefully preserved, they will keep sound for a length of time; which will be the more desirable, as at this season vegetables are mostly scarce and dear. In August the planting should be made, or even in September, if necessary; and at the end of the latter, or in October, they will require to be hilled and earthed, and well cleansed from weeds, which must also now and then be done as weeds make their appearance. In the choice of seed for this crop, a middle-sized potato should be preferred, without any objection to their being cut, as is the customary mode of planting. In October you may also plant potatoes for a latter crop; and this, though perhaps less abundant than that sown in August or the beginning of September, will nevertheless be sufficiently productive to pay well the expense and labour of planting. The potato is so essential and desirable an article of food, that too much care cannot be bestowed in their culture and preservation; for should other crops fail short, this will afford the grower a certain means of supporting his family.

Carrots and parsnips, for a general crop, may be best sown in December and January. The ground should be dug deep, and broke up very fine. If the soil be light, the seed should be sown on a calm day, and trod in. Carrots and parsnips may also be planted in July, and also in November. They thrive best in an open situation, or a light sandy soil; and after they come up, should be thinned and set out with a small two inch garden hoe.

Cabbages, for a constant supply, may be sown in January, April, May, July, August, October, and early in November, at a time when the ground is in a moist state. The plants sown in April will not run to seed. Care should be taken to set out the plants in a richer and stronger ground than the bed they are taken from; otherwise the crop will be poor. Their first bed should now and then be weeded with the hand in dry weather, and the freshest and strongest plants removed first.

The ground for turnips should be prepared in February, and at the latter end of the month some may be planted, for which purpose gentle showery weather is most favourable. Turnips for a general crop should be sown early in March, and they will be ready for food for sheep in the beginning of May. During their growth they require hoeing once or twice, to thin and keep them clean, if the land be foul. Turnips for table use may be sown at any time between March and September, or the beginning of November, when absolutely necessary.

The seed of cauliflower may be sown at any time between November and February, but best in December. Some sow about the middle of May for a summer crop, and this practice is found to answer.

In March prepare the ground for onions, by breaking it up well, and richly manuring it. At the end of the month, and beginning of April, sow a light crop of onions for immediate use. In April prepare for a general crop, which should be sown at the latter end of the month, or beginning of May, to keep them from going to seed. When they grow to a proper size, which will be from the latter end of October to the beginning of November, they should be carefully laid down, so as not to break the tops; for should the tops be broke, and the wet penetrate, the onions will inevitably spoil. When fit to draw, they should be gathered on a fine dry day, and laid under cover, so as not to be at all exposed to the sun.

The ground should be prepared in March for peas and beans of all kinds, by well working and manuring; and at the end of the month, and in April, they may be sown for a spring crop. Some sow from the beginning of March till the middle of June, as occasion may require. Prepare in August for a later crop; and French beans may be as well sown in October as at any other time.

In Van Dieman's Land, the farmer sows his grain in July, August, and September, which are the spring months; in October he prepares the land for Swedish turnips; in November he gets in his potato and turnip crops; December is the height of his hay harvest; at about the middle of January his wheat harvest commences, and continues through February; in March he pays attention to his fallowing and husbandry; in April he gathers his second crop of potatoes; in May he lays down his English grasses; and in June he continues his ploughing and harrowing. Thus, he has a continual round of pleasurable occupation in his fields—

"Oh! friendly to the best pursuits of man,
Friendly to thought, to virtue, and to peace,
Domestic life in rural leisure passed."

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POLITICAL ECONOMY.

POLITICAL ECONOMY is the science which explains the sources and distribution of national wealth. Though a study better fitted perhaps for learned men than for common people, it is yet of more or less importance to every body—for all men have interests which it may teach them to cultivate, and rights which it may teach them to defend. The working classes, in particular, ought to be better informed on this subject than they are in general: it would make them understand the exact nature of their position in the world, the relation which their own interests bear to those of other men, and the means and ways which they ought to take to improve their condition. It has all along been from a want of this knowledge, that labouring people have never as yet had any consistent policy among themselves, wherewith to meet the policy of those who had such knowledge; never as yet have been able to ascertain their true interests, either as individuals or as a class; and thus have grown up at the mercy of mere chance, and are now perhaps far less comfortable and happy than they might otherwise have been. They have hitherto been excusable in a great degree for this ignorance, on account of the science having never been explained, either in terms which they could understand, or in a form which was accessible to them. Such, however, is no longer the case. Here, for a sum of money which even to them is a trifle, and in language which we hope will be within the comprehension of the most unlearned, will be laid before them, all of this branch of human knowledge with which it is of particular importance that they should be acquainted.

CULTIVATION OR NO CULTIVATION.

Originally the surface of the earth was a mere waste, and the men that could live upon its spontaneous fruits were in a most unenviable condition. We see this proved before our own eyes by the state of certain large uncultivated tracts in North America, where there is not above one man for a thousand acres of ground, and even the few who live there by hunting and other rude arts, are exposed to the most dreadful wants, the result of which is frequent cases of starvation.* Human reason informs us, that the design of the Creator in planting mankind upon the earth, was, that they should labour to cultivate it, and live upon the produce. By this means, it is evident that they not only acquire far more comforts as individuals, but enable more to live upon the same space of ground. Two hundred and twenty persons, for instance, live upon every square mile in England, and even a greater number in the Netherlands, while not one man can subsist upon that space of ground in the savage parts of North America. There may be more difficulty in demonstrating that some English workmen are better off than the generality of Indians; for the advantages of the one cannot be exactly balanced against the disadvantages of the other. But it is to be presumed that few rational men would prefer the wild freedom of these savages, accompanied as it is by privations of the severest kind, and which frequently abridge life itself, to the toil of a common labourer or workman, in such a country as England. It is clear, then, that labour was necessary to improve and extend the natural bounties of the earth.

LABOUR.

In one sense, labour has existed from the very beginning—for even to pull a wild apple or hunt down a wild animal requires some exertion. What is here meant, however, is, that regular consistent exertion which produces regular consistent results, and tends to something beyond supplying the necessities of the moment. Labour properly began when the first field was ploughed and the first grain sown; and its utility was first felt, when it was found that the plougher and sower could either live better himself in consequence of the process, or enable others to do so. A step was then taken towards the improvement of natural advantages, and the increase of the species.

This species of labour is called agricultural: it is entitled to the first consideration, because its produce was an article of first-rate necessity, and because the earth, upon which it acted, is the natural source of all things. Another kind of labour is manufacturing. Any operation of the hand, by which a thing in a natural and insufficient state is adapted for the use of man, or rendered more agreeable to him, is an exertion of manufacturing labour. If the first agriculturist made his own plough, or converted the straw of his first crop into a rude bonnet to shelter him from the rays of the sun, he was also a manufacturer.

EXCHANGE.

In the first condition of human labour, every man would have to plough and reap for himself, and also to make with his own hands all the rude articles he required for his personal conveniency. Having plenty of time, he would feel this as no great disadvantage. By and bye, his time would become more valuable, and in order to make as good use of it as possible, he would find it advisable to confine himself to agricultural labour, and purchase those manufactured articles which he required, from a man who, for the same reason, had begun to make the production of such things his exclusive business. Thus, society would become divided into distinct classes, who exchanged labour with each other for the general conveniency, and for the purpose of making each individual more productive.

PROPERTY.

One thing was from the very first necessary, before any labour could be undertaken upon proper principles. It was necessary that where a man sowed, he should be certain he would reap; where he fabricated an article, that he should be certain of having liberty to use it. If he could not calculate pretty safely upon the product of his labour becoming his own property, he would want all motive to exertion, would neither sow nor manufacture necessary articles, and both himself and his fellow-creatures would be deprived of the advantage of his labour. Hence arises the idea of property. At first, as among the North American Indians at the present day, a very faint notion of property would obtain, and perpetual attempts would be made to despoil a neighbour of what he had endeavoured to mark out as his own. By and bye, however, when men began to understand better what was for their general as well as particular interests, men would be permitted to fix themselves upon certain tracts of ground as their own, and would be protected in the enjoyment of them by regulations called laws, which every sensible man would support in the case of a wronged neighbour, in order that they might be supported when it was his turn to be injured. It would be found better that the land should be thus divided among a limited portion of people, while others only lived upon it indirectly, than that there should be no property at all, and, consequently, no labour. Even those who were worst off by this arrangement, were better off than if it had not been formed, for in the one case they could still sell their labour to the man who had property, and thus gain a livelihood, while in the other they would either starve, or be killed in the disputes which would be sure to take place, or, what is most probable, not be called into existence at all. To make it plain how useless is any natural product of the earth, if it be not claimed and guarded by some man as his particular property, let us instance a cherry-tree in a hedge-row, the fruit of which is sure to be seized by wayfarers before it ripens. Better it would be for society to give up this tree by general consent to one of their number, whether *he* had any pretensions to it or not, and thus let it be protected till its fruit ripened, than permit it to remain of no use to any one. The *merits* upon which the first proprietors of the earth contrived to secure what their representatives now enjoy, is a question which all classes of political thinkers seem to think it best not to agitate:† enough it is for our present purpose to show, that property is absolutely necessary, in order that there may be labour, and in order that any of the advantages of labour may be experienced by society at large.

MONEY.

Money is a necessary consequence of exchange. Direct barter is soon found inconvenient, and the cause of loss. The one party does not always want exactly what the other has to give, or only wants a part of it; and before every one gets exactly what he requires, he has to exchange over and over again, by which he loses a part of his time, and probably incurs much expense for carriage. Money, therefore, which saves this inconvenience and loss, appears to have been brought into use almost as early as the very commencement of social transactions among mankind. The labourer accepts of certain coins, or pieces of paper which he knows can be converted into coins, instead of any actual necessary of life which his employer would otherwise have to give him; and with these coins, in minute divisions, he can purchase to a fraction what he requires, without any loss of time. Money, on the other hand, or any of the things which represent it, is of great convenience to those who save a part of their gains; it will keep quite fresh, while many other articles would perish. There has never yet been found any perfect money or representative of value. The metals most commonly used, though the nearest possible approach perhaps to a fixed standard, are yet liable to fluctuations in their own value, by reason that they are themselves articles of merchandise, and are at one period more plentiful than at another. When a nation, however, agrees upon their value, the government (which represents that nation) can give them a sanction by stamping or coining, which obviates a considerable part of the disadvantage.

CAPITAL.

As soon as any thing was produced by labour, above what was necessary for immediate consumption—as soon as the property of the ground could be exchanged for something else, and men became possessed of various articles which facilitated the production of others—capital was in existence. This is a thing of immense importance in political economy. It is evident that, while men could only rear or make what they immediately needed, they were very ill provided. In order to be at all at their ease, it was necessary that they should have something stored up, to serve them in the event of a failure of crops, or of any other deranging circumstance. In order, moreover, that one thing might be made, it was necessary that another (a tool, machine, or other appliance) should previously exist; and the more plentiful the first thing was, the second could be produced so much the more easily, and disposed of at so much the less cost.

Capital is formed of the savings of mankind from the beginning: it is what the reason of man has directed him to lay aside, out of his gains and labours, as a means of gaining and labouring to much greater advantage thenceforward. It is found, like ground property, into which it is convertible, in the hands of a limited number of persons, for all are not so fortunate as to have formed any for themselves, or to have inherited or received any from others who did. When

* This is put beyond question by the Memoirs of John Tanner (who had been thirty years among the Indians), published at New York in 1830.

† It is worthy of remark, that there never has yet been any attempt of the unpropertied classes, in any country, to dispossess their more fortunate brethren. The idea of such a thing seems never to be entertained by more than a few isolated individuals. There have, however, been many wars and movements of the poorer classes against undue privileges assumed by the wealthy.

a man possesses capital, he generally becomes an employer; when he has none, he is generally compelled to be a labourer or workman. The capitalist can apply his possessions to the purchase of a stock in trade, or a set of tools or machines for a manufactory, and thus he is apt to become rather a director of labourers than a labourer; though, in one sense, every man who does any thing to serve his fellow-creatures, is liable to that designation; while every working man, on the other hand, may be termed a capitalist, if he only possesses a spade or a pickaxe, or, what is equivalent, a little instruction in his trade—for all these things are alike the result of a storing up. Capital and labour are in many things, indeed, confounded together; but, in political economy, the latter is generally considered as a bare power of exerting native faculties, while the other is held as that superfluous wealth which has been treasured up by careful men, and is employed in furnishing the materials of labour.

ADVANTAGES OF CAPITAL NOT EXCLUSIVE.

Men who find themselves obliged to labour are very naturally inclined to envy those whom the possession of capital has exempted from that necessity. It could easily be shown, however, that the advantages are not all on *one* side.

Capital obviously produces the following good results: It enables men to buy the raw materials for manufactures in sufficiently large quantities, and to erect and employ machinery, human and mechanical, on a sufficiently extensive scale, to produce goods at a cheap rate, and thus facilitate their sale. Of course, this does good to the labourers, for it extends the bounds of employment. Considering labourers, moreover, as part of the public, they enjoy their fair share of the advantages which that body derives from the employment of capital. If capital lays an extensive railway, or erects a pier or a lighthouse, which reduce the prices at which things can be produced, the labourers, so far as they use the articles so cheapened, are the better of it. Among the uses of capital is that most indispensable one, the storing up of the surplus of a good harvest against the chance of a bad one: the labourers, of course, experience their proper share of the advantages thus attained. Another of its grand uses is the enabling a set of middle-men, merchants and shopkeepers, to buy goods in large quantities from the manufacturers, in order to deal them out in small quantities to those who need them. Without these middle-men, the distribution of goods could not be effected; and without capital, they could not exercise this useful branch of business. Of course, the labourer has his own share of the advantage thus gained. But it is needless to expatiate on this part of our subject. The possession and use of capital is what chiefly distinguishes a civilised from a savage society, and all who belong to the former state must be better off than if they belonged to the latter.*

DIVISION OF EMPLOYMENTS.

As society advances, employments always become more and more divided and subdivided, until each man at length takes only a minute part of an employment which formerly even in its entire state, did not perhaps occupy one man. The advantages aimed at in this, are as follow:—

By division of employments, time is saved. A man carrying on different occupations, in passing from one to another, must change either his position, his place, his tools, or the direction of his mind, and in any case time is lost in the transition. Nor is it alone the time apparently required for the transition that is lost: he does not immediately *get into heart* with his new employment; he saunters and hovers for a while, and the work is perhaps finished before he has attained the full rapidity of execution which it might allow of. The present writer, for instance, has found that he always advanced three times more rapidly, towards the centre and termination of any composition in which he was engaged, than at its commencement.

Greater skill is attained in a small branch of employment, and attained by a briefer period of instruction, than in a more extensive one.

The habit of the body, the muscular system, becomes more powerful when exerted constantly in one direction, than in many.

When an employment is divided, the master can husband the skill and force of his operatives by applying the exact portion requisite for each branch, and no more: whereby the price of production is lessened.

In consequence of divided employments, tools are invented and applied to each, and eventually machines are formed from a combination of these, so as to abbreviate labour in a very great degree, and of course cheapen the articles produced.

It has been customary to give the art of pin-making as a captivating illustration of the advantages of divided labour. Every woman must be sensible, that, if she had to make her own pins, she would hardly have time to do any thing else; hence the advantage of having pins made by one particular set of workmen. If each pin, however, had to be made entirely by one man, and without the use of machinery, he could not sell this article at such a price as to enable any people of ordinary fortune to purchase it; each pin would perhaps cost sixpence. In order that this article may be produced at its present moderate price, it has been found necessary to apply ten different persons, of different degrees of strength and intelligence, to fabricate it. One man is employed in the business of reducing wires to the necessary thinness, by passing them through holes in a steel plate; he will draw and clean about thirty pounds weight in a day. A woman and a girl are then employed in straightening the wire. A man, a woman, and a child, are employed in cutting it into the proper lengths, and giving the point; they can do from thirty-four to thirty-six and a half pounds weight in a day, and earn about seven shillings. The formation of the heads is accomplished by a boy and a man, the former to twist a long spiral wire, and the latter to cut it into the minute portions necessary for one separate head. The fixing of the heads is executed by a woman, by means of a steel die and other processes, and yields one shilling and sixpence for twenty thousand. The tinning of the pin is done by a man and a woman or lad. The papering, which is generally executed by women, we consider a separate process. To make 5546 pins, weighing one pound, occupies, in the different processes, rather more than seven hours and a half; and the total expense of the labour, each person being paid according to his skill and his proportion of the time, is nearly thirteen pence. It is evident, that, if ten persons were not employed, the workmen would lose time in turning from one operation to another, and perhaps have to spend a degree of skill and strength upon particular departments, above what was really required. A man would be doing the work which could be deputed to a boy, and yet require a man's wages, which of course would enhance the price of the article.

Watchmaking presents another striking instance of division of labour. One hundred and one persons in all are employed in forming and preparing the different parts of a watch, and only one of them, the finisher, is instructed in two of the operations. No doubt, as in pin-making, the subdivision of the employment has conduced to facility and cheapness.

QUESTION OF CHEAP PRODUCTION.

It is of importance to observe, that, while these subdivisions produce the effect just stated, the effect also tends to reproduce the subdivisions. If watches were not cheap, and generally accessible, there would be very few sold; consequently, perhaps, there would be no establishment for watch-making where so many as one hundred and one persons could be employed. Twenty persons, perhaps, at the utmost, would be engaged in the whole operation—would, of course, work at comparative disadvantage—and render a greater price indispensable. Unreflecting persons are sometimes heard to say, that it were better things in general were dear than cheap. But it is shown, that, unless we consent to the abstract advantage of the utmost possible cheapness in all things, we abandon the very advantages which the nature of social life holds out to us, want articles which we could otherwise have, and obstruct employment rather than encourage it.

The use of capital is shown here at the same time. If there were not capital or savings to employ one hundred and one men in one place for the production of this small article, it would be much dearer than it is, and not nearly so many men would be employed: in other words, the population would be so much less, or so much the worse off.

CONCENTRATION OF LABOUR.

It is advantageous for the cheap production of articles, that each article should be produced in certain places or districts.

The existence of mines of metal at particular places, renders it necessary that the articles formed from those metals should be respectively produced as near to them as possible, for the saving of carriage. Or, if coal be required in large quantities for the preparation of any kind of goods, a medium may be struck between the locality of the coal and the locality of the material, with a reference to the comparative weight and facilities for conveying each. On the whole, it is of importance that a centre for the issue of the prepared goods should be found as near as possible to the places where the means of preparing them can be obtained cheapest.

The clustering of men of one occupation is not only rendered unavoidable by this governing circumstance, but it is of positive advantage in itself. The competition is the more active where the number in one trade is the greater, and thus the public is apt to be served on the lowest terms, and with all other advantages, in their greatest extent. It is perhaps of still greater service, in as far as it tends to suggest and encourage the invention of useful machinery, and to improve every other mode and practice connected with the business. It is of convenience to the customers, or middle dealers, in as far as it saves them the trouble of moving here and there to considerable distances for a proper and advantageous supply of what they require. It also causes a kind of mart or exchange to be formed, tending to the ascertainment and diffusion of all kinds of information necessary for men engaged in the trade. Finally, it tends to check the unhappy fluctuations of price, which are so often the cause of loss to the capitalist, and the source of misery to the working man.

LARGE FACTORIES.

The advantage of concentrating labour is found in another way, namely, in the erection of large instead of small factories. The more extensive the factory, if all its parts are properly attended to, the more exactly is each man likely to be adapted to his employment—the more likely is it that no part of any man's skill and force is expended amiss or uselessly—and the cheaper does the system of supervision (a very important item) become. Trouble and expense are saved in conveying the various kinds of raw material from one workman to another, and in many instances an expense may be saved upon those officials, of whom one at least is in every case necessary. If *sets* of workmen are required, such as the tens of persons employed in pin-making, the enlargement of the factory may be necessary in order that there may be no imperfect *set*—which would be the cause of a loss. Where one engine or *power* is required, it may serve for a great establishment as well as for a small, and thus cause a very important saving. There may even be an advantage, as Mr Babbage ingeniously shows, in having a factory of such extent, that enough of engines are employed to render the services of an entire, instead of a fractionary man, necessary for keeping them in repair—a regular hired workman being cheaper than one called in occasionally.

In fact, there is no limit to the advantage of large establishments, except the difficulty which a capitalist always finds in getting agents who will turn things to as good account as himself. A master's eye is proverbially advantageous, and it is not good for any man to expend capital much beyond the range of that useful organ. As to the advantage which the public derives from extensive and concentrated systems of production, we are not aware of any limit to it. Every thing that tends to cheapness, as this does, must be of service to them. The workmen, on their part, find its advantage in the same degree, since cheapness increases consumption, and therefore tends either to the increase of their wages, or to the increase of their own number.

MACHINERY.

The question of machinery is one of some delicacy, but it would be improper to omit all notice of it in the present sheet. As the whole progress of things from the beginning has been from *no tools* to *tools*, from *no modes of shortening labour* to *modes of doing so*; and as the community has both been increased in number and improved in comfort by these processes, it would be impossible for any philosophical inquirer not only to deny the advantages of machinery, but to assign any conceivable limits to those advantages. The question, however, has not been ingenuously met by the writers who endeavoured lately to tranquillise the popular mind in the disturbed districts of England. "As well," said they, "fall out with a spade, or any common tool, as with a machine, since they all alike tend to shorten labour: as well might the plough be denounced for preventing the employment of the spade," &c. There is this difference, in our estimation, between the one case and the other, that tools are in a great measure the implements required by individual labourers, before they can work at all; while machines are a combination of tools, dispensing with the men. It is immediately advantageous for the community, and eventually for working men too, that tools should be thus combined, and their users disemployed. But it is not immediately advantageous for *these very men*: on the contrary, it obviously deprives them in the middle of life of all the advantage of their apprenticeship and acquired skill—turns them adrift upon other employments, where there is perhaps no reception for them—and, even if they got employment there, reduces them to the painful and penurious state of learners, in a trade for which their previous habits of body and mind render them, perhaps, very unfit. It is no consolation that the machine which has deprived them of bread offers them a particular necessary or luxury of life at a much lower rate than they ever had it offered to them before; for, without their usual wages, they can buy it at no rate whatever. It is no consolation to them that the public is advantaged just now, and that themselves or their own class will be advantaged afterwards: they cannot but see that the immediate advantage of the public is *their* immediate loss; and as no workman ever has much more than his week's wages to look to, they are brought face to face with starvation, long before their own promised share of the profit can be realised.

It is nevertheless necessary that workmen liable to this misfortune—for such it is to be considered—should

* "When we look at the nature of the accumulated wealth of society, it is easy to see that the poorest member of it who dedicates himself to profitable labour is in a certain sense rich—rich as compared with the unproductive and therefore poor individuals of any uncivilised tribe. The very scaffolding, if we may so express it, of the social structure, and the moral forces by which that structure was reared, and is upheld, are to him riches. To be rich is to possess the means of supplying our wants—to be poor is to be destitute of these means. Riches do not consist only of money and lands, of stores of food and clothing, of machines and tools. The particular knowledge of any art—the general understanding of the laws of nature—the habit of experience of doing any work in the readiest way—the facility of communicating ideas by written language—the enjoyment of institutions conceived in the spirit of social improvement—the use of the general conveniences of civilised life, such as roads—these advantages, which the poorest man in England possesses or may possess, constitute individual property. There are means for the supply of wants, which in themselves are essentially more valuable for obtaining his full share of what is *appropriated*, than if all the productive powers of nature were unappropriated, and if, consequently, these great elements of civilisation did not exist. Society obtains its almost unlimited command over riches by the increase and preservation of knowledge, and by the division of employments, including union of power. In his double capacity of a consumer and producer, the humblest man has the full benefit of these means of wealth—of these great instruments by which the productive power of labour is carried to its highest point."—*Working Man's Companion—Rights of Industry—Capital and Labour*, p. 60.

be made aware of the exact nature of the remote advantages which will accrue from what caused their present distress. The cheapness attained by machinery always tends to increase the consumption to a proportionate extent, not only by bringing the article into powerful competition with other luxuries in our own country (which is not an undivided advantage, since it must diminish employment somewhere else), but by enabling the British merchant to outcheapen the foreign manufacturer. Thus, there are infinitely more people now employed in the cotton manufacture than what there were before the invention of machinery. To go no farther than the piece of literary labour now in the hands of the reader:— It is not long since the paper-making machine lessened to a great extent the number of labourers in the production of that article. Of seventy persons, for instance, in one Mid-Lothian mill, all, except a very few, were in one week paid off; when, being unacquainted with any art or craft, and unable to live on apprentice's wages, almost the whole of these poor men were obliged to become stone-breakers by the wayside. No one can deny the hardship of this case. Yet mark the general result. But for the introduction of the paper-machine, this sheet, containing a full view of a most important subject—the result of much research and reflection—could never have been published. It could not have been published, we mean, at the price of three-halfpence; and had a larger sum been necessary, even so much as a halfpenny, the speculation would have never been thought of, because it would not have held out hope of profit. Thus, it will be observed, at the expense of some immediate suffering to a small class—a suffering which nothing on earth could avert, so long as every man is at liberty to pursue his own interest—the whole of the working men in the empire may be said to have for the first time had presented to them, at a price they could pay, and in terms they could understand, a species of knowledge, the uses of which in benefiting them are altogether beyond calculation.

PROVISIONS AGAINST IT RECOMMENDED TO WORKMEN.

It may also be represented with some force, that the employing classes are not alone responsible for the consequences of abbreviated labour. The *employed* may reasonably be looked to, since they are most nearly concerned, for an exertion of some kind or other, to alleviate what appears to be an unavoidable calamity. By bringing up part of their families to different trades—by storing up a little in Savings Banks or in Friendly Societies, during a period of good employment—by opening their eyes to *coming machinery*, and looking out in time for a retreat—much might be done to soften the calamity, before it arrived. After it does arrive, the proceedings of the workman might in many cases be amended. We hold it not creditable, for instance, to the cotton-weavers in the west of Scotland, that, after their art was destroyed by the power-looms, they should have clung so long to its reduced wages, and persisted in breeding up their children to it, as a means of in some small degree increasing the family resources—thereby entailing certain misery along with existence. It might have surely been expected that where so many more profitable trades were going on around them, they might have more generally contrived to change their employment, and thus, by allocating a small portion of their losses upon their neighbours, put an end to by far the greater part of their distress. Much of what is here blamed may arise from that feeling of attachment which men come naturally to feel towards a particular line of life, and a particular place of residence. But we hold that these feelings are only good to a certain point, and were never meant to interfere with better principles. It may also be represented, that the very condition of a working man implies that he cannot amass any capital, as, when he does so, he is tempted to become an employer or master. But, on the other hand, there is upwards of thirteen millions of workmen's spare earnings in the Funds (through the Savings Banks), which shows that there may be a surplus in wages, which neither is required for immediate support, nor is drawn into mercantile or manufacturing speculation. A working man should take care how he convinces himself that he cannot save. When, from one wage, say twenty shillings, he is reduced to fifteen, does he not still live? Why then might he not have spared, say one shilling off the twenty, and still lived? Even though assured of no mischief from machinery or other accidents in his trade, he should consider that his life, in all probability, will not consist entirely of working years. The evening cometh when no man may work. Upon ordinary chances, there will be a few years at the end of life, during which he will be unable to support himself by labour. Now, it is a sound principle, which cannot be broken without great danger, that every individual man should, if at all possible, *provide for himself throughout the whole of adult life.* It is destructive to all good feeling that he should burden a public establishment; and it is an unfair thing to the succeeding generation, that he should look there for his support. The claim of a child is imperative upon the parent during youth; *that* is no debt, or, if it be, its only fair discharge is in the care taken of the next generation; but the parent has no just or laudable claim upon his own children; it is cruel to enforce such a thing, and it is very uncertain that it will be rendered. So indisposed are men sometimes to attend to their parents in old age, so disposed are they to look after their children only, that we have known instances of the most respectable, and, to appearance, good-natured men, who paid very little or no attention at all to these relatives, leaving them to a style of life bearing no proportion in comfort to their own. We would advise all workmen, if existing circumstances will permit, to trust solely to themselves for provision during old age. It is easy for a man of tolerable resolution to lay by a small weekly sum, which he will not miss at the time; and he may depend upon it, the money will never do him any harm.

PROFITS.

The object of the capitalist is *profit*; that of the workman is *wages*. In common speech, an employer or trader is conceived to aim at profit alone, though he may also exert himself actively. But in reality, every such employer or trader is a workman besides, and in so far as he is so, a part of his gains should be ranked as wages, while only that should be deemed profit, which accrues to him as a remuneration for his disbursement of capital. On the same principle, that part of the gains of any operative which arises from his possessing tools or acquired skill, should be ranked as profit, seeing that it arises from capital, while only that (generally much larger) portion should be considered as wages, which he earns by the actual exercise of his natural strength and ingenuity.

As capital is the result of former industry—the gatherings of either some existing man, or of some deceased person who bequeathed it to him—and may thus be considered as the reward of past self-denial; so is profit the reward of a continued self-denial in the possessor of capital. If a man possesses, for instance, a hundred pounds, which he has it [illegible] to spend in personal indulgences, or to put out to active use, under his own industry and superintendence, or under the industry of another, he will, if he can abstain from spending it, realise a certain addition to it, which falls to be considered as profit. Should he think proper to employ it in setting up a small shop, he may, by the aid of his own industry, and the exertion and display of other good qualities, probably double it before the end of the year. If he prefers letting others exert their industry upon it, he may put it into a bank; in which case, he will only get a per-centage for the liberty of using it, being something much smaller than he would probably acquire the other way, but only so in proportion to the absence of his own labour, and his comparative exemption, in the latter case, from the risks of trade. Either way, it is just the reward which he deserves for his fortitude in abstaining from squandering his hundred pounds. Where the profit is not required for the immediate necessities of the capitalist, it is added to his existing stores, and thus becomes in itself new capital.

It is a law of profits, that they must, at every particular time, be pretty nearly alike in all branches of employment. Capitalists are generally very much alive to the superior advantages which may exist in any particular line of business; and if they see an opportunity of turning their stores to better purpose in one way than another, they instantly desert the present channel, and throw their money into the new one. Competition, of course, soon reduces the advantages of the new line to the general level. There may, it is true, be circumstances which protect the said new line. Other capitalists may find it difficult, from personal considerations, to make a change; or the cost of the change, and loss incurred by it, may exceed the probable profits. The invention of improved processes generally produces an increase of profits; and this superiority continues as long as it is difficult, or inconvenient, or impossible, for other capitalists to take advantage of the improvement. Upon the whole, profits must always bear a reference to the general standard of prosperity for the time: when the country is prosperous, and many articles of consumption are wanted, capital comes more into request, and profits rise; when, on the contrary, there exist more articles than what are immediately needed, capital flags in its activity, and profits sink.

It is impossible to dismiss the subject of profits without alluding to the singular decline which they have experienced within a very few years. It is in the nature of things that profits should decline in proportion as capital becomes larger in amount and more active in operation; and when they decline from no other cause, there is reason for rejoicing rather than regret. Of late years, however, profits have been reduced, not only by this salutary cause, but by another of a very different kind—namely, unfortunate legislative arrangements respecting the currency. This is a subject which it would be difficult to explain to a common mind, and upon which even cultivated thinkers are not altogether agreed. The decline of profits has inevitably produced a decline of wages, and thus the poor man suffers from a cause which it would perhaps require volumes to explain to him—if even volumes could clear up so intricate a subject. It is a striking fact, and should spur on the common people towards general knowledge, that they sometimes suffer, like dumb animals, to the most frightful extent, without knowing the source of their malady, and, consequently, without being able to take the least step towards their own relief. Were they generally enlightened, they might be able to avert or overcome various disasters, which otherwise press severely on them, and cause a trouble to the rest of the community; and it should form an argument of power against those who *fear* the progress of plebeian tuition—that, if thus enlightened, the industrious classes would be less apt than they are to attribute that to the government, which has arisen from causes entirely distinct. No safety, indeed, but in perfect light!

WAGES.

We now come, it may be said, to the kernel of the whole subject. Wages are what the industrious man habitually regards as the motive and object of all his toils. Wages supply him with his own share of the earth's alimentary productions—often too small for his comfort—and give him the means for a dearer purpose still, the gratification of those helpless beings who depend upon him as their sole refuge, guard, and stay. Wages, indeed, have an interest in the eyes of the poor man, which the capitalist can never experience, in almost any degree, respecting the same sum of money. To the employer, a shilling, in one weekly instance, is nothing; to the workman or clerk, it is held as a thing of the last moment—appreciated if gained or added, and deplored when taken away.

Wages, then, it is necessary to inform the poor man, are governed in a great measure by the proportion between the demand for any particular article, and the rate at which he or others may be then supplying it. DEMAND and SUPPLY are the great ruling powers of the commercial world; and hardly any shift can take place in their relative position, but, like the sun and moon, they affect the tides of that ocean of workmen who lie between. If the public be requiring more of a particular article than the ordinary rate of manufacture, or the existing stores, can conveniently supply, the manufacturers take advantage of the circumstance to lay on an additional price, knowing very well that the public will rather stand that exaction than want the goods. The direct consequence of this is, that he [illegible] to increase the wages of the labouring producers of the article, to induce them to work, for it is not to be expected that they will suffer him to reap the whole benefit of the rise, when, by declining to work, they can bring him at once within their power. The same train of events takes place when there is even an *apprehension* that the public will want more of an article than what can be readily supplied. The dealers nearest to the public, called retailers, then press for anticipatory supplies upon the general merchant, who in his turn presses upon the manufacturer, who in his turn presses upon the workman.

A decline of prices, from over supply, produces a result exactly the reverse. The workmen, in that case, soon find that the master does not so highly appreciate their services, and has to pay off a few of them, besides offering the remainder a lower wage. At first, the workmen who remain in employment are reluctant to accept this; but they soon find that their discharged brethren, by offering to take it, leave them no other course. In all declines, as in all rises, the effect goes even beyond its proper natural bounds. A falling market, when once set agoing, gains from the imagination of the merchants, and the necessity for the last-bidden sum being under the preceding one; and it requires a time to come to its proper level.

It forms a great addition to the unhappy condition of the workman on this occasion, that he has no fort of vantage to set his back to, for the purpose of bearing up against the ebb tide. He cannot, like a master, stand upon his capital, and rather suffer a little than just immediately give way. His needs are urgent: he must *every week* have a wage, and to gain that in any shape, he is compelled to come down from what we may call his prices. It is obvious that, if he had a little store laid up from former gains, he would not be in nearly so defenceless a state, but would often keep up the market of his own labour.

But the grand protection of workmen from low wages is a shortcoming in their own number. Under ordinary circumstances, it is the superfluous unemployed man, who, by bating down his neighbour, reduces wages. And it must be clear to every capacity, that, if more are born than what there is employment for, the result must be a declension in that exact degree. It is always good times for a workman while a country is on the advance, as Britain has been, or *was*; for then the natural increase of the people does not press so much upon the sources of support. But when a country is stationary in resources, the natural increase of people, if not moderated by some means or other, is sure to reduce the wages and comforts of the working classes.

There is a general impression that wages have, of late years, suffered so great a depression, as to have materially lessened the workman's command over the necessaries of life. This, however, is hardly made out by statistical inquiries. Husbandmen of the year 1832, in receiving 12s. a-week, could purchase 60 pints of wheat, which is as much as the wages of husbandmen have been able to purchase at any time during the last two hundred years. Domestic artificers, such as carpenters and masons, whose average wages in 1832 are stated to have been 33s. a-week, could for that sum purchase 265 pints of wheat, being a considerably larger quantity than the wages of the same artificers could have purchased at any time during the last two centuries, except within the last ten years, when the quantity was on one or two occasions *slightly elevated*. It is, we suspect, in the comparative addition to articles differing in some degree from the character of necessaries, and almost all of which are heavily taxed, that the alleged disability of the operative to make himself as comfortable as formerly, lies. Out of 17s., calculated as generally spent weekly by working men, upon bread, bacon, butter, cheese, tea, sugar, beer, coals, &c., 5s. 5½d, or one-third, goes for tax and monopoly, being a much larger proportion than what we can suppose to have been enacted at any time before the late war.

The liability of wages to be affected by the number of hands competing for employment, brings us to the question of

POPULATION.

We have the ascertained fact that a population, where there is unlimited support, will *double itself in fifteen years*. This proves that, as one grain of any kind of seed produces many grains, so there is a principle in the human race tending to increase. Such a principle would appear to have been necessary from the first, in order that, from the original pair, all the earth to its uttermost corners might be peopled; and, conversely, it is important to observe, the principle is a *proof of all having proceeded from one pair.* Nothing can be more certain than that men, if unchecked, would very speedily outpeople the regions to which they are in the habit of confining themselves, unless they will or can obey the law which nature meant to impose upon them when she conferred this tendency, and move along over the surface of the earth till it is all brought under cultivation. Unfortunately, another law, which nature probably imposed for the moderation of the diffusive principle—namely, a disposition to become attached to particular scenes and persons—prevails very strongly among us, being greatly enforced by our insular situation, and our appreciation of generally good institutions. There is therefore a decided likelihood in population exceeding employment in this country, unless it be outstripped by our resources—which is not the case—or unless certain moral checks, imposed by immediate necessity, be also obeyed.

The moral check, in which of course lies the only hope, consists in the horror which a man of good feelings must entertain at the idea of bringing children into the world, to drag out a starveling existence, or be cut down in their early years by the effects of misery. He will not multiply competitors for his own and his neighbour's labour, or do that which will subdivide a morsel already too small, and make all, himself included, the more wretched. He will not do this, if he *have* good feelings and just views; but he will do it, if he want these great distinctive features of an estimable character. There is a proverbial expression, very generally used by the common people in reference to a too rapidly increasing family, to the effect that no more mouths are sent than what there is bread for. There could not be a greater fallacy; and if all men were to bring children into the world in the same spirit of heedlessness, an universal starvation would very soon take place—at least in such countries as Great Britain. No, no; it ought to be present to the mind of every man, that, without a reasonable prospect of maintaining his offspring decently, it is an offence against society—an act of unutterable meanness and cruelty—to marry.

It is obvious that much must here depend upon what different people may consider as the standard of a decent maintenance. The Englishman has erected the highest known standard, in requiring wheaten bread, animal food, and a malted liquor. The Scotsman is contented with oaten bread, very little animal food, and water for his drink. The labourer in China, where the population has been *completed*, and no moral check exists, feeds on garbage. Some individuals are easily induced to marry, compared with others: we once knew a poor author who married on the score of two pounds, which he had received from some unusually liberal publisher. And the poor Irishman, it is well known, marries almost without the hope of a potato. But it is certainly of importance on general views that men should keep up a high standard. Better, decidedly, that fourteen millions should now live in England on the excellent fare which they usually enjoy, than that eighteen millions should exist, and the wheaten loaf be exchanged for bannocks. Let them make a stand upon wheat and beef, and posterity will never blame them for not being called into existence. The working classes may depend upon it, there is no effectual way of keeping up wages but in restraining the population. If they make a strike at all it should be against matrimony: if they forbid any thing, it should be the banns.

[The writer is aware of the prejudice which exists in many cultivated as well as uncultivated minds, against what is called the Malthusian doctrine of population. To meet this, he begs leave to present the following extract from Mr M'Culloch's Principles of Political Economy:—

"It has been often said, that if the doctrines now laid down, with respect to population, were really well founded, they would go far to subvert all the best established opinions with respect to the goodness of the Deity, and would effectually paralyze all attempts at improvement, by showing it to be in a great degree **hopeless**. There is not, however, any real ground for these statements. Not only are industry and forethought natural to man, but his advancement in the scale of being has been made to depend on their cultivation and improvement. We should infallibly die of hunger and cold, did we not exert ourselves to provide food and clothes. But could any thing be more ludicrously absurd than to object to those who simply state a fact of this sort, that they are impeaching the order of Providence? The powers and capacities implanted in man, seem capable of an almost indefinite improvement; but instinct did not direct him in their use. The more remote the epoch to which we carry our researches, the more barbarous and uncomfortable do we find his condition. Pressed on the one side by the strong hand of necessity, and stimulated on the other by a desire to rise in the world, our powers have been gradually developed, according as observation or accident taught us the best method of effecting our ends. *Want* and *ambition* are the powerful springs that gave the first impulse to industry and invention, and which continually prompt to new undertakings. It is idle to suppose that men will be industrious without a motive; and though the desire of bettering our condition be a very powerful one, it is less so than the pressure of want, or the fear of falling to an inferior station. Were this not the case, invention and industry would be exhibited in the same degree by the heirs of ample fortunes, as by those who have been educated in humbler circumstances, and compelled to exert themselves. But every one knows that the fact is not so. The peerage cannot boast of having given birth to an Arkwright, a Watt, or a Wedgwood. Extraordinary exertions, whether of mind or body, are very rarely made by those who are enabled, without their assistance, to live comfortably. The principle of increase has, however, prevented this from ever becoming the condition of the great mass of mankind, and unceasingly applies the most powerful stimulus—the *duris urgens in rebus egestas*—to industry and invention. Much, indeed, of the effect usually ascribed to the desire of rising in the world, may be traced to the operation of this principle. It is not solely on the lower classes, nor by the actual pressure of necessity, that it exerts its beneficial influence. At that period of life when habits are formed, and man is best fitted for active pursuits, a prospect is presented to every one, whatever may be his rank or station, who is either married, or intends to marry, of an indefinite increase of his necessary expenses; and unless his fortune be very large indeed, he finds that economy and industry are virtues which he must not admire merely, but practise. With the lower classes the existence of present, and with the middle and upper classes the fear of future want, are the principal motives that stimulate intelligence and activity. The desire to maintain a family in respectability and comfort, or to advance their interests, makes the spring and summer of life be spent, even by the moderately wealthy, in laborious enterprises. And thus it is, that either for ourselves, or for those with whose welfare our own is inseparably connected, the principle of increase is perpetually urging individuals to new efforts of skill and economy. Had this principle either not existed at all, or been comparatively feeble, activity would have been superseded by indolence, and men from being enterprising and ambitious, would have sunk into a state of torpor; for in that case, every additional acquisition, whether of skill or wealth, would, by lessening the necessity for fresh acquisitions, have infallibly occasioned a decline in the spirit of improvement; so that, instead of proceeding, as it became older, with accelerated steps in the career of discovery, the fair inference is, that society would either have been entirely arrested in its progress, or its advance rendered next to imperceptible. But it has been so ordered, that whatever may at any time occasion a decline of the inventive powers, must be of an accidental and ephemeral character, and cannot originate in a diminution of the advantages resulting from their exercise. Even in the most improved societies, the principle of increase inspires by far the largest class—those who depend on their labour for the means of support—with all these powerful motives to contrive, produce, and accumulate, that actuates the whole community in more early ages. No people can rest satisfied with acquisitions already made. The constant pressure of population against the limits of subsistence renders the demand for fresh inventions and discoveries as great at one time as at another, and secures the forward progress of the species. A deficiency of subsistence at home leads to migrations to distant countries; and thus not only provides for the gradual occupation of the earth, but carries the languages, arts, and sciences of those who have made the farthest advances in civilisation, to those who are comparatively barbarous. It sometimes, no doubt, happens, that notwithstanding this resource, and the most strenuous efforts on the part of the industrious classes, population so far outruns production, that the condition of society is changed for the worse. But the evils thence arising, bring with them a provision for their cure. They make all classes better acquainted with the circumstances which determine their situation in life; and while they call forth fresh displays of invention and economy, they at the same time dignify and exalt the character, by teaching us to exercise the prudential virtues, and to subject the passions to the control of reason.

It does, therefore, seem reasonable to conclude, that the law of increase is in every respect consistent with the beneficent arrangements of Providence, and that instead of being subversive of human happiness, it has increased it in no ordinary degree."]

It is eminently satisfactory to know that marriages *are* progressively decreasing. In 1810, the number in England was one annually in 122 persons; in 1830, it was only one in 129. Of course, as the population is still on the advance, there can be no reason whatever for complaint, even among those philosophers who rejoice in the contemplation of matrimonial happiness. Nay, there is much reason for congratulation to a benevolent mind, for is it not thus proved, that, of the children born, fewer are cropped off by misery? It may be desirable that people were married rather than single—but not surely if the only result be to increase the number of deaths, without adding to the births. There is an amiable but pernicious weakness in society on this subject. No sooner does any one hear of an approaching marriage, than he pricks up his ears, and, though the parties be far beneath his notice on ordinary occasions, he dwells upon them *now* with a ludicrously profound sense of interest. Under the influence of this feeling, well-meaning people often encourage and contribute towards a marriage, when they should rather administer a solemn advice to the contrary.

There is a contingent advantage in keeping up a good standard of food. Supposing a great and sudden reduction of wages, or any other severe calamity, which would make provisions less easy of purchase, the workmen can resort to cheaper kinds of aliment, with which he may keep up existence till better times. The Englishman has always the reserve of potatoes; but if the Irishman should want that root, he has nothing to interpose between himself and starvation. It is desirable, however, that the standard should be as rarely departed from as possible, lest, becoming accustomed to the meaner fare, the population should lose relish in some degree for the better, and forego the prospect of returning to it.

EMIGRATION.

To press onward over the earth till it be all peopled, seems part of the general destiny of mankind; and indeed it is quite impossible for the principle of increase to act otherwise, without producing misery. Men should therefore look upon emigration as no strange or painful necessity, but as one which has been ordained by nature herself. It is obvious, that, for every active labourer who leaves the country, there is the more employment and food for those who remain, provided that the native principle of increase does not fully meet and overpower the benefit. It is also obvious that nothing can be more absurd than deliberately to submit to narrow supplies at the place of one's birth, when, by removing elsewhere, larger supplies are sure to be obtained. The hardships incurred in this way are clearly nothing more than the punishment ordained by nature for the resistance to one of her most imperative decrees.

A doubt may reasonably occur, however, as to the reality of this diffusive or dispersive principle in nature. Pursue the idea to its utmost extent, and you find the whole globe at length fully occupied, and population pressing, as it were, upon the very verge of creation. What is to occur then? Nature, it is to be supposed, could never have instituted a radical principle which was at length to expend the whole of its utility, and, beyond a certain and unavoidable point, become a source of distress. She could never have designed that her whole children were at length to fall into the present condition of the Chinese, whose misery arises from a reluctance to move into reserve lands which actually exist.

It *may be*, nevertheless, that the principle was intended to act beneficially for a certain length of time, and then to experience a check from another quarter, which would prevent it from acting detrimentally. It might be calculated, that, by the time the whole earth was peopled, the moral character of man would be so much improved, that the populative principle would be sufficiently weakened to keep all right. Or it might be ordained, that improved and extended means of maintenance were to be sufficient, when the land was entirely covered, to keep pace with the increase. It is evidently absurd to suffer any apprehension, even abstractly, on this score, after seeing so much done in our own country in a few years to extend the means of maintenance. After seeing such immense additions to human power—the steam-engine, for instance—recently conferred upon mankind, who were previously altogether unconscious of them, we are entitled to presume that there are still many latent bounties in nature, which are hereafter to be developed, for the yet farther aid of man in his endeavours to support himself. To doubt this were only to imitate the conduct of those gentlemen, who, on the first attempt of Fulton to impel a boat by steam, predicted its inevitable failure. The cotton-spinning machinery has enabled thousands to live where there were once only hundreds. The steam-engine has done, or is doing, something of the same kind. Nay, there is not a railway or a canal formed in the country, but a calculation might be made of the increase which it gives occasion for and justifies in the numbers of mankind. Why, then, this ludicrous despair of philosophers, as to a supposed overstocking of the globe!

It is at least clear to all, that in *the meantime* emigration ought to be encouraged. The rising of kindred and enlightened nations in the neighbourhood of such a country as Great Britain, holds out the most exalted hopes to the philanthropist, as it tends to strengthen that minority of liberalised beings, who constitute the only really estimable portion of the human race—to the merchant, as it tends to extend commercial relations—and, though last not least, to the poor labourer, since it promises him either a better home than what he now possesses, or increased means of enjoying himself where he is. There is little reason to fear an universal surplus of people in our own age—for the world, which at present contains about a thousand millions of inhabitants, is calculated as able to support fully ten times that number, even by the present modes of raising victual. And, indeed, calculating the one thing against the other, there is no reason to suppose that this surplus will occur before the period of equally universal moral improvement.*

COMPARATIVE REMUNERATIONS OF TRADES AND PROFESSIONS.

The great inequality in the condition and comforts of men is a thing obvious to every eye. It is often the source of discontent to those who feel themselves low in the scale; and it is hardly to be expected, perhaps, that the poor man can behold, without a sigh, the superior style of living in which the rich one can indulge. Few poor men, however, are so blind as not to perceive some of the causes which render this inequality unavoidable. We shall here explain these causes.

In the first place, it must be already plain that a great part of the advantages of the wealthy arise from the industry, talent, and economy of their forefathers. To be the descendant of a family which has acquired, in past time, either land, or goods, or the respect of the community, is a piece of natural good fortune, which such an individual must be permitted to enjoy, because it is evident that, though he did not create these advantages, he has still a right to them, through the will and pleasure of those who did create them—and further, because if he were deprived of them, or in the least disturbed in their enjoyment, existing men would want one of the greatest motives to exertion, and the commonwealth be injured accordingly. The contemplation of wealthy people, instead of inspiring poor men with envy, or any other malignant feeling, should make them cheerful and happy, in so far as it assures them that, whatever they can gain, they or their children will be permitted in the same way to enjoy.

It will be less plain, however, to common understandings, that the men engaged in certain trades and professions should realise large incomes, while others are kept at the merest pittance that will suffice to retain life. There are reasons, nevertheless, for all these inequalities—reasons quite sufficient to satisfy the sense of even those who enjoy the smallest denomination of incomes

The five following reasons are stated by Adam Smith, in his celebrated work on the Wealth of Nations, as those which chiefly tend to increase or decrease the recompense of employment:—

1. The agreeableness or disagreeableness of the employments themselves. Some employments are confessedly much more pleasant, much more healthy, and much more honourable to be engaged in, than others. The business of a gardener, for instance, is preferable in all these respects to many other occupations requiring the same degree of strength and ingenuity. Hence, it is more apt to be resorted to; and, consequently, its wages must be somewhat less than in trades otherwise corresponding. The business of an executioner is paid higher in proportion to the time, strength, and ingenuity engaged in it, than any other, in order to make up for its want of public respect. The trade of a tailor is also paid very high in these proportions, in consequence of the silly popular obloquy which attaches to it. Clergymen and officers of the army and navy are not, in general, paid so high as men exercising the same learning and talent, or encountering the same risks and disadvantages, in other employments—and this purely because a clergyman and an officer enjoy much public respect and eclat: their profession is styled that of a gentleman, and partly remunerates itself.

2. The comparative difficulty of learning a trade or profession, and the comparative time and money employed in so doing. It is evidently quite fair that, where a trade requires an apprenticeship of seven years, or a profession can only be exercised after a tedious and expensive education, the said trade and profession should afterwards bring greater remuneration than others more easily and more cheaply acquired.

3. The constancy or inconstancy of employment. Nothing can be more clear than that a trade which can only be exercised at a particular season, or which depends upon occasional chances to be called into exercise, should be paid higher than one which enjoys regular and permanent employment. Stone-masons, for instance, who are laid off work by bad weather, should be better paid when they do work, than a craft, equal in other respects, which can be exercised at all hours throughout the year. Street-porters, on the same principle, must be paid as high for their occasional jobs, as may enable them to live, upon the whole, as well as other persons who exercise the same degree of labour and ingenuity (such as it is) in a more steady way.

4. The comparative trust reposed in workmen. Character, be it observed, is just as good to a workman, in its proportion, as his skill or his possession of tools; for it is as likely to be called into service by employers, and as well entitled to remuneration. When a common labourer has afforded such grounds of confidence to his master as to justify his being entrusted with the least censorship over the rest, he naturally claims and receives a higher rate of wages; for in fact it is the utility of every thing that assigns its value—and character is here applicable to use. "We trust our health to the physician, our fortune, and sometimes our life and reputation, to the lawyer and attorney. Such confidence could not be safely reposed in people of a very mean or low condition. Their reward, therefore, must be such as may give them that rank in society which so important a trust requires. The long time and the great expense which must be laid out in their education, when combined with those circumstances, necessarily enhance still farther the price of their labour."—*Smith's Wealth of Nations.*

5. The chance of success in different employments. Where there is a risk of, say, one to three, that after all preparation employment will not be obtained, and where this is the result of incalculable circumstances, the remuneration of those who do gain employment ought to be so much higher as to make the loss of their competitors their own gain. In all ways of expending capital there is a risk, which is paid in proportion; and, accordingly, there should be payment in this case also. It is chiefly in *professions* that such risks occur—for in the most of trades and crafts, the skill required is such as the most of people are capable of acquiring.

In all ways of gaining a livelihood whatsoever, the remuneration will be governed by one or other of these circumstances, *balanced against the multitude of persons who compete for employment in the respective professions, trades, and arts.* We only recollect one exception from the general run of Mr Smith's remark—and that is in the monstrous over-payment of such persons as drivers and guards of stage-coaches, the exhibitors of public places, tavern-waiters, &c. It is notorious that waiters, though they lay out no capital, and boast but a very ordinary kind of skill and address, very frequently realise more profit than the master of the house, who has much property engaged and hazarded, and, by his superintending management, exercises a far higher and more useful kind of labour. In the palaces which are visited by public curiosity, a mere chambermaid is in the way of realising more money than an ingenious man who employs perhaps two thousand pounds of capital. And, in the shilling which one of every twelve persons, perhaps, gives to the guard of a stage-coach, after three hours of the most simple kind of service, there is perhaps ten times more remuneration than the said persons give every day to those who supply them with the necessaries of life. These are cases, however, in which no competition is admitted; and the abuse evidently lies so entirely with the simplicity of the public, that it cannot be held to enter into the consideration of the general question.

FLUCTUATIONS AND GLUTS.

The progress of production in manufactures is, unfortunately, not a regular flow; it is, like that of the blood in the pulses, of an intermittent nature. Demand asks only so much; but, let it be never so precise in its orders, supply is sure to give more. The state of hope into which a master is thrown by a little briskness in his trade, his consequent direction of all his force on that point, and the natural difficulty of drawing off in time, inevitably produce this result. The fear of a glut may with some be a check to a certain degree; but it is not all, nor nearly all, who will permit themselves, or are able, to foresee the tendency of their own over-activity. The only sure check is the glut which sooner or later takes place, and the consequent fall of prices beneath the level of competing articles, or beneath the expense of production.

Sometimes there is a glut in the market of goods, and sometimes in the market of labour. In the former case, there immediately takes place a glut of labour also; but the glut of labour may arise from distinct causes.

The glut of goods produces low prices, and this, after a time, generally attracts so much new custom as to occasion a revival of the trade—some new consumers being in this case generally added from a lower class, so that in the long-run a glut may be of some benefit. The trade, once more in active operation, is apt to proceed as formerly to the extreme of over-production, and then comes the glut once more. Thus things proceed, not only in particular trades, but in the entire business system of the empire.

Fluctuations arise from minor causes, as the seasons, the changes of fashion, the abbreviation of labour by machinery, and the shifting of manufactures from one district to another. It may be said that all variations in the rate of manufacture are of detriment to the labourer, as the periods of depression, which invariably produce real suffering, are not compensated by the rise, the results of which are seldom turned to their proper account. The workman, moreover, finding his wages fall, is apt to take a method for increasing them, which can only tend to increase his own distress or that of his neighbours. He works a longer time each day, and thus adds to that over-production which it would be his interest to diminish. Hence, in Manchester, there is always most work done in bad years.

Distinct and powerful causes of fluctuations are found in alterations of the currency, in erroneous legislation, and in political events. None of these, however, is it our present business to discuss. We conclude the subject by quoting and recommending the following excellent suggestions from Dr Wade's "History of the Middle and Working Classes;" a work that would be a treasure to the industrious part of the community, if any considerable portion of them could afford the treasure (eight shillings) necessary for purchasing it:—

"To provide for changes in employment occasioned by periodic alternations of prosperity and depression, two suggestions may be offered. First, the workman, by saving out of his high wages during years of brisk demand for labour, might lay by a fund for a period of stagnation of trade; or, secondly, he might enter into an agreement with his master to serve at an average rate of wages for such a term of years as would embrace the ordinary commercial cycle of depression and prosperity. Various other expedients might be suggested; but it appears superfluous, as they must be either generally obvious, or are already partly acted upon. The object sought is to make the *good* years cover the *bad ones*, and *vice versâ*. That this is partly possible, there does not appear any doubt; since it appears, from the inquiries made into the rate of wages in the principal trades and manufactures, that the earnings of workmen are sufficient, on an average of years (if the earnings could by any means be spread over the whole period), to maintain their families in comfort and independence.

In some of the trades of London (particularly the tailors) all the journeymen are in organised clubs for mutual support during want of work; and out of the general fund, to which they all contribute when in work, each man out of employment has a right to a weekly allowance. Such a society is, without doubt, highly beneficial, especially in a trade where the demand for labour is much greater at one period of the year than another. It has one drawback, in operating as a combination to regulate and keep up wages; and so far has this been successful, that no reduction in the wages of tailors appears to have taken place since 1815, notwithstanding the change in prices of almost every article of life. As respects a class of journeymen employed entirely on articles of home consumption, this may not be esteemed a disadvantage; but it is evident that if the same combination existed among workmen manufacturing articles of export which had to compete with the fabrics of other countries, such a system might be ruinous both to masters and men.

The journeymen brushmakers, amounting to not more than one thousand in number throughout the kingdom, support a union for mutual aid in scarcity of employment. The carpet-manufacturers, and other trades, are united for a similar purpose. Few of these, however, have any fund beforehand, but draw the support from increased contributions by the men who remain at work.

Some workmen of superior character make a provision for periods of temporary stagnation of trade, by accumulating a small fund in a savings-bank; but the great majority have no resource when out of work but to live much worse, to exhaust their credit, pawn their clothes and furniture, and finally apply to the parish, where their spirit is broken, and independent feeling lost.

The master manufacturers resort to two expedients of a very different character for meeting temporary stagnations of trade. In the one case, on the demand for goods becoming slack, the quantity made is diminished; a less amount of work being given out, and the workmen paid (by the piece) nearly as much as before. Having, however, but three or four days' work per week, they are obliged either to economize their expenses, or resort for support during the other days to whatever fund their forethought may have provided; thereby, the quantity of goods made being reduced nearly to the real demand, no glut is formed in the market, and on the revival of the trade the men again resume full work without great loss. This is the case with several trades having a fund to fall back upon, and is beneficial to all parties."

COMBINATIONS.

Combinations among workmen to keep up their wages, are, upon the whole, the characteristics of a period of decline—in other words, a period when either labourers are increasing too fast, or the means of employing them are diminishing.

The last few years have notoriously been a period of decline—not owing, apparently, to any failure of the natural resources of the empire, or to an imprudent increase of population, but to some unfortunate regulations respecting money, which have rendered the quantity of that article too small for its proper functions as a representative of capital in transition from one hand to another. One of the primary results of this state of things has been the embarrassment of men who would otherwise have had both the will and the power to give employment; another has been a large reduction of income to almost all men whatever, so as to render them unable to purchase

* In treating this department of our subject, we have not adverted to the different ways in which emigration is treated by different political thinkers. The Tories, we believe, in general, recommend emigration, as a means of relieving the distresses of the poor; while the Independent or Radical party assert, that it would not be necessary, if the landlords would give up their monopoly in the raising of bread. We trust it will be seen that we have argued in favour of emigration upon abstract views alone.

goods which they could formerly purchase. It is now found that no expensive kind of article will now be bought to nearly the same extent as formerly, but that cheapness has become a leading principle in every thing. Where formerly there were splendidly illustrated works, which amply remunerated their producers, there are now annuals at half a guinea; where formerly there were magazines at half a crown, there are now magazines at three-halfpence and a penny. It is not so much an extended appetite for literature which supports works, for instance, like our own—as it is an absolute inability in the public at large to purchase dearer ones. Hence the branches of bookselling which apply to more expensive kinds of literature, are experiencing a severe depression, from which there can be no rise, without a restoration of former circumstances in the public, if even then.

One of the notorious results of this state of things, is an almost universal combination of the labouring classes to keep up their wages. A general Trades Union has been formed for this object, and an alienation of the affections of masters and workmen from each other is rapidly advancing. If things were upon the rise, and if such a thing could be as a disposition on the part of masters to exclude workmen from a fair share of the advantage, such a combination would be decidedly necessary. But it would be a mere dishonest flattery of the working-classes, to tell them, that, under the contrary state of things, their efforts are either laudable or likely to be attended with any good effect. The misfortunes of the country, from whatever source arising, befall masters and men alike; for not more certainly does over-production, or failure of demand, or erroneous legislation, diminish the wages of the one, than they diminish the profits of the other; so that the relative circumstances of employer and employed must at all times be nearly alike. If the capitalist deserves a certain share of profit during good times, he deserves a proportionate share in bad times; and it would be equally unjust to ask workmen to labour for nothing, that masters might thrive, as to expect masters to lay out money for nothing, that workmen might thrive. Beyond this principle, there can be no claim from the workmen to the masters, further than what benevolence may sanction, or what the latter may be pleased to advance, in order to secure the services of estimable workmen against better times. Nor can the pressure of a general combination be of any permanent benefit, except perhaps to urge an alteration of parliamentary enactments, so far as these may be proved to have occasioned the decline.

While thus unavailing for good, it is certain that a general combination must produce harm, but in the first place to the workman only, in so far as it tends to embitter their employers against them, and, if temporary idleness should inter to injure their personal habits and value as workmen. It is also almost inseparable from the nature of a combination, that it must narrow the liberty, and interfere with the rights and profits, of men who are unwilling to join in it.

We would hope that the reasonable workman will not see, in these speculations, any disposition to take the part of capital, abstractly, against labour. There is hardly, we believe, a public writer in existence, who does not feel a deep and abiding sympathy with the prospects and interests of the labouring classes; but if there be any such, we are not of the number. Neither do we believe is there any indifference, generally speaking, among masters, towards the welfare of workmen. There has always appeared to us, on the contrary, to be a kind feeling, going far beyond the letter of the contract, and compensating in some measure for the unavoidable partiality of fortune. It is for the advantage of workmen that this feeling should not be impaired or banished.

To conclude, there is one advantage which *might* arise from trades associations, and prove of vast service to the labouring classes. This is the possible diffusion, by such means, of just and really profitable knowledge on the general interests of the manufactures and branches of business with which they are connected.

MONOPOLIES AND RESTRICTIONS.

While general combinations to prevent decline of wages are represented as unavailing, it would be the height of injustice to deny that the preservation of a free market here should be accompanied by a free market all over, so that no other class should gain at the expense of the labouring classes.

All kinds of restrictions whatever upon the free exercise of industry, and the range of commercial speculation, are radically evil—the characteristics of an ignorant people—and self-destructive in their effects. Great Britain, which at present struggles with the sloughs of all kinds of antiquated institutions, has, unfortunately, to deal with many of these legacies of former and less enlightened ages, by which her unexampled prosperity, so far from being favoured, has been only kept under what it must have otherwise been.

It is customary to trace these evils almost exclusively to interested legislation; but we are inclined to think that they have in a great measure arisen from the narrow prejudices with which the English nation in general has been heretofore replete, and from which it is only now awakening. The agricultural, and hitherto ruling class, have not solely instituted restrictions in their own favour; they have, at the same time, permitted almost every other trade and interest in the country to do the same thing. Their attentions to themselves were only to have been expected where all were attended to. The sin and blindness appear to us to have been quite general.

The first and leading prejudice is that of country. It is no doubt to be conceded that a high national feeling is sometimes of service in preserving national independence and honour; but the use has been carried into the abuse. An intense selfishness—a fear that any other nation should have the least benefit from the intercourse which we carry on with them for our own notorious profit—has prevailed among all the mercantile classes; and till a few years ago, it was accounted philosophy to suppose that certain neighbouring states were, in every relation of life, our "natural enemies." This and other causes led to bloody and expensive wars, the consequences of which were an enormous and apparently irreducible debt, entailed upon posterity. War is in every point of view an evil: it has not in itself a single redeeming feature. It may only be occasionally necessary, to protect a nation against unjust aggression or insult. We blush for our country, however, when we reflect on the heedlessness, and even eagerness, with which, not the government only, but the people, have hitherto entered into contests, where the utility of taking up arms was far from clear. For instance, the war of 1775–82, for reducing the American colonies, was at first far from unpopular, though certainly opposed in every respect to those principles which the nation had bled to defend in the preceding century. It is also a matter of historic certainty, that the people entered heartily into the last French war (the blame of which it now throws so absurdly upon a particular party of statesmen), and this from no clear or judicious perception of the causes assigned for it by the government (which might be good or evil, as men happened to think), but from a mere vulgar idea of national glory, and the fascination of empty military parade. It is pleasing to think that both the government, by which we mean the ruling class at large, and the people, have become, even in a few years, so much more enlightened than they were—so much more capable of perceiving the bearing and tendency of important national movements—that there is now little chance of any such infatuation again occurring. The best protection against such follies evidently lies in that intelligence which is now in the course of being implanted in the minds of the people, by which they will be placed above all risk of having their senses imposed upon by toys and sounds, and enabled, when necessary, to check the rashness of statesmen. Men are now beginning to overlook, in a great measure, the ideal bounds of particular countries, and to extend their sympathies over the whole family of man. It is a blessed change, and ought by all means to be encouraged. By such means, we have no doubt, different nations will soon look upon each other as friendly customers and reciprocal assistants, instead of rivals or aliens, and commerce will be permitted to go to a far greater extent amongst them than has ever heretofore been known. It will speedily be seen that the best way to cause other nations to buy from us, is to buy also from them. We must wean ourselves from a notion which has possessed us, that all the advantages of the commerce of this world are by a law of nature due to Great Britain, and that other nations must starve that we may enjoy. Like all unjust notions, it is eminently absurd.

Next comes the prejudice of district. When men live for a while in any place, interest and fancy conspire to give them a notion that there is an abstract advantage in favouring this place by all possible means, although it may be notorious that the same good could be done at less expense and more convenience elsewhere. "The garter trade of Stickleton ought by all means to be encouraged"—for—for—we live at Stickleton. It all resolves itself into a delusive prepossession. Under the influence of this feeling, a gentleman a few years ago laid out twelve thousand pounds in forming a small harbour at a rock-girdled part of the coast of Ayrshire, where the requisite space had to be cut from the solid granite, and nothing but a small village existed within many miles, to consume the articles proposed to be imported. Of course, the capital, instead of being turned to profit, which was perhaps the secondary object of the expender, was completely sunk. And every day we see instances of similar attempts to force trade and manufactures where nature presents no advantages for the purpose—though it seldom happens that the folly of the procedure is so very obvious as in this particular case. Men must clear their minds of this ridiculous propensity to think the interests of their own place of residence above all others, before they can *deserve* a free trade, even in the articles which it most concerns them to obtain without restriction.

The third grand prejudice is that in favour of particular trades or branches of commerce. Having expended time in learning an art, it is natural to cling to it very earnestly, and to desire to see it succeed beyond all others. Such a feeling, in so far as it produces competition, may do a general good. But it is iniquitous, and, like all iniquitous things, absurd, to hedge round these interests with corporate privileges and legislative restrictions. By such practices, the public is the first loser, neighbouring trades the second, and the privileged trader himself the third—for in the long-run his trade is limited by unnatural prices. No man, we hold, who belongs to a profession in the least favoured, or attempted to be favoured, by such restrictions, has any title to complain of either the corn monopoly or any other. Such, we are glad to see, is an incipient feeling among the trades themselves, for within the last year several corporations in Scotland have spontaneously resigned their privileges.

THE CORN MONOPOLY.

This is well known to consist in an exclusive right, with which the proprietors of British land are invested by Parliament, to supply the people with the chief article of human aliment, at prices higher (except under very particular circumstances) than the same article could be obtained from some of our supposed "enemies," the other countries of Europe.

The arguments generally presented in favour of this monopoly are chiefly grounded on an assumption similar to that expressed by an old Scotch proverb, that it is proper to keep the offal of our own fish for our own sea-mews. It is presumed to be of service to all classes within Britain, that the bread of the people should be purchased from British rather than from foreign growers, because the money is thus, as it is said, kept in the country, and speedily distributed again among the people for their own goods, whereas, if it were sent abroad, very little of it would ever again return.

Against this it is argued, that it is not money which is given for bread; it is, in either case, goods or manufactured articles. The true interest of Britain, it is alleged, does not consist in its agriculture, but in its manufactures. The country should be esteemed as only one vast factory, aiming at the supply of all other countries with goods, and taking the bread of its workmen from such producers as will give it cheapest, and take most goods in return. It is represented, that, if the people could get at the cheaper corn of the Continent, they would produce goods cheaper (which is self-evident), and would thus attract a wider range of customers all over the world, with or without regard to the people they bought their bread from; whereby, while the native landlord got no more than his due, all other persons would be greatly benefited.

In favour of these views, it is ascertained that the manufacturing classes of the empire are increasing at an infinitely more rapid rate than the agricultural, and are at this moment as two to one in comparative numbers.* If landholders are to be considered as only producers, like other people, which they really are, why, say the anti-monopolists, should the two be sacrificed for the one?

We believe it is now pretty generally conceded by candid thinkers, that the principle is wrong, and that the only valid objection to the abolition of the monopoly lies in the severe and sudden injury it would occasion to a class, who, though themselves instrumental as legislators in imposing the protective regulations, were so in a great measure under the influence of common error—who, as always necessarily happens, have laid out much capital on the faith of no speedy alteration—and whose distress would operate dispersively, for a certain time, over many departments of the working population. If a process could be instituted for returning, by imperceptible or slightly perceptible degrees, to a state of things more generally beneficial, little objection in any quarter would be raised. Agricultural capitalists, however, are entitled to expect that all kinds of monopolies should be given up at the same time, and by equal steps. It would be unjust that the manufacturer should get free bread, while the bread-grower could not get every thing *he* required as free. Nor can we see any moral or political difference between agriculturists making laws for their own behoof in Parliament, of which they happened in the course of things to have possession, and tradesmen making laws for theirs, within the circle, and under the protection of their own corporations, or by any other species of combination against competition. The whole system, in fact, is replete with reciprocal injustice, and ought to be subjected to an universal and impartial, but cautious reform.

FREE TRADE.

The practice of excluding this and that foreign article by heavy duties, in order that the producers in our own country or in our colonies may be advantaged by it, is liable to the same abstract objections as the monopolies in corn and certain kinds of goods. It favours or seems to favour a certain class of persons, at the expense of the community at large. As in the other cases, there remains little doubt any where, as to the expediency of abolishing such practices; the only objection is a fear to meet the distresses which their abolition would occasion, among those who are interested in them, and the various wide-spread connections of those parties. An abstract of the popular arguments on this subject may here be given:—

* "In Italy, the proportion of agriculturists to non-agriculturists is as one hundred to thirty one; in France, as one hundred to fifty; in England, as one hundred to two hundred. But the most remarkable fact, as respects this country, is the change that has taken place in the employment of the people since the commencement of the present century. In 1801, the number of persons engaged in trade and manufactures in England, as compared with those engaged in agricultural pursuits, was as six to five; in 1821, it had increased to eight to five; in 1830, to two to one. In Scotland, the change has been still greater, having risen from five to six in 1801, to nine to five in 1821, and is now estimated at nearly two to one, as in England. During the whole period of thirty years, the general population of the country has increased nearly fifty-one per cent., which exceeds the proportionate increase in the manufacturing districts. In four rural districts, the increase of population, during the last thirty years, has been only thirty per cent.; in London, fifty-eight per cent.; and, in three of the largest manufacturing towns, no less than one hundred per cent., or exactly double."—*Dr Wade.*

"Take the case which the opponents of free trade would put forward as most favourable to their cause. Assume, for instance, the case of the glove-maker. Gloves may be had, it shall be supposed, from a French maker for the value of two shillings a pair. An Englishman stands up and says, that he can make gloves of the same kind for three shillings; and therefore, for the sake of encouraging British commerce, it is expedient to pass a law to prohibit the introduction of French gloves at two shillings, in order that those who choose to wear gloves may be obliged to take them from the Englishman at three.

When you buy a pair of French gloves, it is clear that they have been paid for in something. You have the substantial evidence that *you* did not get them for nothing; and so has every body else. They must have been paid for either with goods of English produce, or with goods of some kind (gold and silver included) which have been bought from abroad with goods of English produce, or with bills, which are only an order for payment in one of the other ways a few days hence instead of to-day. Unless an Englishman has the art of getting any thing for nothing, in one or other of these ways must they infallibly have been paid for. Here, then, are, at all events, two shillings accounted for out of the three, which are as fairly expended for the benefit of British producers and manufacturers of some kind, as they would be if the gloves were bought from a British glove-maker at the same price. They are paid for to the Frenchman, it may be, in Sheffield goods. But if the glove-maker procures a law that gloves shall not be brought from France, it is plain that Sheffield goods must stop. The glove-maker may gain employment and trade by the alteration; but it is equally plain that the Sheffield man must lose.

So much for the part which consists of the *two* shillings—next for the part which consists of the other *one*. And this, says the glove-maker, is to be a clear gain to British commerce, and it is a horrible wrong if it is deprived of it. Now, mark the juggle—look sharply to the shuffling of the balls. If the wearer of gloves is to be forced to expend a shilling more upon the glove-maker, he must expend a shilling less upon [illegible]body else. It may be that he would not have [illegible]pended it at Sheffield, but at Birmingham; or that it would have been divided among fifty other places which it is impossible to assign by name. But still it is as clear as ever, that the shilling which it is proposed to make him expend *nolens volens* [willingly or unwillingly] upon the glove-maker, must be taken from the custom of some other British manufacturers somehow and somewhere. There is no deception arising from the payments being made in money; if, instead of shillings, they were made with pecks of wheat, it would be just as true that the third peck which the glove-maker demands a law to put into his own pot, must be taken from the pudding of some British manufacturer, to whom it would otherwise have gone. Sift this; turn it over; see if it be true or not. Do not allow yourself to be tamely taken in, because the men who try to do it wear good clothes. Either it is true or it is not. If it is not true, let somebody show where it is false. Till then, we account it correct.

Here, then, are the whole three shillings perfectly accounted for. It is shown to be a hocus-pocus and a fraud, that states that any gain arises to British commerce or production in the aggregate from the prohibition of the commerce in French gloves, or that any aggregate loss is induced by the permission. The whole amounts only to a plan for robbing a Sheffield man or a [illegible], who can make what people will volunt[illegible] for the benefit of the glover who cannot; [illegible] commerce of some individual who has [illegible] skill enough to command a market, to [illegible] who is without.

But [illegible] is another count in the Indictment. [illegible], the unfortunate who is in the habit of [illegible] gloves, is to be the gratuitous loser of a shilling [illegible] the shilling was to go to the benefit of commerce, he might wrap himself up in his patriotism, and be consoled. If it was really to cause any increase in the safety or strength of the community of which he is a member—if the thousandth part of a farthing of it was to appear in the shape of national wealth, security, or splendour—he might lay aside the feelings of an injured purchaser [illegible] mittees, and exult in his fractional portion of the [illegible] of those who have suffered for their country. [illegible] when it is to be taken from him with no object, [illegible] prospect, no hope, but that a clumsy and inefficient [illegible]man shall be enabled to appropriate the custom of [illegible] intelligent and effective one—his situation presents itself in all its nakedness, his courage sinks under the view, [illegible] feelings of humanity prevail, he drops a tear [illegible] wipes it on his three-shilling gloves, and sits down [illegible] melancholy monument of what it is to be 'the envy of [illegible] nations, and the wonder of the world.'

This is [illegible] exam[illegible]tion of one single act; the next is to multiply the cases, as is the fact in nature. Suppose that every individual in the community was a producer of some kind, and that every one had a 'protection' upon his particular trade. What would be the result, but that each would steal something out of his neighbour's box, with a general loss to be divided among themselves in their character of consumers, equal to what might have been saved by buying goods of all kinds where they were cheapest?

But it will be said that this is not an exact statement of the case;—that all men are not producers, but on the contrary there are large classes that produce nothing. And hereupon it will be attempted to infer, that the whole is a patriotic machine for drawing wealth from the unproductive, and giving it to the industrious. There might be some show of reason in this argument, *if the industrious classes were to gain by it.* But the industrious are in the aggregate to gain nothing—all that is to be given to one of them is to be taken from another; and the unproductive, as they are called, are to be robbed for love. A great proportion—a large and important share of the sum thus stupidly thrown away—must of necessity fall on the industrious; for though they do not consume all, they consume a great deal. And it is no remedy to *them*, that somebody else is to lose the rest. Besides this, the classes so unceremoniously voted unproductive, are in a very great measure composed of those who *have* produced. There is no reason in saying a man shall be protected while he is producing, but shall be robbed whenever he begins to enjoy. Men do not labour for the simple love of labour, but for the love of the enjoyment they may ultimately procure by it. No man in his senses would consent to an arrangement, by which he should be protected while he was a hard-working citizen, but should be exposed to all robberies whenever he had the impudence to think of retiring to live upon his savings. Yet this is the very theory of those who talk of robbing the unproductive with as much lightness of heart, as if men really produced and saved with no other view but that somebody else might take it from them.

It is clear, therefore, that what is really recommended, is to incur an assured loss in the aggregate; but men are exhorted to struggle and pull caps, for the chance of what they may individually get from others in the contest. That all the traders in a country, and all the inhabitants in general, whether they trade or not, must lose by such a principle, if the effects were evenly distributed, is as plain as in the case of a lottery; but they are to be cheered on by the probability that the distribution may not be even, and that they may be the lucky rogues who win. It is a political *little-go*, in which every body knows the concern to be ruinous in the main; but jolter-headed individuals are to be encouraged to throw again, by the vision of some paltry prize they are to catch at the expense of the remainder.

If a saving is to be made by the introduction of steam-coaches, no effectual opposition can be offered by the dealers in horses, because the public are sufficiently informed to know, that all they expend less upon coach-hire, will be expended upon something else instead, and therefore the loss of business to horse-dealers will be balanced by an increase of business of exactly the same amount to somebody and somewhere, and they (the public) will gain the difference besides. They are aware that such a piece of legislative dullness as this would amount to setting up the principle, that it was for the interest of every body that every thing should be done in the most bungling and round-about way possible. But let a single exchange intervene, and the question is too much for them. If the machine in which men are to ride for two shillings, instead of three, can only be bought with Sheffield cutlery from France, they are utterly unable to see, that the national profit by steam-riding—the ultimate advantage of employing an English cutler to effect the production of the cheap machine, instead of an English horse-dealer to supply the dear one—is the same as ever. In this case they are ready to join the horse-dealer in begging, first, that the employment may be taken from the Sheffield cutlers; secondly, that it may be taken from the persons at present employed by the expenditure of the shillings of which it is proposed to rob the coach-riding public; and, thirdly, that they (the public) may be robbed of a shilling in their coach-riding, without advantage in the aggregate to any body. They can see that it would be absurd to put down the *omnibus* on the ground that men rode cheaper in it; but they cannot see that if the omnibus could only be got from France in exchange for Sheffield goods, the case would be unaltered. Was it rightly said that John Bull is a man of one idea, or at most of two?"

"INTERESTS."

It is a result of the systems just described, that various branches of our national exertion and capital ha[illegible] [illegible]een resolved into large and powerful fraternities, all of which are favoured and protected by privileges or enactments, tending to their own apparent advantage, without regard to the general good. Thus we have the East India Interest, the West India Interest, the Bank Interest, and so forth. It is perhaps necessary, in the infancy of some departments of national enterprise, that, in order to obtain a certain ultimate and general good, some exclusive favour should be shown to them by the state. But after the first difficulties are got over, it is still more clear that a continuance of an exclusive system only confers an undeserved and unnatural force upon capital employed in these particular directions, and makes a limited number of people wealthy, while capital otherwise employed is just so much the less productive and useful, and other people of course so much the poorer. It could be shown that much of the evil arising from these causes was owing to a well-meaning and almost unavoidable, but nevertheless reprehensible compassion, which the state was called upon to show towards those interests, at various times when they were suffering under a natural depression. Whenever any branch of manufactures, or any of these larger systems called "Interests," happens to get the least deranged, or less prosperous than usual (even though this may be owing to an imprudent use of former advantages), up it comes to the government with a loud complaint, perhaps referring to opposite and jarring interests; and if the government be either weak enough or kind enough to lend a pitying ear, it is ten to one that it comes back with some additional restrictive privilege, which, though only designed for temporary relief, is never after resigned, but becomes a new and regular bead upon that string of millstones wherewith the public neck is adorned—the said public (and this is the most curious part of the affair) sympathising deeply with the event which confers upon it this new distress.

If it could be ascertained that all the various privileges and protective regulations enjoyed by different bodies throughout the empire, are so exactly balanced with each other that capital and industry are alike remunerated in all, in proportion to their deserts, there would lie little objection to the system, except that it was a ridiculous one. It is impossible, however, to prove that this is the state of the case; and hence, according to the principles of even-handed justice, it is desirable that a different plan should be instituted. As in other cases, the only valid objection lies in the difficulty of reforming so vast and intricate a system, without producing a greater degree of immediate misery than is to be coolly contemplated; and caution requires that, be it reformed when it may, the process should be one of slow and hardly perceptible degrees.

THE CURRENCY.

Coined money, it has been found, is only fully serviceable in a country where mercantile transactions are very limited; for the expense and risk of transporting large quantities of it would absorb great part of the profit of most transactions.* In a country where transactions are extensive, a lighter and more transportable representative medium is necessary. What is called paper-money presents its services for this purpose.

The advantage of this may be easily shown. Suppose a man in Kent owes [illegible] man in Yorkshire a thousand pounds, and another man in Yorkshire owes the Kent man an equal sum. It is evident, that, if the Kent debtor makes his Yorkshire debtor pay over the sum to his Yorkshire creditor, the transactions of all parties are managed without the use of an actual representative medium at all: a transference of credit, effected by a piece of paper, does all that is required. Such transactions, or modifications of them, melting into a general system, and employing agents called bankers, make up the paper currency.

As a piece of paper is in itself valueless, it is obvious, that, unless it be supposed to be backed by equivalent capital on the part of him who issues or gives it, no other man will have any thing to do with it. Paper-money, in fact, is only a credit asked and given, on the faith that there is something, which could be converted into its supposed value, standing behind, and liable to the demand of him who accepts such a visionary coin. If the Kent debtor was not supposed to have a thousand pounds worth of real stock, his little bit of paper would not carry that value, and the convenience and saving of the transaction above described would be lost. To have coin, it will be observed, a nation requires two capitals: it requires both the actual goods, and a thing for representing them which has an use and value in itself—for the metals from which coins are made, are wanted for making a certain kind of articles always more or less in request. If a nation was composed altogether of honest men, none of whom would issue a bit of paper without being certain that he could at any time give goods equivalent to the sum written on it, it might escape the expense of keeping up any part of this second and expensive capital. But just in so far as men are less honest and wise than they ought to be, this expense is unavoidable—an unhappy necessity, partaking in degree of what would be the case if no man would trust another so far as to give him a bullock, without getting a plough in return; for, after all, coin is only a less clumsy kind of barter. Coins, it is true, are of use in small retail transactions, but chiefly because among the poor there is no capital to enable them to give paper. The very tear and wear of gold and silver, occasioned by the use of coins, is an important consideration. It is calculated at a six-hundredth part every year for gold, and a two-hundredth part for silver.

The superior advantages of paper-money being thus established, it only remains to be considered what general forms and regulations shall be assumed for creating it.

The government, unquestionably, as the most creditworthy and extensive dealer in the country, ought to be the creator of paper-money. It draws and disburses fully as much annually as serves the whole country, and would thus promote circulation. The profit, moreover, on the creation of the national money, ought unquestionably to be a benefit to the nation.

The next best expedient is one which has been brought to the test of experience, and found bene-

* In what is called the Clearing-house at London—the grand centre of the mercantile transactions of England—five millions of money exchange hands every day. The interchange of this in coin, with all the corresponding transactions of carriage, &c., throughout the country, approaches to the character of a physical impossibility.

ficial. A number of individuals, possessed of a large aggregate capital, form a bank, and issue notes (or representations of fractions of their capital), on which they make a profit. As their whole issues are within the amount of what they can answer for by producing real goods, the public is completely safe in receiving their notes. These banks, moreover, give a certain interest on money deposited with them, and lend it again at a profit to persons of credit who want it (by discounting bills); and thus, becoming as it were centres of interchange, bring about the great general advantage that no part of the country's money is ever idle. This is the Scotch system of banking, and to it is to be attributed a great part of that prosperity, which, in less than a century, has raised our country from the poorest to one of the most comparatively productive and wealthy on earth.

England, with all her advantages in other respects, has wanted this great good fortune. A great privileged bank—the Bank of England, as it is called, but which should rather be termed the bank of a few Englishmen for the misery of the rest—has contrived, by obligations to the government, and other influences, to get into that old-constituted system of abuse, which there is hardly any altering. By forbidding the establishment of other banks (which is done by preventing a sufficient number of partners to render them credit-worthy), the whole of the *safe* business of the country centres here, producing illimitable inconvenience, obstructing trade to an inconceivable amount, and inducing the necessity of all the representations of capital in the country, in sums under five pounds, being in the expensive shape of coin.

It is of the last importance to all men in the country, from the wealthy capitalist to the poorest labourer who lives upon the using of capital, that money should at all times bear nearly the same value. The least increase or decrease in the full amount of existing money, has an immediate effect in diminishing or increasing the price of commodities; and if a man contracts a debt under the one set of circumstances, and has to pay it under another, or if he hires himself for a wage at the one thing, and live at the other, he is a loser. Now, owing to the decrease of gold and silver from the failure of mines, and the particular circumstances and modes of action of the Bank of England, there is not now nearly so much money in existence as there was twenty years ago, while, in the same time, the numbers of the people and the rate of their productive ingenuity have greatly increased. In 1797, in order to obtain money more easily for carrying on a war against France, the government granted to the Bank of England the tremendous boon of issuing as much paper money as it pleased, without the necessity of possessing equivalent goods to back its issues. Perhaps there was not the advantage taken of this privilege which there might have been; but the result, as is well known, produced an undue plenty of money, or apparent money, and as it thus became less valuable, all commodities rose in price. All seemed to be prosperity then; but, by and bye, in 1819, came the time for restoring things to their right footing, by compelling the bank to issue no more than it could account for by a show of real capital or goods—in other words, by paying gold for notes, on demand. Since that day, money has become every day scarcer and more valuable; and it is no unfounded calculation, that the debt contracted during the former period is now worth half as much again, and draws half as much more interest than it ought to do. Some political economists urge the propriety of an expansion of the value of money to its former amount, by which means it would become as abundant a commodity, and worth as little, as before. But, while this would equalise the obligations of the public, it would be unjust to all who have bought of the debt since its first contracting, and bring about a partial distress, and react against the public in some other way. It may also be represented with some force, that the debt contracted between 1797 and 1819, could not have been contracted, if the money had not been of reduced value, and thus rendered more than usually attainable by the lenders; that no provision was made in the contract for the consequences of a return to gold payments, which formed a contingency alike beyond the calculations of borrowers and lenders; and that, in fine, the larger sums we now pay and stand indebted for are just a natural penalty of our having contracted debt at all, under such circumstances. There is, however, no doubt that the extreme depression of prices and wages, and the consequent inutility of capital, and inadequacy of labour to support its votaries, arise in a great measure from this cause, and are evils of which we have not seen the end.

RENT.

Political economists are at issue respecting the bearing and nature of this well-known commodity.

According to Adam Smith, it is a surplus arising from the limited quantity of land, in comparison with the competitors for its produce.

A more intricate theory was suggested by Dr James Anderson, and has since been elaborated by Mr Ricardo and Mr Mill. According to these writers, as soon as the most fertile and easily cultivated land is brought fully into use, it is necessary to resort to the next best; and as soon as that is fully used, then the next best—and so on. It is not, say they, till the second comes into use, that the first pays any rent at all, and, till the third, that the second does so—and so forth. Rent is therefore the surplus yielded by land, above what is yielded by the worst kind which the necessities of a population have called into cultivation, or which is produced by a less than the maximum expenditure on the improvement and cultivation of land.

In the opinion of certain writers, characterised by an unsparing disposition to expose respectable fallacies, what is here stated as the cause of rent is only its consequence; for without the prospect of turning capital to account, land No. 2 would never have been cultivated—and so on as to the rest. For our part, we see no occasion to treat rent in any other light than we treat profits. Land, though originally perhaps appropriated by main force, is now to all intents and purposes mere capital—the same as a factory or a stock in trade. Money is every day invested in land, with the purpose of obtaining a return, which generally consists partly in money, and partly in privileges and honours attached by custom to land. True, it is almost always committed to the hands of an intermediate class of capitalists, called farmers, who take all the risk and trouble of cultivation for the sake of a certain share of the produce. But in what is this arrangement different from the demission of a factory, for instance, in full operation, into the hands of a person not possessed of enough to purchase one for himself, but enough to carry one on, and who, undertaking the risk and trouble, agrees to pay the proprietor a fair consideration, out of the profits, as a return for the capital sunk in the property? Landlords, it is true, are almost invariably deputers of their property, while manufacturers are as invariably the reverse; but this is a merely optional matter, depending on the respective convenience and taste of the parties. Landlords are, simply, manufacturers of food, disposed to purchase an exemption from the trouble and risk of additional capital [illegible]ary in carrying on their business, at the expe[illegible] to a deputy.

SUP[illegible] POOR.

It has been already [illegible]t the natural doom of all men is, that they [illegible]r for their own support. The wealthiest capi[illegible] in the country has either laboured himself, or received the benefit of the labours of his forefathers. There is no getting from him, by violent means, the least fraction of what he possesses, without taking away a great deal of the general inducement to labour, and thereby injuring the interests of the community. Even a legislative enactment for forcing away a shred of his gains, for the sake of others, is injurious in the same way, and irreconcileable with all the just notions of property.

The idea, then, of a natural right of the poor to relief, which some writers have advocated, must be abandoned. It may be expedient for the rich to support the poor, or they may do as much voluntarily towards that purpose as suits their inclinations and convenience. But there can be no enforcing a right of those who do not work upon part of the gains of those who do, without striking at the root of one of the most important and salutary points in the constitution of society.

The choice between a voluntary and irregular, and a compulsory and regular method of supporting the destitute (both resting upon the mere plea of expediency), is thus left as the only question liable to discussion. It is a point which has been very keenly debated, and, as usual, much may be said on both sides. The following are the chief arguments for and against:

1. Compulsory assessment for the poor breaks in upon the right of every man to enjoy his own gains.

Answer. Ordinary rights always sink, in the eye of the state, under general expediency.

2. It only tends to increase the evil.

Answer. From tables it is ascertained, that, ever since 1688, the number of paupers has kept steadily at about 9 in 100.

3. It encourages improvident marriages, as the parties always know they have the parish as a last resource.

Answer. It is ascertained by parliamentary evidence, that it *does not.* The idea of the poor-house rather acts as a beacon to warn the poor against rash marriages.

4. It encourages the increase of a mean-living population.

Answer. The reverse would appear to be the case. In England, where there has been a compulsory assessment for upwards of two centuries, the standard of living is higher than in any other country where there are no poor-laws. The knowledge that, if a pauper population increases, its support will come upon the rich, induces the rich to see to the keeping down of such population.

5. It chills the hearts of the rich against the poor, and prevents private charity.

Answer. Private charity is an evil, as it is always carried on by means of imposture, or something else on the part of the asker, which degrades his character more than the workhouse. It is also uncertain, and admits the hard-hearted to throw upon the benevolent the whole of a burden, in the discharge and benefit of which all are concerned.

Note. It is to be regretted, however, that, by totally repressing private charity, much surplus food in the kitchens of the wealthy, which would be a blessing to many poor persons, is left to waste.

6. It tends to take away the forethought of the poor.

Answer. In general, those persons who require parish assistance would have no forethought under any circumstances. Is it to be supposed that the forethought of the poor in Ireland, or of the Lazzaroni of continental countries, is improved by the want of poor-laws?

In short, it is argued by the friends of a compulsory assessment, that such is just the price paid by the rich, as a matter of police, for repressing the numbers, and diminishing the power of annoyance, of a set of people, who, under any circumstances, *will* exist in a certain proportion to the general population, and whose destitution would be incompatible with the enjoyment of life and property in the more opulent, prudent, and industrious.

In favour of this view, we must acknowledge that, before the institution of poor-laws in 1601, England abounded in vagrants, whose idleness and vice probably occasioned a greater proportionate loss to the rest of the community, than the amount since paid for keeping it in check. The complaint of vagabondage and mendicity rose steadily in proportion to the emancipation of the poor from slavery (under which condition, of course, all were supported by their proprietors); and hence poor-laws assume the complexion of a necessary result of the personal liberty, now and for a long time enjoyed by the working-classes.

"The legitimate purposes of a poor assessment," says Dr Wade, "I take to be the raising of a provisional fund for meeting, in the least objectionable way, a positive evil, inseparable from the existing knowledge and habits of society; that this fund ought to be so disbursed as to leave no one an excuse for being a beggar or a thief; and, at the same time, so sparingly disbursed, as to make it the interest of no person to be a pauper rather than live by honest labour. The object of the poor-laws is to relieve real and unavoidable distress, not distress wickedly and wantonly created; and if the poor-laws are perverted into the fostering of the idle and the dissolute, the fault is not in the laws, but in their administrators, who apply the poor when they ought to apply the vagrant laws."

This passage suggests some important considerations. In the first place, how far is it possible, by improving the knowledge and habits of society, to reduce the necessity for a poor assessment, or its amount? For the explication of this point, we are inclined to contrast the condition of Scotland with that of England. In the former country, begging is no more frequent than it is in England; the poor assessments are comparatively trifling (seldom producing to any single pauper above a shilling or eighteenpence a-week, while these paupers are very few in number); and a spirit exists very generally among the common people, as to the propriety of avoiding, by all possible means, a state of dependence upon parochial relief. If we contrast this with the state of England, where, in 1830, nearly seven millions were expended upon the poor, and where, although the character of the English labouring classes is remarkably independent and manly, still there prevails a far less disinclination to accept of the parish bounty, we might almost be tempted to conclude that the poor-laws of England had in a great measure produced the necessity of their own existence. But mark the real cause of the difference. Every Scottish peasant, however humbly born, learns to read and write. His mind is under the immediate and constant ministration of a clergyman, who takes a close and brotherly interest in his religious and moral condition, and exerts himself to see that he never for a moment forgets the decencies of life. The very penury of his country, though now in a great measure past, has conferred upon the people so much economical wisdom, that the relation of income and expenditure is in general preserved with singular exactness. It might be invidious to specify the particulars in which England differs from Scotland, as to the religious, moral, and economical culture of its lower inhabitants. But no one could assert that it approaches its poorer neighbour in any one of these respects. And hence, it appears to us, arises a great deal of that necessity for poor-laws in the southern state, which is escaped in the northern. The pressure of this tremendous assessment is just the penalty which the English landholders pay for their inattention to the moral interests of the working classes—the price of that security which they think they enjoy in the ignorance of their fellow-creatures.

In the second place, how far is it possible, by improved management, to reduce the assessment in England? We are decidedly of opinion that much might be done in this way. From Parliamentary evidence, it appears that in the poor-house of St Lawrence, Reading, from forty to fifty persons seldom consume less than one hundred and fifty pounds of meat weekly, or more than three pounds each per week. Now, there surely is no reason that paupers should live so well as this. Independent labourers in Scotland do not at an average, we are safe in saying, eat above a third of this quantity of butcher meat. Greater vigilance, moreover, on the part of the overseers, might perhaps preclude part of the imposture which is complained of in the applicants for relief. As it is proved that the rates have of late decreased, in consequence of improved management (being less in 1830 than ten years before, when the population was not so great by half a million), we are entitled to hope that much might be done in this way towards a lessening of the evil.

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THE DOG.

The Shepherd's Dog.

The English Mastiff.

The Dog is an animal which seems to have been destined by the Creator to be the friend and assistant of man. Throughout the dangers and difficulties which beset the human being, particularly in an inartificial state of society, the dog has ever proved himself the kindly defender of his life and property, as well as a powerful and essential auxiliary in subduing other animals to his purpose. Without the assistance of the dog, man would not even yet have obtained a beneficial dominion over the various races of wild animals of the earth, or been able to watch with sufficient care those creatures formed for his food.

In entering upon the history and character of this valuable animal, nothing astonishes us so much as the extraordinary variety of its form. Whether sprung from one root or not, it is obvious that there now exist dogs fitted to perform purposes entirely peculiar to their peculiar varieties, in which respect this animal resembles no other in the list of animated nature, and therefore possesses distinguishing characteristics possessed by no other creature but man. In this respect, therefore, the dog in its numerous varieties answers every end that could have been gained by the creation and existence of many distinct races of animals. By it, we have an animal which watches our flocks; another which tracks and hunts down noxious wild beasts; another, which destroys and digs out vermin from the earth; another, which guards our houses and lives, while we are asleep; another, which seeks out for game in our field sports; another, which will plunge into the deepest waters, and save us from being drowned; besides many other varieties, all less or more distinct in character, yet all consorting together, and endowed with certain uniform peculiarities of character, which identify them as all of one species.

Widely different as are the varieties of dogs, it has been supposed by Buffon and other naturalists, who are certainly best entitled to judge, that all kinds of dogs whatsoever had their origin in the shepherd's dog, and that climate, food, domestication, and treatment, have been the prevailing causes of producing the departure from the primeval parent stock. It is nevertheless certain, that there is no variety of the dog now existing in an unreclaimed state which exactly agrees with our domesticated shepherd's dog; and it is likewise evident to our observation, that no description of treatment seems to have an effect in changing the apparently fixed character of a breed of dogs. If we trace the genealogy of a greyhound for centuries, we shall find that its forefather was just a greyhound like itself; or if we send a pair of mastiffs to the hills, it will similarly be remarked, that, at the end of a period of years, their progeny have not retrograded to the original shepherd's dog, although there is reason to believe that they may have somewhat degenerated from the true mastiff breed. M. F. Cuvier, a modern French naturalist, has devoted much attention to this curious subject, and has formed a new arrangement of dogs, founded on the shape of the head, and length of the jaws and muzzle. These he has separated into three great groups, as follow:—

I. Matins.—These have a head more or less elongated; the parietal bones insensibly approaching each other, and the condyles of the lower jaw placed in a horizontal line with the upper cheek-teeth.

II. Spaniels.—The head moderately elongated; the parietal bones do not approach each other above the temples, but diverge and swell out, so as to enlarge the forehead and cavity of the brain. In this group are included all the varieties of dogs which are of the greatest utility to man, and also the most intelligent.

III. Dogues.—The muzzle more or less shortened; the skull high; the frontal sinuses considerable; the condyle of the lower jaw extending above the line of the upper cheek-teeth. The cranium is smaller in this group than in the two previous, owing to the formation of the head.

Captain Thomas Brown, a Scottish naturalist, has formed an arrangement, in which he has followed M. F. Cuvier in the three great groups, but has divided these into distinct sections, agreeing in particular characters, for which the dogs which he has included in the several sections are remarkable. The table of his divisions and sections is as follows:—

Division I.—Head Elongated.

Section 1. Wild and half-reclaimed dogs, which hunt in packs.

Section 2. Domesticated dogs, which hunt in packs or singly, principally by the eye, although sometimes by the scent.

Section 3. Domesticated dogs, which hunt singly, and always by the eye.

Division II.—Head less elongated than former division.

Section 4. Pastoral dogs, or such as are employed in domestic purposes.

Section 5. Water-dogs, which delight in swimming, having their feet in general semi-webbed.

Section 6. Fowlers, or dogs whose natural inclination is to chase and point birds, and hunt singly by the scent.

Section 7. Hounds, which hunt in packs, by the scent.

Section 8. Mongrel hounds, which hunt singly, either by the scent or eye.

Division III.—Head much shortened.

Section 9. Watch-dogs, which have no propensity for hunting.

GENERAL CHARACTER OF DOGS.

The dog has six incisory or cutting teeth in both jaws; beyond which there are, on each side, both above and below, a canine tooth; and still farther into the mouth are six cheek-teeth, or molars, in each side of the upper jaw. The three first are sharp and cutting, which Cuvier calls false molars. The next tooth on each side is a carnivorous tooth, furnished with two cutting lobes, beyond which the other two teeth on each side are flat. There are seven cheek-teeth, on both sides, in the under jaw; four of these are false molars, a carnivorous tooth, with the posterior part flat, and behind it two tuberculous teeth. The muzzle is elongated, subject to great variety of length in different varieties. The tongue is smooth and soft; the ears erect in the wild varieties, and in some of the tame ones, but, in the latter kinds, for the most part pendulous. The fore-feet are provided with five toes, and the hind-feet with four toes, furnished with rather longish nails, obtuse at their points, and not retractile. The females are provided with both inguinal and ventral teats. The pupils of the eyes are circular.

The female goes with young sixty-three days, and generally produces from three to five at a birth, and sometimes even twelve, which are at first blind, in which state they continue for from nine days to a fortnight. About the end of two months, their faculties begin to develope themselves. They shed their first teeth at the end of six months, which are replaced by others that do not exfoliate. At twenty months, or two years, dogs arrive at their full vigour.

The males continue to propagate for nearly their whole lives, while the female discontinues having young ones at about the age of eight or nine years.

The average age to which dogs live is about fourteen years; they frequently, however, live to sixteen, and even have been known to attain the age of twenty years. In their latter days, dogs frequently suffer greatly from decay, and various diseases. They are extremely subject to rheumatism, from their liability to exposure to rain and damp beds.

Until dogs have attained seven or eight years, their teeth are white, smooth, and acutely-pointed; but after this age they become yellow spotted, and their points assume an uneven and jagged appearance. At this time, also, the hair of the muzzle and around the eyes assumes a hoary appearance, and becomes whiter as they increase in years.

The dog, independent of the beauty of his form, his vivacity, force, and swiftness, is possessed of all those internal qualifications that can conciliate the affections of man, and make a tyrant a protector. A natural share of courage, an angry and ferocious disposition, renders the dog, in a savage state, a formidable enemy to all other animals; but these readily give way to very different qualities, in a state of domestication, and his only ambition seems the desire to please; he is seen to come crouching along, to lay his force, his courage, and all his useful talents at the feet of his master: he waits his orders, to which he pays implicit obedience: he consults his looks, and a single glance is sufficient to put him in motion: he is more faithful than even the most boasted among men: he is constant in his affections, friendly without interest, and grateful for the slightest favours: much more mindful of benefits received than injuries offered, he is not driven off by unkindness; he still continues humble, submissive, and imploring; his only hope to be serviceable, his only terror to displease: he licks the hand that has just been lifted to strike him, and at last disarms resentment by submissive perseverance.

More docile than man, more obedient than any other animal, he is not only instructed in a short time, but he also conforms to the dispositions and manners of those who command him. He takes his tone from the house he inhabits: like the rest of the domestics, he is disdainful among the great, and churlish among clowns. He knows a beggar by his clothes, by his voice, or his gestures, and forbids his approach. When at night the protection of the house is committed to his care, he seems proud of the charge; he continues a watchful sentinel; he goes his rounds, scents strangers at a distance, and gives them a warning of his being upon duty. If they attempt to break in upon his territories, he becomes more fierce, flies at them, threatens, fights, and either conquers alone, or alarms those who have most interest in coming to his assistance; however, when he has conquered, he quietly reposes upon his spoil, and abstains from abusing—giving thus at once a lesson of courage, temperance, and fidelity.

Most animals have greater agility, greater swiftness, and more formidable arms, from nature, than man; their senses, and particularly that of smelling, are far more perfect; and having gained, therefore, a new assistant, particularly one whose scent is so exquisite as that of the dog, was the gaining a new sense, a new faculty, which was before wanting.

The dog, thus useful in himself, taken into a participation of empire, exerts a degree of superiority over all animals that require human protection. The flock and the herd obey his voice more readily even than that of the shepherd or the herdsman: he conducts them, guards them, keeps them from capriciously seeking danger, and their enemies he considers as his own. Nor is he less useful in the pursuit: when the sound of the horn or the voice of the huntsman call him to the field, he testifies his pleasure by every little art, and pursues with perseverance those animals, which, when taken, he must not expect to divide. The desire of hunting is indeed natural to him, as well as to man, since war and the chase are the only employment of savages. All animals that live upon flesh hunt by nature: the lion and the tiger, whose force is so great that they are sure to conquer, hunt alone and without art. The wolf, the fox, and the wild dog hunt in packs, and assist each other, and partake the spoil. But when education has perfected this talent in the domestic dog—when he has been taught by man to repress his ardour, to measure his motions, and not to exhaust his force by too sudden an exertion of it—he then hunts with method, and always with success.

As the dog is of the most complying disposition, so also is he the most susceptible of change in his forms. The varieties of this animal seem almost endless. Climate, food, and education, all make strong impressions upon the animal, and produce alterations in its shape, its hair, its size, and in every thing but its nature. The same dog taken from one climate to another, seems to become another animal, and different breeds are as much separated, to all appearance, as any two animals the most distinct in nature. Nothing appears to continue constant with them, but their internal conformation—different in the figure of the body, in the length of the nose, in the shape of the head, in the length and direction of the ears and tail, in the colour, the quality, and quantity of the hair; in short, different in every thing but that organization which serves to continue the species, and keep the animal distinct from all others. It is this peculiar conformation, this power of producing an animal that can reproduce another, that marks the species; for nature seems to have established a law, that one deviation from specific distinctions can be permitted, but no farther, as she has doomed that all mules shall be sterile.

The extremes of size are truly wonderful in this species, as dogs have been known to reach four feet in height; while there is one in the museum at Dresden, quite perfect in its form, and only five inches in length.

Dogs' flesh was lately an extensive article of food in the Sicilies, and we have the following interesting account of it, given by Swinburne in his travels in these countries:—"Casalnuova is a considerable town, containing about four thousand inhabitants, noted for nothing but their taste for dogs' flesh, in which they have no competitors that I know of, except their neighbours at Lecce, and the newly-discovered voluptuaries of Otaheite. We did not see one animal of the canine species in the streets, and wo to the poor cur that follows its master into this cannibal settlement! I could not prevail upon my conductor to own whether they had any flocks of puppies, as of sheep; or took any pains, by castration, or particular food, to fatten and sweeten the dainty before they brought it to the shambles. I have since procured some information upon the subject from impartial persons, and find that the people of this neighbourhood are looked upon by the rest of the kingdom as dog-eaters; and it is certain, that, both at Lecce and Casalnuova, many of the lower sort relish a slice of a well-fed cur."

This circumstance is further confirmed by the following extract of a letter from Sir William Hamilton:—"At Casalnuova we had a confirmation of what you mention concerning the inhabitants of that village eating dogs' flesh; for one of our guards had a dog with him, which was immediately stolen; and when I missed and inquired for the dog the next day, the guard told me that these cursed dog-eaters had got him. At Galipo I was assured that there was no doubt of the fact."

Lecce and Casalnuova are both celebrated for an imitation of Turkey leather, and the tanners of those places are known to kidnap dogs for this manufacture. The great demand for this article probably led to eating the carcases of the animals they had destroyed; and hunger and experience have at length taught them that dog's flesh is by no means so unpalatable as some imagine.

Captain Carver, in his travels through the interior of North America, in describing the ceremony attending the admission of an Indian of the Naudowessie nation into one of their societies, proceeds to give an account of the feast given in consequence, as follows:—

"The dishes being brought near me, I perceived that they consisted of dogs' flesh; and I was informed that at all their public grand feasts they never made use of any other kind of food. For this purpose, at the feast I am speaking of, the new candidate provides fat dogs, if they can be procured at any price. In this custom of eating dogs' flesh, they resemble the inhabitants of some of the countries that lie on the north-east borders of Asia."

On their declarations of war, they have also festive ceremonies, in which Captain Carver speaks of them as follows:—

"This ceremony is followed by dances, such as I have before described; and the whole concludes with a feast, which usually consists of dogs' flesh. This feast is held in the hut or tent of the chief warrior, to which all those who intend to accompany him in his expedition send their dishes to be filled."

This practice does not proceed from any want of food amongst these people, as they on ordinary occasions live upon the flesh of the buffalo, the elk, the wild boar, the red deer, bison and racoon, with which their country abounds.

We shall now proceed to give the characters of the different dogs, according to the arrangement of Captain Brown, and to intersperse these with a series of anecdotes.

DIVISION I.—DOGS WITH LENGTHENED HEADS.

Section I. Half-reclaimed dogs, which hunt in packs.

The *Dingo*, or *New Holland Dog*.—The head of this dog is not unlike that of a wolf, on which account Bewick calls it the New South Wales wolf. The muzzle is long and pointed, with short erect ears. He is two feet six inches in length, and about two feet in height. His fur is composed of a mixture of silky and woolly hairs, and is of a deep yellowish-brown colour. His tail is long and bushy, resembling that of a fox. This dog is of a ferocious disposition. Pennant mentions one which was brought to this country, and that leaped on the back of an ass, and had nearly destroyed it before a rescue could take place.

The *Dhole* is the native wild-dog of India, and bears a strong resemblance to the dingo, but without the bushy tail of that species; he is of a uniform bright red colour.

Differently from other dogs which hunt in packs, according to the account given by Captain Williamson, this species always hunts mute, and only utters a soft whispering sound when in high chase, and near his prey. The dhole is exceedingly swift of foot, and soon overtakes most animals which are the objects of his pursuit. It is said they are exceedingly fond of the flesh of the tiger, and that in consequence this animal is prevented from propagating to that extent which would soon overrun and lay waste all the countries which it inhabits. This predilection is confirmed by Bishop Heber, who states, upon the authority of the peasants of Khaysa, which borders the frontiers of China, that a tiger is often killed and torn to pieces by the wild dogs, which give tongue like foxhounds or harriers.

It is in the unfrequented wilds of the western frontiers of India that the dhole takes up his abode, lurking amongst the extensive jungles which cover mighty tracts of that territory.

The *Pariah* is the common village dog of India. He has a small sharp head, with short pricked ears, a slender body, and particularly drawn up about the abdominal region; his chest is deep, his limbs light, and his colour is of a reddish brown. The native Indians use these in hunting the tiger and wild boar. They are very fierce, and follow their game with much avidity.

The *Ekia* is the native dog of Africa, and in all likelihood sprung from the same stock as the dhole. They are said to be of various colours, as black, red, white, brown, and sandy yellow. They are eaten by the negroes. The African wild dogs, like those of India, hunt in packs.

The *South American Dog* is not unlike the dingo, and is about the size of the springer, with short and pricked ears like most other wild dogs. The hair on his tail is long and bristly; he is of a brownish-grey colour on the back, with sandy-coloured spots on the legs and flanks. In their general aspect, they greatly resemble the wolf, but are much smaller in size.

There is another South American dog called the Alco, of which there are two varieties. The head of the Alco is very small, and the ears pendulous; thus differing from almost all other wild dogs. The back is somewhat curved, and the tail rather short. It is said that the Spaniards found this dog among the natives on the first discovery of America. Herrera says, that Columbus found in America many dogs which did not bark.

The introduction of dogs into the continent and islands of South America, is thus described in the History of the Buccaneers:—"But here the curious reader may perhaps inquire, how so many wild dogs came here. The occasion was, the Spaniards having possessed these isles, found them peopled with Indians, a barbarous people, sensual and brutish, hating all labour, and only inclined to killing and making war against their neighbours, not out of ambition, but only because they agreed not with themselves in some common terms of language; and perceiving the dominion of the Spaniards laid great restrictions upon their lazy and brutish customs, they conceived an irreconcilable hatred against them, but especially because they saw them take possession of their kingdoms and dominions: hereupon, they made against them all the resistance they could, opposing every where their designs to the utmost; and the Spaniards, finding themselves cruelly hated by the Indians, and nowhere secure from their treacheries, resolved to extirpate and ruin them, since they could neither tame them by civility nor conquer them with the sword. But the Indians—it being their custom to make their woods their chief places of defence—made these their refuge whenever they fled from the Spaniards. Hereupon, these first conquerors of the New World made use of dogs, to range and search in intricate thickets of woods and forests for those their implacable and unconquerable enemies; thus they forced them to leave their old refuge, and submit to the sword, seeing no milder usage would do it; hereupon, they killed some of them, and quartering their bodies, placed them in the highways, that others might take warning from such a punishment. But this severity proved of ill consequence; for, instead of frightening them, and reducing them to civility, they conceived such horror of the Spaniards, that they resolved to detest and fly their sight for ever; hence the greater part died in caves and subterraneous places of woods, in which places I myself have often seen great numbers of human bones. The Spaniards, finding no more Indians to appear about the woods, turned away a great number of dogs they had in their houses; and they, finding no masters to keep them, betook themselves to the woods and fields to hunt for food to preserve their lives; thus by degrees they became unacquainted with houses, and grew wild. This is the truest account I can give of the multitudes of wild dogs in these parts."

The *North American Dog*.—We have no very distinct account of this variety, but it is said to resemble the dingo in its pricked ears and general conformation. It is remarkable for the acuteness of its scent, and very expert in the detection of its prey, or animals which it may be trained to pursue.

The following anecdote is highly illustrative of the exquisite sense of smelling possessed by this dog:—Le Fevre had a plantation in the neighbourhood of Warwaring, near the Blue Mountains, which stretch across part of the state of New York. His youngest son, only four years of age, disappeared one morning. He was missed, and partially sought for by his parents; who, not finding him, became alarmed for his safety, as these mountains abound in wild animals. As is the custom in these parts, they had recourse to the assistance of their neighbours. The united party separated, and bent their way through the forest in different directions; but no traces of the child could be had. They renewed their search next day, with no better success. The hearts of the parents were wrung with grief, and they were at a loss what steps to take for the recovery of their lost child, when one of the native Indians, named Tewenissa, happened to pass that way, accompanied by his dog, named Oniah. He called at Le Fevre's, to refresh and rest himself. He found him in deep grief; and being informed of the cause of his distress, he requested that the shoes and stockings which the lost child had last worn might be brought to him. He applied them to the nose of his dog, and desired him to smell them, and immediately afterwards departed for the woods, accompanied by the family; and describing a semicircle of a quarter of a mile, he urged the dog to discover the scent of the lost child. They had not proceeded far, when the dog began to bay; he followed up the scent, and his notes of triumph became louder as he proceeded, and at last he bolted off at full speed, and was soon out of sight. In half an hour after, they met him returning towards them, with a countenance full of animated expression; from which Tewenissa was sure he had discovered the child. But was he dead or alive? This was a moment of acute suspense, although happily of short duration. The Indian followed his sagacious dog, which soon conducted him to the spot where the lost child lay scaithless at the foot of a large tree. Tewenissa snatched him up in his arms, and with a joyful heart sped his way to where his distressed parents and friends were advancing with less speed than the son of the woods was able to do. He restored little Derick to his father and mother, when a scene of gratitude and tenderness ensued, which may be more easily imagined than described.

Section 2. Domesticated dogs, which hunt in packs or singly, principally by the eye, although sometimes by the scent.

The *Irish Greyhound* ranks among the noblest of the canine race; his mien is striking, full of dignity, and his conformation beautiful. In his general shape he bears a strong resemblance to the common greyhound, but is much taller, and more robust. He is not fitted for pursuing the more speedy animals of the chase. His use in early times was to free the country of wolves and wild boars, which abounded in England and Ireland. The hair is short and smooth, and the colour of these dogs is fawn or pale cinnamon. The Marquis of Sligo had some of this breed, which were of various colours; some were brown and white, and others black and white. The ordinary height of the Irish greyhound is about three feet, although they have been known to reach four feet. Goldsmith, who had seen several of this breed, says they were about four feet high, and as tall as a calf of a year old.

The *Albanian Dog.*—This variety is about the size of a full-sized mastiff. His hair is very fine and close set, and of a silky texture, variously clouded with brown; his tail is long and bushy, and carried like that of a Newfoundland dog; his muzzle is pointed, and rather long; his legs are strong and muscular, which fit him well for hunting the wild boar, in which sport he was much used in ancient times; he was also used in hunting wolves, and in protecting sheep-folds from thieves.

Lieutenant Shipp gives us the following anecdote of one of these dogs:—"I learnt," says he, "that this sagacious and faithful creature would regularly, when his master was on watch, stand his hour and walk his round; that in very dark nights he would even put his ear to the ground and listen; and that, during the period assigned to him as his turn to watch, he would never venture to lie down, but would steadily and slowly walk his round, which nothing could induce him to leave, such was his opinion of the nature of his post. The man added, that he once gave him to an officer of the Company's service, who took him from the station where he was (Meerut) to Loodianna, a distance of 400 miles, and that the moment the officer let him loose he returned to his old master, having performed this great journey in two days and a half. He was on the main-guard the night the dog returned, and was awoke by the animal licking his face. It appeared that he had been through the whole barracks, and visited every sleeping soldier on their separate bets, until he found his master. The man related several other anecdotes of the same brute. Among the rest, he said he was one day drinking toddy, some miles from camp, and, from the intoxicating effect and extreme heat of the liquor, he went to sleep. On waking, he found his clothes torn in several places, and observed that he had been dragged more than three yards from the bush under which he had lain down; but what was his astonishment on getting up, to find a large snake almost torn to pieces, no doubt by his faithful guard!"

The *French Matin* has an elongated head, and flat above; his ears are erect, and slightly pendulous towards the tips; the hair of a yellowish fawn-colour, with darker, oblique, and parallel indistinct rays traversing the whole of his fur. His height is about two feet, and his length three feet. He is strong, muscular, and active, and very courageous. He evinces great eagerness in hunting the wild boar and wolf, in which sport he is frequently employed. Pennant thinks this variety is a descendant of the Irish greyhound.

The *Great Danish Dog.*—This variety is somewhat allied to the matin, but with a bluntee muzzle; he is also somewhat like the Dalmatian in appearance, but differs in his body being all covered with large black patches and spots, whereas the fur of the latter dog is universally spotted. His ears are pure white, while those of the Dalmatian are generally black. He is used as a dog of chase in his native country, and in England as an attendant upon carriages.

The *Scottish Highland Greyhound.*—This dog will either hunt in packs or singly. He is an animal of great size and strength, and at same time very swift of foot. In size he nearly equals the Irish greyhound. His head is long, and the nose sharp; his ears short, somewhat pendulous at the tips; his eyes are brilliant and very penetrating, and half concealed by the long crisped hairs which cover his face and whole body. He is remarkable for the depth of his chest, and tapers gradually towards the loins, which are of great strength, and very muscular; his back is slightly arched; his hind quarters are powerfully formed, and his limbs strong and straight. The possession of these combined qualities particularly fit him for long endurance in the chase. His usual colour is a reddish sand-colour, mixed with white; his tail is long and shaggy, which he carries high, like the staghound, although not quite so erect. It is this noble dog which was used by the Scottish Highland chieftains in their great hunting parties, and is supposed to have descended in regular succession from the dogs of Ossian.

Tradition states that the hunting dog of Fingal, called Branne, was the best dog in the world. In his hunting excursions, he is said to have taken *one hundred* dogs into the field with him at a time. Even the markings of Branne are celebrated in the Highland legends. He is said to have been of a sandy colour, with yellow legs, and his sides were black.

In Perthshire and Argyleshire are the remains of many old circular buildings which tradition assigns to the era of Ossian. On the estate of Garth, the property of our late distinguished and amiable countryman General Stewart, late governor of Trinidad, the walls of two of these buildings remain, which are constructed with such weighty stones that it is scarcely possible they could have been raised without the aid of machinery. These castles are called *Caistail nam Fiom*, or the castles of the Fingalians. In Glenlyon is shown the kennel for Fingal's dogs, and the house for the principal hunter.

Mr John Stewart (one of the higher class of farmers), at Baranamue, parish of Ardchattan, Argyleshire, about the year 1716, while shooting on the hills one afternoon, he was suddenly seized with inflammation in his side; he returned home, and died the same evening. His funeral took place some days afterwards, when his favourite greyhound, of the true Highland breed, followed the remains of his beloved master to the churchyard of Appin, betwixt nine and ten miles, and remained with a sorrowful countenance till the interment was completed; he then returned home with those who attended the funeral. Upon entering the house, he found his master's plaid hanging in the lobby; he pulled it down, and, in defiance of all attempts to take it from him, lay on it all night, and would not even allow any person to touch it. Every evening afterwards, about sunset, he left Baranamue, travelled to the churchyard, and reposed on the grave of his late master, and returned regularly in the morning, between nine and ten. And what was very remarkable, he never would touch any meat which was offered to him, and it was never known by what means he existed. While at home, he was ever dull and sorrowful, never moved about, but lay in a sleeping posture, frequently uttering long and mournful groans. Mr Stewart and family were in hopes that time would assuage his grief; but he continued his nightly wanderings and watching for a considerable time unremittingly, till the family, despairing of an end to his sorrow, and as it only kept alive their own grief for the departed worth of the head of their family, resolved to give it to a friend at some distance, where it still continued in a melancholy state. We have been favoured by the above from Mr Duncan Stewart, lately farmer at Dallens, Appin, Argyleshire, who is grandson to Mr J. Stewart's sister.

The *Russian Greyhound* is nearly as large as the Irish greyhound, resembling him in shape as nearly as possible, but covered with long bushy hair. His general colour is of dark reddish brown. He is sometimes hunted in small packs, and as frequently single, in which case he not unfrequently will kill a wolf, deer, or wild boar, without any aid whatever. When used in coursing, he is taken to the field in slips, in the same manner as is practised with greyhounds.

Section 3. Domesticated dogs, which hunt singly, and always by the eye.

The *Gazehound.*—This is a dog, the breed of which is now lost. It was hunted in the same manner as the greyhound, and took foxes and hares by running them down. It is said by Bewick that it was employed in stag-hunting, which we think is rather doubtful, as, although the stag is an animal of great speed, yet the contest between it and a dog possessing the swiftness of a greyhound would be but very unequal. No representation of this dog has been preserved, which is much to be regretted, as we are but imperfectly acquainted with its appearance.

The *Greyhound* is the fleetest of all dogs, which is in consequence of his peculiar conformation. His head is long, tapered, and shaped like that of a snake; his neck long and slender; his ears somewhat erect and pricked, slightly pendulous at their tips; the tail ought to be very fine, pointed, and the hair on it very short; the chest should be wide and deep; the belly drawn up, with strong loins, and with large and prominent hip-muscles. This dog is by no means so intelligent as many other varieties, and he is in consequence much less susceptible of education. He has, however, very fine feelings, and seems to be much alive to caresses, which excite him to such a degree, that it produces a quick pulsation of the heart. This may be felt beating against his side with much vigour. He is one of the most elegantly formed of all the canine species.

In November 1792, as Richardson, gamekeeper to the Earl of Egremont, was leading two greyhounds, coupled together, near Ulndale, a hare ran across the road; the dogs instantly broke from their conductor, and gave chase, fastened as they were to each other. The pursuit began at Ulndale Brow-top, and afforded a very entertaining sight to several spectators; the frequent windings of the hare embarrassing the dogs greatly, particularly in changing their direction. At one time puss was very near giving them the slip, but she was baffled in an attempt to escape through a gate; and, by the sudden turning of her pursuers, after a run of about four miles, she fell a sacrifice at Pikeless gate, being actually killed by the coupled greyhounds, whose eagerness for the chase could not be restrained by any efforts of the gamekeeper.

As a party of gentlemen were coursing at Wooley, the seat of G. W. Wentworth, Esq., on Monday, January the 21st, 1822, a brace of dogs, which had run together about half an hour before, being led by a boy at the top of a large stubble-field, by a handkerchief tied to the couples, a hare started within twenty yards of them; hereupon the dogs gave a sudden pull, and the boy lost his hold. Thus they run the hare, fastened together, nearly to the bottom of the field, when they gave her a turn, which was repeated about half way up the same field; here she got considerably the advantage, made for the hedge, and *smused*; the dogs following up, *fenced* in grand style, and turned her twice in the next field; whereupon, she took towards a lane, and ran through an opening betwixt a stone post and the end of the hedge, not more than fifteen inches wide: here it was expected that one or both of the dogs would be killed; but they, as if quite conscious of being fastened together, and knowing, instinctively, it would be impossible to pass *abreast*, darted through (as it were) *one over the other*, when, to the astonishment of all present, they killed the hare, after running about ten yards down the lane. During the whole course, the dogs kept as regularly together as soldiers marching to the attack; all the while the red handkerchief waving above their heads, as if they had been conscious of running under "flying colours."

The *Scotch Greyhound.*—This dog is formed exactly like the common greyhound, and differs from it merely by being of a larger size, and in the hair being longer and hairy. Its general colour is reddish brown, or of a sand colour.

The *Italian Greyhound.*—This dog is merely a miniature of the common greyhound, being only about half the size of that dog. It has a very fine skin of a silky texture.

The *Turkish Greyhound* is still smaller than the Italian greyhound, being little more than half its bulk, and is entirely divested of hair, except on the tail, where it is few and scattered. Its usual colour is blackish lead colour.

DIVISION II.—HEAD LESS ELONGATED THAN FORMER DIVISION.

Section 4. Pastoral dogs, or such as are employed in domestic purposes.

The *Shepherd's Dog.*—This dog is covered with long flowing, somewhat woolly, hair; his muzzle is long and pointed, and his ears erect, and slightly bent downwards at the tips; his tail is long and bushy, and the usual colour of his fur black and white, or varied with black and grey; the backs of his fore-legs have also long hairs.

The peculiar and highly useful qualities of this dog seem to be rather intuitive than acquired; indeed, nothing can hardly exceed the quickness with which he can be taught any lesson; and certainly no other dog has the same patient perseverance and courageous fidelity, and at the same time possessed of the greatest discrimination.

The labour of a shepherd, with the assistance of this faithful and intelligent animal, is comparatively an easy task; and it is hardly possible to fancy a more arduous employment than it would be, if divested of the services of the dog; for without him, how could he collect extensive flocks scattered over high and widely-spread mountain ranges? The shepherd's dog is possessed of great sagacity, gratitude, and self-denial. Mr Duncan Stewart informs us, that it is extremely common for the shepherds' dogs in the Highlands to point game, and that many of the young farmers in Argyleshire use them for that purpose. He has seen them as good finders as the pointer or setter, and as steady on their point.

Mr John Macintyre, farmer at Cuell, had a cross betwixt a pointer and shepherd's dog, which resembled the latter in every particular, and was of a black and brown colour—his body being black, and legs a brown tan colour—which was constantly used during the shooting season. One year, at the commencement of grouse-shooting, he was sporting, when he met with a party of gentlemen from the south, and accompanied them. It turned out, that, after a long day's shooting, the dog in question beat every dog in the field. The gentlemen were so highly delighted with the qualifications of this animal, that they offered a pretty large sum for him, which Mr Macintyre refused; and from that day he prized his dog more than ever, as he found, on competing with celebrated dogs, his qualifications were greater than he before was aware of. This dog was not only a good hunter, but also excellent as a sheep-dog, in which capacity or in driving cattle he was generally used the whole year. He was also an excellent watch-dog, and took the water very readily. He was up to every kind of sport, for he would find hares, roes, and all other kinds of game.

During a snow-storm, in February 1829, a remarkable incident of the brute-reasoning kind occurred at a farm house in the neighbourhood of Falkirk. A number of fowls were missing one evening at the hour when they usually retired to their roost, and all conjectures were lost in trying to account for their disappearance. While sitting around the kitchen ingle, cursing all the "gangrel bodies" who had been seen that day near the house the attention of the family was roused by the entrance of the house-dog, having in his mouth a hen apparently dead. Forcing his way to the fire, the cautious animal laid his charge down upon the warm hearth, and immediately set off. He soon entered again with another, which he deposited in the same place, and so continued till the whole of the poor birds were rescued. Wandering about the stack-yard, the fowls had become quite benumbed by the extreme cold, and had crowded together, when the dog observing them, effected their deliverance. They had not lain long before the glowing ribs, ere they started to their legs, and walked off to their *bawks*, cackling the *hen's march*, with many new variations, in thanks to their canine friend.

A shepherd, named John Lees, of Whitelaw, parish of Selkirk, had a young dog of little experience, but which evinced great judgment. One day a ram broke away to a neighbouring flock of ewes. The shepherd sent his dog after the ram to fetch him back; he had, however, got in amongst the ewes before the dog reached him. The dog, on getting up to the flock, darted amongst them after the ram, and cut him off, with about a score of ewes, from the flock, and drove them to some little distance; then stopt, and surveying them for a short time, he darted amongst them, separated the ram from the ewes, and brought him up the hill to his master. The distance where the ram joined the ewes was more than a mile from where the shepherd stood; therefore he could have no influence on the dog at that distance. The above anecdote was furnished to us by Mr Thomas Mackaill, an acute observer of the canine species.

On Saturday, the 5th January 1822, as Mr A. Byres, of Highstone Ridge, accompanied by Mr Johnston, of Chapel Hill, was travelling over Eskdale Muir, Dumfriesshire, a common sheep-dog, which had been trotting quietly along, commenced barking at some distant object, and, springing forward, was soon out of sight. At first they paid little attention to the circumstance, imagining the dog was attracted by some moorland hare, with which he was taking a gambol; but upon riding a little out of the way to partake of the sport, how greatly were they surprised at finding *colley* busily employed in turning and returning a full-grown fox athwart the face of a pretty steep hill. In point of speed, the parties were pretty well matched; but the strength and cunning of foxes being very well known, the gentlemen expected nothing less than that sly reynard would shortly "turn a corner juking," and earth him in some heathy retreat. But no; in this they were agreeably disappointed. In spite of every fox-like effort to get away, the new courageous cur kept close at the heels of his scented prey, or fought him in gallant style, until he at length succeeded in fairly killing him; and he was borne off in triumph, to attest in all time coming the mettle of the dog of Highstone Ridge.

In December 1830, A. W. Gardner, Esq. of Melrose, near Banff, hired a shepherd from Ross-shire, who, when he had entered his service, brought with him two sheep-dogs of the colley breed. In the beginning of August 1831, the shepherd had an errand to Macduff, about three miles distant from Melrose; and as there was a boat going round, he took the opportunity of going to it from the slate quarries below Melrose House. When the shepherd went into the boat, he left one of the dogs on the rock, refusing to allow him to follow: there the poor animal continued to remain for some days bewailing the loss of his master; at any rate, he was seen on the morning of the third day howling most piteously. The shepherd never imagined, when he left the dog, but that he would return to his house, not a rig distant; but finding that he did not, and after making search for him in vain for at least eight days, he at last bethought himself of writing to Ross-shire, to know if he had found his way there. He received an answer in course, stating that the dog had returned there quite exhausted and dispirited from the loss of his master, and even refused to be comforted because he was not there. He had occupied about two days in his journey; but how he crossed the ferries, or was supplied with food, will remain a mystery. The distance he had to travel was at least 180 miles, after a sojourn at Melrose for nine months.

The *Cur Dog* differs from the shepherd's dog in being nearly smooth; he is stronger in his make, and has half-pricked ears, and his tail is rather short, and slightly feathered beneath. He is a trusty and useful servant to the farmer and grazier, and is chiefly employed in driving cattle; and being larger and stronger than the shepherd's dog, from which he is sprung, he is better qualified for the grazier and farmer. He bites with great keenness, and always makes his attack at the heels. His sagacity is very great, and he soon knows his master's fields, and watches with great assiduity the cattle which are in them.

As a farmer of good circumstances, who resided in the neighbourhood of Bowbrink, in the county of Norfolk, was taking an excursion to a considerable distance from home, during the frosts in the month of March 1795, he at length was so benumbed by the intense cold, that he became stupified, and so sleepy that he found himself unable to proceed, and lay down, and would have perished on the spot, had not a faithful cur dog, which attended him (as if sensible of his dangerous situation), got on his breast, and, extending itself over him, preserved the circulation of his blood. The dog, so situated for many hours, kept up a continual barking, by which means, and the assistance of some passengers, the farmer was roused, and led to a house, where he soon recovered.

Section 5. Water-dogs, which delight in swimming, having their feet in general semi-webbed.

The *Pomeranian*, or *Wolf Dog*, has the hair on the head short, as is also that on the feet and ears; but it is long and silky on the body and tail, which last is curled up in a spiral form. His colour is white, black, gray, or sometimes yellowish; his head is long, and his muzzle pointed; his ears are short and pricked. He is possessed of intelligence nearly equal to that of the shepherd's dog.

The *Siberian Dog* has much the appearance of the Pomeranian dog, and is very nearly allied to him, except that he is covered with long hair even on the head and paws. In their native country, four of these dogs are attached by pairs to a sledge, and in front of them is placed a leader, on the proper training of which much of the useful services of the others depend. These sledges are just large enough to contain one person, who directs them with his voice, and in which he is partially assisted by a stick. The reins are fastened to the dogs' necks by a collar. These dogs, thus yoked, have been known to drag a sledge from seventy to eighty miles in a day, and so powerful is their scent, that they contrive to keep on the beaten track by that means alone, even although it be hid by showers of snow.

The *Greenland Dog* is of a large size, strong in the bone, and its fur consists of long, thick-set, woolly-like hair; his muzzle is sharp, and his ears short and pricked; his tail is thick, very bushy, and spirally twisted.

The *Iceland Dog* is shorter in the hair than the above variety; his ears are pricked, but slightly bent downwards on the tips. His general colour is white, with patches of black, differently disposed.

The *Esquimaux Dog.*—This highly useful variety is described by M. Desmarest as having the head shaped like that of the wolf dog; the tail is spreading and curved, and the ears erect. The hair is thinly scattered, and consists of two sorts, the one silky, the other thick and fine, and somewhat curled, and so detached from the other, that it may be pulled off in flakes from the animal.

The *Hare-Indian Dog* has a narrow, elongated, and pointed muzzle; his ears are broad at the base, and pointed towards the tips, and perfectly erect; his legs are long and slender, and his tail thick, bushy, and curved slightly upwards, but by no means so decidedly curved as that of the Esquimaux dog. His body is covered with long straight hairs, the ground colour of which is white, marked with large irregular patches of greyish black, intermingled with various shades of brown. Dr Richardson says it has neither courage nor strength for pulling down any of the larger animals.

The *Newfoundland Dog.*—This beautiful and intelligent dog is remarkable for the symmetry of his form and the acuteness of his understanding. He measures from the tip of the nose to the point of the tail, six feet and a half, the length of the tail itself being two feet: from the one fore-foot to the other, over the shoulders, five feet eight inches: the girth behind the shoulders three feet four inches: the length of his head is fourteen inches. He has webbed feet, in consequence of which he is a dexterous swimmer. His hair is long, flowing, and slightly curled, and his tail very bushy, particularly in the lower side, and he carries it in a very graceful manner. The docility of the Newfoundland dog is very great; there are innumerable most striking anecdotes of his sagacity and benevolence of disposition.

A gentleman who had for many years been commander of a ship in the West India trade, had a fine old Newfoundland dog, which accompanied him in all his voyages, and which was found to be very useful, for he would tell when land was near much better than any man on board. Some hours before land was made, the dog used to get to the side of the vessel, snuff the air, wag his tail, and seem much pleased, which was the signal for sending a man aloft, and in a short time the shore was discovered. The vessel no sooner came to anchor in ports which she had previously visited, than the dog would jump overboard, and swim to the shore; he there visited his friends, and after staying some time would return, and, on coming to the side of the ship, howl till he was taken on board. The captain retiring from the sea-service, took his dog with him, and went to reside at a village within a few miles of London, where he regularly attended church on Sundays, accompanied by his dog. On any particular occasion, when his master was prevented from going, the dog, on hearing the bell, would set off alone, walk slowly to the church, and lie down in the captain's pew till service was over, and then return quietly home.

During the gale on Thursday, June 11, 1829, a vessel was driven on the beach at Lydd; no boats could get off to the assistance of the crew, who were, however, all saved and brought ashore, through the activity of a fine Newfoundland dog. The surf was rolling furiously, and eight poor fellows were crying for aid, which the spectators could not afford them, when one man directed the attention of his dog to the vessel, and the intelligent animal at once swam towards it, and the crew joyfully made fast a rope to a piece of wood, which the dog seized and swam with to his master on shore; a line of communication was thus formed, and the eight mariners rescued from a watery grave.

Mr Smith, master of the William and Ann, whaler, has a very bold and docile Newfoundland dog, to which he is particularly attached. When at Greenland, during the summer, his son observed a large seal, which he fired at and wounded slightly; the dog instinctively leaped into the water, and pushed directly for the spot where the seal dived when it was hurt, and on reappearing, the dog seized it by the forefoot, and a desperate combat ensued. During the struggle, the combatants were frequently under water; but the dog resolutely kept his hold, till a boat was launched to his assistance, and, when seized by one of the sailors, he fairly pulled the seal aboard with him. On another occasion, when seven men were on an iceberg, it gave way; six of them got hold of the bow-ropes, but the seventh sunk, the waters closed over him, and his comrades concluded that he was lost. Mr Smith was in bed at the time, but hearing the noise, he promptly sprung on deck, and, in obedience to his signal, boats from the other vessels immediately came to his assistance. His faithful dog was at his foot, and while gazing intently, he observed the head of the sailor above the water. He pointed it out—gave the word—the dog leaped from the bow of the vessel, and, while swimming towards the man, he barked, either with anxiety, or with a view to cheer the perishing sailor with the prospect of assistance. When within a few feet, the man was picked up in a state of utter insensibility, by a boat from the Rambler of Kirkaldy. Observing the rescue of the man, the dog returned to his own ship, and when taken on board, his gambols, frisking and fawning on his master, indicated that though he had not saved the man, he was aware that he had done his duty.

On the occasion of opening the family vault of the Bosvilles, at Ravenfield, a short time ago, for the interment of Mrs Bosville, a large Newfoundland dog, belonging to the late Colonel Bosville, who was interred eleven weeks previous, found its way to its master's coffin, and placed itself upon it, and remained there until the funeral of Mrs Bosville took place, from whence it could only be removed by force. It is worthy of remark, that, though there were several coffins in the vault, the dog instantly proceeded to that of his old master.

The *Russian Dog* is somewhat larger and stronger than the Newfoundland dog: he is a cross between that variety and the Siberian dog, and has now become a distinct race. His head is large, with his ears pendulous and rather full sized; his tail is curled over his back; his hair is very long and shaggy, consisting of black and white patches.

The *Great Rough Water-Dog* is web-footed, swims with great ease, and dives with much dexterity; his hair is long and curly, and he is of various colours; his legs and feet are also thickly covered with thick and bushy hairs.

The *Large Water-Spaniel* is about the size of the English setter, but of a stronger make. His face is smooth, as also the front of his legs, while the rest of his body is covered with small crisped curls, usually of a dark liver-brown colour. This dog is very valuable in the sport of shooting wild-fowl.

The *Small Water-Spaniel or Poodle.*—This is a breed between the large water-dog and the springer; he is thickly covered with fine hair, all of which is in distinct small curls, more like an effort of art than of nature. It is one of the most active of dogs. Its general colour is white, and sometimes it has various black patches. It dives with much dexterity, and will leap from a very great height into the water; we have seen one leap over Tyne Bridge at Newcastle, a height of nearly fifty feet.

At the moment when the ranks of the Imperialists were broken, at the famous battle of Castiglione, and the heat of pursuit was in proportion to the obstinacy of the conquest, Bonaparte coming to the spot where the thickest of the combat had taken place, where French and Austrians lay strewed in horrible profusion, he perceived one living object amidst those piles of corpses, which was a small water-spaniel. The faithful creature stood with his two fore-feet fixed on the breast of an Austrian officer; his long ears hung over his eyes, which were rivetted on those of his dead master. The tumult seemed neither to distract the attention nor change the attitude of the mourner, absorbed by the object to which he clung. Bonaparte, struck with the spectacle, stopped his horse, called his attendants around him, and pointed out the subject of his speculations. "The dog," said Bonaparte, "as if he had known my voice, removed his eyes from his master, and throwing them on me for a moment, resumed his former posture; but in that momentary look there was a mute eloquence beyond the power of language: it was a reproach, with all the poignancy of bitterness." Bonaparte felt the appeal; he construed the upbraidings of the animal into a comprehensive demand of mercy. The sentiment was irresistible; it put to flight every harsh and hostile feeling—Bonaparte gave orders to stop the carnage instantly.

Mr Frazer, Minto Street, Newington, had a poodle dog, called Doon, which was possessed of great sagacity. Upon one occasion, Mrs Frazer, being accompanied by Doon, had gone a-shopping, and having purchased some small articles, which, after being rolled in paper, she put it into her muff. When nearly home, she missed the parcel, and immediately turned back to look for it, when she was agreeably surprised by seeing Doon travelling at her heels with the parcel in his mouth.

The *Shock Dog* is the smallest of the water-dog varieties, and is probably bred between the smaller spaniel or King Charles's dog and the poodle. Its hair is extremely long and flowing, so much so that its ears and eyes are nearly concealed from view by it. It is used as a lapdog.

Section 6. Fowlers, or dogs whose natural inclination is to chase and point birds, and hunt singly by the scent

The *Springer.*—This variety is shaped much like the English setter, but shorter in the body and legs in proportion to his size, being about two-fifths less than that dog; the hair is long and shaggy, and the ears very long and pendulous, and covered with long waved hairs. He is usually of a white colour, with patches of liver-colour or chestnut. He is, however, sometimes black, and at other times entirely of a liver-coloured brown.

The following circumstance occurred in 1793, at Uxbridge:—A fine springer, who, during the heat of the sun, was in the practice every day to enjoy the shade of a stately elm, the pride of that part of the country, one evening was observed to quit his favourite retreat rather suddenly, and plunge into an adjoining pond. The singularity of the circumstance induced the attention of the gentleman to whom the dog belonged, who, on approaching the pond, discovered the poor animal panting in the water, with the extremity of the mouth only above the surface; on dragging it on shore, it died in great apparent agony. The body was opened, when the throat appeared much inflamed and swelled. Various conjectures were formed on the occasion, but the cause remained undiscovered. Some weeks after, a hornet was discovered in the village, and, as is usual, a long thread was fastened round the body, and let fly, that, on returning home, its nest might be discovered. It was traced to the very tree under whose branches the poor animal was wont to repose, and who, it now appears, had most probably been stung in the throat by one of these poisonous insects. On examining the tree, a numerous nest was found; and in endeavouring to smother the latter, the former was consumed.

The following singular instance of animal adoption occurred in 1794, at Dyon's Hall, Essex, the seat of J. Sparling, Esq.:—A favourite spaniel bitch, remarkable as a hare-finder, having had her puppies drowned, went out one morning into the plantation, and soon after returned with a young leveret, about a week old, in her mouth, which she suckled.

About the year 1790, after a severe run, a fox was earthed; in digging for which, some cubs were found which were yet blind; two of them were killed by the terrier bitch which accompanied the pack: next morning she was shown the three remaining cubs, which she immediately adopted and suckled, and brought them up with as much care and fondness as if they had been her own whelps. What renders this circumstance the more remarkable, the terrier pups were upwards of a month old, and had been taken from her some days previously.

The *Cocker* is about a third less than the springer, and like it in all respects. It is used as well as that variety for raising woodcocks and snipes, in which exercise they are both very expert.

A lady had two dogs, Perdue and Vixen; the one a cocker, the other a terrier. These dogs were great favourites, and generally in the lady's sitting-room. Sometimes it happened that they were ordered out of it, and the humour shown on this occasion was whimsical. If Perdue was first ordered to quit the room, she rose reluctantly, but always went and seized hold of the ear of her companion Vixen, and so forced her out also; and if Vixen had the command given her first, she never failed to perform the same ceremony on Perdue, when they together contentedly sought another place of repose. It so happened that these favourites had puppies at the same time, all of which, except one, were drowned. About this single puppy the mothers were for the space of a week continually quarrelling, after which they were observed to agree perfectly well. On watching them, it was discovered that one mother nursed the puppy during the day, and then resigned her place to the other, who nursed it through the night.

A Mr Forbes of Glasgow was in possession of a little spaniel, who gave strong proofs of his having an ear for music. One day, when lying below his master's chair, in a room where a few friends had met, the conversation turned upon the sagacity of dogs, when Mr F. said his little dog never failed to show his displeasure, if he happened to make any discordant notes when playing on his flute. In order to try the animal, and to satisfy those in company, a flute was produced; and while he played a tune without introducing discords, the canine amateur raised his ears, and listened to the melody with evident signs of satisfaction; but in the middle of it, when he introduced some inharmonious notes, he got out from under the chair, and barked most furiously in the face of his master, till he changed the tones to others more consonant to the taste of the little musical quadruped, which at once allayed his rage.

On Wednesday, the 23d of July last, a child (says a letter from Paris, of 12th August 1783) thirty-five months old, belonging to a Swiss, a porter to Monsieur de Caumartin, provost de Marcha, or mayor of this city, disappeared between six and seven o'clock in the evening; at the same time, the father missed a favourite lapdog. The few hours that remained of the Wednesday, and the whole of the following day, were employed in search of the child; every place and corner was looked into, but to no purpose. At length, on the Friday, about eleven o'clock in the forenoon, the valet-de-chambre bethought himself of a reservoir of water, situate at one end of the dwelling-house. On a kind of terrace that leads to it, stands the door of a store-room, from whence the servant heard the howling of a small dog; he opened the door; the liberated animal, being tormented with thirst, went to the water, and returned in haste to the store-room. Word was brought to the Swiss that the dog was found; but how light and insignificant was such a comfort to the parents who were lamenting the loss of a child! But it soon appeared that the dog and child had been shut up in the store-room ever since the preceding Wednesday. The faithful animal, seeing that none of the signs he made were understood, returned to the room where the babe was, plunged in the deadly slumbers of inaction. The little dog gently dragged the child to the terrace, and thinking to have secured the child's life, he ran skipping to the porter's lodge, now and then turning his eyes and head towards the place he had just left. His mute language was at last understood; he led the way, and the joyful parents were so happy as to arrive soon enough to restore to life their long lost and almost expiring child.

When St Michael's bridge fell, a child was buried in the ruins, but luckily slipped in between two beams, which supported each other in such a manner as not to receive the least hurt. A small cocker dog happened to fall in the very same condition, and not being able to escape, barked incessantly. The noise attracted several people, one of whom released the animal with much difficulty; but the poor creature's joy was not of long duration, when it no longer beheld its infantine companion. It ran to the place, jumped into its former situation, and continued barking till they were both released.

The *King Charles's Dog* is still less than the cocker, and distinguished by the very great length of his ears.

The *Comforter* is another diminutive variety of this race, chiefly used as a lapdog. It is supposed to be a cross between the Maltese and King Charles's dog.

The *Maltese* and *Lion Dogs* are descendants from nearly the same stock.

The *Alpine Spaniel.*—This dog exceeds all other varieties of the spaniel for size and beauty. Its usual height is two feet at the shoulders, and he is six feet in length from the nose to the tip of the tail. Two of these dogs are sent out from the monasteries of the Alps of Switzerland, to scour the mountains during snow-storms, in search of lost or wearied travellers—the one with a warm cloak fastened to his back, and the other with a basket tied round his neck, containing a bottle with some cordial, and bread. In this employment they manifest great judgment, and seem to understand perfectly the import of their mission. They are frequently of the greatest use in meeting the travellers who in those stormy and dangerous regions often fall victims to the inclemency of the weather. It is said that if they meet with a traveller who has sunk under the fatigue and inclemency of the blast, that they will lie close to him, until by their warmth they restore heat and energy to the animation which is nearly suspended, and thus frequently will save the life of the sufferer. Should they discover a traveller to have fallen into some deep pit or fissure, from whence he is unable to ascend, and if they are unable to render him any assistence, they will return to the convent, and give the alarm to the monks, and then conduct them to the place where the unfortunate traveller is immured.

The *Old English Setter.*—It is supposed that this breed was produced between the large water-spaniel and the Spanish pointer: they were much more curled than the present breed of setters, and were very steady in the field, but not so rapid in their movements.

The following may be relied on as a fact:—In 1795, a clergyman in London was possessed of an old English setter dog, which had a strange custom of going every morning, during the summer season, to the New River, and plunging into the water, after which immersion he trotted home again in a very orderly manner. This peculiarity attracted the attention of another clergyman, who in his morning walks had more than once been a witness of the fact, to his no small entertainment. Nor did he escape the notice of the dog; for honest Rover, finding he had crept into some little favour with the parson, resolved, as will appear, to cultivate a farther acquaintance. Upon one of these occasions, instead of making the best of his way homewards, he made bold to arrest the clergyman, by seizing the skirt of his coat, rather sportively, indeed, than with any vicious or sanguinary intention. But yet he seemed unwilling to let go his hold. The oddity of the circumstance, as may be imagined, awakened the curiosity of his prisoner, who, wisely thinking it would be to no purpose to remonstrate, put himself under the conduct of his canine companion, and walked on, musing on the whimsicality of the adventure, at the same time what would be the issue.

> "Around from all the neighb'ring streets
> The wond'ring people ran,
> And said the dog had lost his wits
> To follow thus the man."

Through many byways and windings did they travel, till at length Rover released his captive, and made a *set*, which was saying as plain as a dog could say, that their journey was at an end. So in fact it was. And now the last act of civility remained to be performed on the part of the dog, which he acquitted himself of (to his credit be it spoken) very handsomely, never losing sight of his charge until he had introduced him to his master. The *denouement* was not inconsistent with the whole tenor of the dog's deportment, the clergymen having contracted an intimacy, and lived on habits of the greatest friendship ever afterwards.

The *English Setter* is a mixed breed between the water-spaniel, Spanish pointer, and the springer, which has attained a very high degree of perfection as a sporting dog. He is one of the most beautiful, lively, and active of dogs.

The *Spanish Pointer* is the stock from whence the English pointer has sprung. He is one of the most staunch of all dogs used in the sports of the field, although he is considered too heavy for the present improved mode of sporting, and has now nearly become extinct in Great Britain.

A pointer dog, which was brought from South Carolina in an English merchant vessel, was a remarkable prognosticator of bad weather. Whenever he was observed to prick up his ears in a listening posture, scratching the deck, and rearing himself up to look to windward, where he would eagerly snuff up the wind—if it was then the finest weather imaginable—the crew were sure of a succeeding tempest; and the dog became so useful, that whenever they perceived the fit upon him, they immediately reefed the sails, and took in their spare canvass, to prepare for the worst.

The *English Pointer* was obtained by a cross of the Spanish pointer and fox-hound, and is unrivalled for the rapidity of his movements in the field, and the beauty and symmetry of his form. Since his first production, he has been improved by being re-crossed with the harrier. He is subject to considerable variety in point of size.

Pointers have not unfrequently been known to point otters. In the beginning of February 1792, as two gentlemen were sporting in the fields, in the parish of Pilton, in Devonshire, their pointer stood at a brake in a hedge-row. When they came to the spot, suspecting it to be a hare, the pointer rushed in, and out burst a large dog-otter. The pointer seized him, though he was soon obliged to quit his hold, having been sorely bit; but after driving him about for some time in a turnip-field, they struck him several violent blows on the head, and killed him. What is rather singular, it was at a distance of at least five miles from any river where this animal was found.

"I have frequently endeavoured," says a sportsman, in the third volume of the Sporting Magazine, after stating that he has a pointer bitch, the equal of which he had never met with, although hunted with numberless first-rate dogs, "to learn of my sporting friends what were the most valuable qualifications of a pointer. Their different replies were, to find the most game, steady when found, to back the find, come into charge, bring the game, &c. &c.—(this last quality is now exploded). I will add, in my opinion, the greatest of all qualifications in this list, and that is, when, having several times found a straggling bird, or birds of a scattered covey, at a remote part of the field or heath (for she ranges wide), but sufficiently within rake, in making the point more frequently trod upon one or more birds (perchance I killed), the game has often dropt in her sight, and several times within a few yards of her; and provided the game at her nose withstood the first report, I never yet lost the advantage of her find. At two years old she first acquired this habit, being out with a friend the season before last (1791). In beating the first snipe-ground we came to, she being soon found in making up, within about thirty paces of the point, I sprung a snipe; it fell close before her; she turned her head towards me, as if to rebuke me for trying her patience so long; then to the point as before. I rather delayed reloading, as I was foremost, and wished my companion the shot; but he declining, I walked on, and trod up the jack-snipe, which she highly enjoyed to see drop to him. That same day, at the request of my friend, I made a mark in my pocket-book of every point she had, and at the close of that day's sport, her performances of finding amounted to thirty-two brace and a half of snipes, two coveys, and a single bird, of partridges, notwithstanding I hunted her with another brace, her half brothers, one year older than she was, and allowed, by the first judges, to be as excellent dogs as any in the kingdom. In the course of December 1792, and three following months, I killed to her nearly two hundred brace of snipes, and, upon a fair calculation, her *finds* were five to her constant companion's one."

A gentleman who lived in Stockport, and who was a keen sportsman, had a pointer, which evinced on many occasions great sagacity, but it did so in an especial manner in 1793. Having one day been led farther than he intended, by the wildness and continued evolutions of the covey he was in pursuit of, at length he only began to think of returning when the curtain of night had been drawn around him; being unwilling to return through the many windings by which he had advanced, and thought of shortening the distance by returning through an almost trackless path. He had travelled this way, but not for many years; he therefore kept the route he had formerly known, by the side of the river Mersey, whose stream had in one place undermined its banks, and left only the turf remaining above, twenty yards from the surface of the water. When he reached this place, it sunk with his pressure, and he must have inevitably perished, had not his gun, which he carried under his arm, caught two trees that had inclined, but not totally uprooted. Here he must have remained while his strength enabled him, or have fallen into the muddy depths of the river, had not one of his faithful dogs rescued him from his perilous situation. Had he himself attempted to move, his gun would have lost its hold; and he felt quite at a loss what to do, when his faithful dog, seeming to be aware of his danger, ran about in despair, whining, and at length gazing at him with an expression indicative of his strong desire to release him; then seized him by the collar of the coat, and absolutely drew him from his pendant situation. The gentleman, when delivered, lay for some time on the ground, thunderstruck and motionless, hardly able to fancy himself safe. His faithful dog watched him with apparent solicitude; but when he perceived him rise, he bounded round the field, in an ecstacy of transport, leapt up as high as his head, again bounded about, and used every other conceivable gesticulation to manifest his joy.

The *Small Pointer*.—This is a diminutive breed, being only about two feet from the point of the nose to the tip of the tail, and scarcely a foot in height, and is a complete and beautiful miniature of the large pointer. They have proved themselves excellent sporting dogs, but their small size renders them unfit for use in rough land.

The *Russian Pointer* is much like the Spanish pointer in shape, but his hair is long and hairy.

The *Dalmatian* is that well-known dog which is used as an attendant upon carriages. He is a handsome dog, and the spotting on his skin gives him a beautiful appearance. He is a native of Dalmatia, in European Turkey, where he is used as a pointer.

Section 7. Hounds, which hunt in packs by the scent.

The *English Terrier*.—This beautiful dog is too well known to require any description. He is possessed of great courage, and is famous for killing all kinds of varmin, and is a useful attendant upon a pack of fox-hounds, for getting into the earth when the fox has taken to his hole, and driving him out. His hair is smooth. His general colour is black, with tanned cheeks, and the insides of his legs are of the same colour. They are now to be met with of a brown, and even white colour, but these have unquestionably an admixture of some other breed in them.

The *Scotch Terrier*.—This breed has short wiry hair, and is much shorter in the legs than the English terrier. His usual colour is sandy, but he is also to be found black, and also grey. He bites with great keenness, and is a bold and determined dog. He will attack dogs of any size; and when he fixes on an animal, he maintains his hold with great pertinacity. He is much used as an attendant upon packs of foxhounds.

In 1822, an engagement took place on the banks of the Monkland Canal, Scotland, between a terrier pup and a weasel. After varied success on the part of the combatants, they went into the canal, where the pup was gaining a decided advantage, when the weasel seized him by the snout. To get free from such a perilous hold, appeared impracticable; and the terrier, as if aware of the only way to terminate the struggle, thrust his head under water, and drowned his adversary.

Mr Webster, of Leven, had a dog of the terrier kind, but in appearance resembling a Dutch pug, with which Mr W. Keith, portrait-painter, amused himself lately by taking a likeness. On the picture being shown to the animal, he ran off, and has not since been heard of; he had been ten years about the house. This reminds us of the story of Northcote, the celebrated pupil of Sir Joshua Reynolds, who made a portrait of one of Sir Joshua's servants so like, that it was mistaken by a tame macaw for the man himself; and the bird having a grudge at him, flew on the picture with beak and claws, considering his quietness there only as a good opportunity for getting revenge.

The *Talbot* is one of the primitive breeds of British dogs, and is the same which was used by the ancient Britons in the chase of the deer, and other wild animals. Several gentlemen in the town of Presteign, in Radnorshire, were concerned in a pack of hounds of the Talbot or southern kind. The gentleman who had the principal care and management of them, one day met with a badger, in November 1793, which he determined to turn out before his hounds. This he did the next day, and the badger had ten minutes' *law* given to him; they took him alive, and bagged him in reserve for another day's sport. They ran him three miles only, this first day.

On the second day, they had a very numerous field of horsemen; they turned the badger out, to give him half an hour's *law*; and being determined to have a better day of this, the manager, who was mounted on a very fleet bloodhorse, rode after him, to flog him on, that he might be as far as he possibly could, before the hounds were put on; and he assured us, that it was with the greatest difficulty he now and then got a cut at him, with a very long hunting whip, for the badger ran so fast. At the end of the half hour, the time allowed him, the hounds were put on, and they ran him *twenty-five miles*, in full cry all the way, when he was again taken alive, and bagged; for which purpose, the huntsman carried a bag under his saddle. He was again put by in reserve, for another day's sport, when a Counsellor Jenkins, of that town, begged, if they should kill him the next run, that they would give him the hams, as he would have them cured; it being a very common practice of that country to cure the hind-quarters of badgers, and eat them for hams.

The next day they turned him out, giving three quarters of an hour's *law*, resolving, if he could get away, they would not prevent him. They flogged him in the same manner as they had done before, but notwithstanding the extra time they gave him *law*, they only ran him eighteen miles, before they took him alive, and bagged him. This was the third time he had escaped death. He was again conveyed back to his habitation, to be preserved for some future sport; and all the sportsmen returned, hoping to have the pleasure of spending another day at the expense of this extraordinary animal; but in this they were much disappointed, owing to the neglect of the huntsman, whose omission of providing him with food caused the poor animal to die of hunger.

Bloodhound.—It was this dog which was so much used in former times for tracing criminals who had committed murder, as also the remains of murdered persons. He is a large and bold-looking animal, and possessed of great strength. He can discover the scent of a man or animal hours after they have passed over the ground.

On the night of Tuesday, January the 22d, 1822, a labouring man, named Tipper, of Forestside, Stenstead, had a fat hog, of twenty stone, stolen from his stye. He made application to the park-keeper of Lewis Way, Esq., to assist him in its recovery. A couple of sleuth-hounds were laid on, which ran on trail six miles and a half, to the door of a cottage in Westbourne, where James Goble was taken into custody, he having killed the hog and cleaned it.

In the island of Cuba, a certain species of bloodhound is trained to hunt and destroy the negroes who escape from slavery, just as in England the dogs are instructed to pursue hares and foxes. In that island, and in other islands to which these bloodhounds are transported, such is the ferocity of their nature, that, unless they were chained up, or kept in confinement, no negro would be safe. In the island of Hispaniola, during the late revolution which gave independence to the black population, many families were torn in pieces in the woods by these ferocious animals, stimulated to these deeds of barbarity by the inhuman white men. To go a negro-hunting with bloodhounds, was, in the last-mentioned island, a sportive employment, which existed before the French revolution began; and frequently, as soon as the fugitive negro was overtaken, his head was severed from his body. The latter was then given to the dogs for their repast, while the former was carried in triumph to the appointed office, to procure the offered premium, with which the hunting vagabonds of Hispaniola thought themselves honourably rewarded. It is obvious, from hence, that a similar training under the blacks would call forth the canine appetite against the whites; and that against persons of either colour, the ravenous disposition may at times break from all artificial restraints, through the influence of exciting causes with which mankind are but imperfectly acquainted.

The *Staghound* is the largest of all the British dogs of the chase; he has a noble and dignified aspect, and possesses great sagacity and endurance in the chase; this dog is also supposed to be a direct descendant of one of our original British dogs.

The *Foxhound* has a much larger muzzle than the staghound, and his head is small in proportion to the size of his body; his ears are very long and pendulous, although less so than those of the staghound and bloodhound.

A foxhound bitch, belonging to the Kirlington Hunt, near Bolton, on Thursday the 8th November 1792, during the chase, pupped four whelps, which she carefully covered in a rush aisle, and immediately afterwards joined the pack. In a short time after, she pupped another, which she carried in her mouth during the remainder of a hard chase of many miles, to the great astonishment of a number of spectators, after which she returned to the place where she had dropped the four.

On the 20th November 1792, Mr Willoughby's foxhounds had one of the longest and most severe runs ever known in England. They unkennelled a fox at Skusely-wood, near Hull, which was killed seven miles beyond Black, after a run of four hours and ten minutes, with only one short check. The ground they went is calculated at fifty-one miles, over a very deep and strong country. The only persons in at the death were the two whippers-in, Lord Carlisle's stud-groom, and a gentleman of the name of Leatham. Thirty couple of hounds went into the field, nineteen of which were in at the death.

A female fox, with her litter of cubs, were taken to Blackmore Park, the residence of T. C. Hornybold, Esq., and an outbuilding on the premises appropriated to the crafty family as a nursery. Impatient, however, of restraint, and having become convalescent, Madame Reynard escaped the first opportunity to her native haunts, abandoning her progeny to chance. It happened that about this period a favourite hound of Mr Hornybold's had destroyed her whelps; and although she had for six years distinguished herself as a determined and relentless pursuer of the species, it was resolved to place the cubs within her kennel; the anticipated result was their instant destruction; but the generous animal, on the deserted little ones being given to her, instantly softened down the sterner qualities of her nature, and adopted them as her own, suffering them immediately to suckle, and continued to foster and nurse them with every appearance of maternal attention and anxiety.

Mr Hazland's Kentish foxhounds had a famous chase of nearly five hours, in January 1822; in the course of which, the fox crossed the orchards and leaped the garden-wall at Shieldwich, and secreted himself under a water-butt; but finding he was discovered, he again mounted the wall, and, repassing the gardens, darted through the kitchen window of a lady of the name of Beck, and thence into the parlour, and there seated himself. Being quite spent with fatigue, he here suffered himself to be quietly taken alive.

The following circumstance proves that the dog will in some instances devour human flesh, and we believe it is not uncommon for wild dogs to do so:—On Friday, the 5th January 1793, as the hounds of Mr Gordon were hunting at Whitley Shrubs, near Seven Oaks, in Kent, a hound was perceived with a head in his mouth, which, on examination, proved to be a human one; and, in searching the wood, the remaining part of the body was found, with the flesh all eaten from the bones, and supposed to have been there from October 1792, at which time a boy was lost from the workhouse at Heresford, and who was then advertised, but not since heard of.

On Monday, November 25, 1793, a bag-fox was turned off in the parish of Paglesham, in Roachford Hundred, Essex, which afforded much diversion in that neighbourhood, and, after a long chase of hard running, took across the water to Creeksea, in Dengie Hundred, where he was pursued by four of the best hounds, Drummer, Blueman, Tyser, and Trueman. The three young hounds took the lead after crossing the water; but being rather eager, quite lavish, and no way to be depended upon, overshot the fox, leaving only poor Trueman in the chase. Trueman, however, came up with reynard, fastened upon him, and a strong contest ensued; but poor Trueman being rather lame, and otherwise much disabled, reynard broke from him, and ran off in full view of the three young hounds, without their stirring one step to pursue him.

Mr Newman, in Essex, had a pack of foxhounds, which were remarkable for their staunchness. On Monday, December the 2d, 1793, they found a fox at Broomfield Hall-wood, near Chelmsford, and, after a chase of more than twenty-six miles, without the least check, ran into him, as he was attempting to get into Lord Maynard's garden, at Dunmow, and killed him. It is worth remarking, that the hounds pursued the fox through several herds of deer, and amazing quantities of hares, in Lord Maynard's park, with a steadiness not customary to some crack packs which sometimes hunted that country.

A little after nine o'clock on Saturday morning, the 7th December 1793, Mr Curwen's hounds started a fox upon Moutray, which they pursued through the line of woods from Isell to within a very short distance of Whitefield, when he took up the side of Skiddaw, and went clear over to Threlkeld; then skirting the mountains towards Ormthwaite (the seat of Dr Brownrigg), he ascended Skiddaw a second time, passing over the highest parts of it, and crossing in his route a considerable drift of snow. Night coming on, the foot-hunters durst pursue him no longer, and most of the dogs were with difficulty taken off. The whipper-in followed the greater part of this very remarkable chase on Miss Frances, the mare which had won the hunter's whip at Carlisle, on the Thursday previous. They who know the country will be astonished at this relation; every circumstance of which is, however, matter of fact. For extent and difficulty of ground, this chase has probably never been exceeded; and perhaps it is not easy to instance one in which it has been equalled.

In 1794, a singular accident happened to Mr Roche's foxhounds, in Pembrokeshire. In a thick foggy day, four of the best hounds were lost in the Hook Wood; and, notwithstanding the strictest search was made by the colliers in the coal-mines, and a considerable reward offered, no account whatever could be had of them. About three weeks afterwards, a collier fancied he heard a noise in a pit near the road-side; he procured a rope, and let himself down, where he found one bitch alive, and in excellent condition, the skulls of the others, and a small one, like that of a fox, quite picked to the bone, and the hind-quarters of one of the dogs whole.

The *Harrier*.—This dog is used in hare-hunting, and was originally obtained by a double cross between the small beagle, and southern hound. He is very eager in the pursuit of the hare. There are few instances of any of the deer tribe being hunted with success by dogs of so small a description as harriers, therefore the following deserves to be recorded, being rather an uncommon feat:—

On Friday, the 4th January 1822, Mr Best and some of his friends enjoyed a great treat in hunting a very fine doe, which had been known to be resorting in the woods near Rochester eight or ten days before, and having been seen by a woodman, Mr

Best was informed where she might be found. That gentleman took out ten couple of his harriers, and soon discovered her. The doe came out into a large lay field between the woods; and as if to display herself, and bid defiance to her pursuers, bounded about the field, full of pride and fire, in the finest style, exhibiting to the spectators one of the most beautiful sights imaginable. She crossed the turnpike road, from wood to wood, several times, seeming determined not to leave her haunts; but after being hunted about for half an hour, and closely pressed, she broke cover to the eastward for Chatham, where, being turned on the road, she made off behind the town of Streetend and Luton, and from thence along the Suttonton vallies, for Lord's Wood, which she made; but on the hounds coming up, she headed back again into the open fields, and then took a direction for Shartstead and Hemstead, and through the greater covers belonging to the crown, once the estates of the Earls of Aylesford and Thanet, in the neighbourhood of Bainham, through Mr Stacy's preserves at Stockbury, and was at last killed between Stockbury and Binbury, after a run of exactly three hours, in which the harriers scarcely came to a check. This chase excited the astonishment of all who witnessed it, as it was supposed impossible that a few low-scented harriers could overtake an animal possessing such strength and speed. Five of the horsemen only were in at the death.

On Tuesday, the 20th November 1822, the harriers belonging to Mr Hill of Press, and Mr Roberts of Wem, had one of the longest and severest runs ever perhaps known to have been performed by a pack of harriers in this kingdom. They started a fox on Twamlows Moor, and he was killed under Beeston Castle, in Cheshire, after a run of at least sixty miles! Of thirty horsemen that started with the hounds, only six were in at the death.

In February 1793, an extraordinary circumstance occurred with Mr Palmer's harriers. Finding a hare at Sonning, she made a circle to the turnpike road near Twyford, where, with an excellent chasing scent, the hounds pressed her closely; she swam the deepest part of the river Loddon, followed by the hounds with the rapidity of a fox-chase, leaving a numerous field of horsemen to explore their way through the only passable part of the river, which, with the waters being out, was up to the skirts of the saddles for half a quarter of a mile, before the opposite shore could be gained: this they had no sooner accomplished, than the hare, making a semicircle on that side, recrossed the river near Hurst Lodge, in so rapid a part that many of the hounds were unable to recover the land, but were extricated by the hunting whips of the company; though it was much to be regretted that neither her fortitude nor her sagacity could resist the severity of her fate, the leading part of the hounds having run into, killed, and consumed her, before a single horseman could get in to save her—a matter that had been previously determined on, could it have been luckily effected.

On Monday, December the 16th, 1793, the hounds of Mr Snep, of Haremare, immediately after killing a hare, struck off on a fresh scent, which was supposed to be from the foot of another hare; but after following it a while, the game appeared in view, and proved to be a marten-cat, which produced most excellent sport. The little animal was treed and dislodged six times before it was killed. But the most extraordinary circumstance that attended this hunt, was that of a man's flushing, and catching a woodcock as he was preparing to climb a tree after the marten.

The *Beagle* is the smallest of the dogs of the chase. He is possessed of a very acute sense of smelling, and pursues the hare with unwearied steadiness, and what he wants in speed and strength he makes up for by his perseverance.

The *Otter-Hound* is a cross between the large southern hound and the large rough terrier. He has a large head with pendulous ears, and his whole fur is of a wiry texture and rather long; his colour is either sandy or black. Otter-hunting was a favourite sport in ancient times, but is now nearly lost in this country.

The *Bull-Terrier* is a cross between the bull-dog and the terrier, as its name implies, and has now assumed the character of a distinct breed. It is much used by the gentlemen of the fancy as a fighting dog.

Section 8. Mongrel hounds, which hunt singly, either by the scent or eye.

The *Lurcher* is a cross between the greyhound and harrier, and re-crossed with the terrier. His limbs are strong; his head less sharp than that of a greyhound; his ears are short, erect, and half-pricked; and his hair coarse and wiry. He is much used by poachers, and is famous for killing rabbits, as he has a fine scent, and runs his game without giving tongue.

The *Leymmer* and the *Tumbler* are imperfectly known dogs, which are now nearly, if not entirely, extinct. They hunted both by the scent and eye.

The *Turnspit* is a small dog with a long body and short crooked limbs, and was much used in turning the spit before the invention of jacks.

Division III.—With short heads.

Section 9.—Watch-dogs, which have no propensity for hunting.

The *Mastiff* has a large flat head, and a short and blunted muzzle; his lips are full, and hanging considerably over the lower jaw; his ears, although rather small, are pendulous. He has a sullen and grave aspect, and is excellent as a watch-dog; his voice is loud and deep-toned. He is a dog of large size, and is supposed to have been produced betwixt the Irish greyhound and bull-dog.

The following anecdote of the ferocity of a mastiff is recorded by Colonel Thornton in his Sporting Tour:—"After breakfast, having advanced the carriage and horses a mile, as we walked smartly on, an accident occurred which had like to have proved serious. A favourite pointer that attended us happened to be playfully rambling about, when on a sudden he was attacked by a very large and furious mastiff, which rushed forward, and apparently with an intention to destroy him. We immediately interfered, and the attack in an instant was changed from the pointer to us. Mr P—— had no other offensive weapons than stones, which he threw at the creature, who, contrary to the general custom with these animals, valued them not, and was in the act of flying at my friend, when I gave him the severest crack I could with my gig-whip. This changed the attack to me. I had no defence but parrying as skilfully as I could with my whip and my hat; the latter I took off, to allow him to seize it when he had broken the whip, which he soon did, and intended, as soon as he had firmly seized the hat, by some violent kicks on the tender parts of his belly, to defend myself, or rather to defeat my antagonist—a way, when at college, and priding myself on this *métier*, I have often effected on my very superior master in this mode of fighting, Mr C—n. But courage is all custom; and had not the owner fortunately come to our assistance, roused by Mr Gerard, who had no offensive weapon but his delicate *gollette* and more delicate brush, I rather fear I should only have been second in the contest; for a more ferocious or much larger mastiff I never saw."

A mastiff bitch, belonging to a butcher in Greenock, had a practice of hiding part of her provisions in a neighbouring wood. On one occasion her store was plundered, and it appears she had discovered, by the smell round the place, that the theft had been committed by pointers, as she has ever since had a strong antipathy to pointers, and attacks them on every opportunity. A gentleman wished to have some pointers nursed by her, and for this purpose her own pups were drowned, and the young pointers put in their place. On the following morning, when the gentleman went to see his pups, he discovered, to his astonishment, that they had been devoured by the mastiff bitch, and nothing remained of them but the claws of their feet.

A mastiff bitch, belonging to Mr William Fyfe, in Rutherglen, in June 1823, littered nine pups, one of which was dead. To this dead carcase, however, she was more attached than all the rest of her family, and resisted with great bitterness any attempt to deprive her of it. She kept it in this manner ten days, after which she took the putrid remains in her mouth to the garden, where she dug a hole, in which she deposited her defunct offspring, and with mournful howling carefully covered up the grave.

A gentleman, some years since, who resided in Macclesfield, possessed a large mastiff dog, remarkable for his great sagacity. One day a maid-servant belonging to the house, being particularly busy, desired a poor woman, who occasionally paid them a visit, to go into the market and purchase some vegetables, which were wanted for dinner. The poor woman excused herself by saying that she had no shoes fit to wear in such a public place. The servant, in reply, said that she should put on an old pair belonging to her master, which were then in the kitchen. The woman, thus equipped, set off to the market, where she was unfortunately met by the dog that had been out on his rambles. The dog, on coming near, began to examine her feet; when, discovering his master's shoes, he attacked her, threw her on the ground, pulled off the shoes, and with them marched home in triumph, leaving the poor woman to return barefooted to tell her mournful tale.

The *Bull-Dog*.—This dog is remarkable for the depth of his chest and the strength of the whole muscles of his body. His head is large, flattened above, and his muzzle much blunted, with the under jaw projecting considerably beyond the upper one; his eyes are set far apart, and project considerably from his head; his power of smelling is less acute than any other of the canine race, on which account he is a dangerous dog, for he frequently has been known to lay hold of his master without discriminating the difference between him and a stranger. He is the boldest and most obstinate of all dogs, and has been known to hold his adversary so determinedly, that his legs have been cut off without making him desist.

Many instances have been recorded of the invincible courage of the English bull-dog, but we scarcely recollect one in which so much unconquerable spirit and tenacity of life have ever been displayed, as on the following occasion:—A short time since, a large dog of this species, from some cause that was not observed, suddenly flew at a fine cart-horse that was standing at the end of the salt-house dock, Liverpool, and, fixing his lacerating teeth in his shoulder, defied every effort to get him off. At first he was beaten with cartwhips and sticks with such fury as seemed to break his bones; but this being unavailing, a carpenter with an adze in his hand came up and beat him with the blunt iron head of the instrument, till it was thought he had pounded him to a jelly; but the dog never moved a tooth. A man then took out a large pointed clasp-knife, with which he stabbed him repeatedly in the back, loins, and ribs, but with no better success. At length, one of the spectators, who appeared to have more strength of sinew and arm than the rest, squeezed the ferocious beast so tightly about the throat, that at length he turned up the white of his eyes and relaxed his jaws. The man threw him off to a distance, but the dog immediately went round the crowd, got behind the horse, and again seized him by the under part of the thigh. As no terms could now be kept with this untameable brute, he was again loosened, and thrown into the dock to drown. He instantly, however, rose to the surface, when a sailor struck him a supposed deadly blow on the head with a handspike, which again sent him to the bottom. He arose once more, and was again sent down in the same manner, and this process was repeated five or six times. At length one of the bystanders, who either possessed or assumed some right of property in the dog, overcome by his amazing tenacity of life, and weary of persecution, got him out, and walked off with this prodigy of English courage, to all appearance very little worse for the horrible punishment he had undergone.

On Monday, February 18, 1822, a large brindled bull-dog flew at a gentleman's cabriolet horse, in Mount Street, Grosvenor Square, and, horrible to relate, fastened on the poor animal's shoulder, where he held on with the most surprising tenacity. The gentleman leaped out, and providentially escaped with his life, as, in a second after, the horse set off at full speed, the dog hanging to his shoulder, when, turning into an adjoining mews, the cabriolet upset, and the owner of the dog with difficulty got him off, no other person daring to approach him. The horse then fell from exhaustion, when the traces were cut, and the poor animal was extricated.

The *Pug Dog* is descended from the bull-dog, by a cross with the small Danish dog, and resembles the former so much in appearance, that he may be considered as a miniature of that variety. He is a useless dog, without a single quality but his ugliness to recommend him.

MISCELLANEOUS DOGS,

Whose varieties are not known.

THE ISLE OF DOGS.

The servants of a gentleman who had a house near the river's side, opposite to the little island in the river Thames called the Isle of Dogs, observed that a dog came constantly every day to them to be fed, and as soon as his wants were satisfied, took to the water and swam away. On relating this to the master, the gentleman desired them to take a boat and follow the dog the next time he came. They did so; and the dog, on their landing, expressed, by his emotions, great pleasure, and made use of all the gestures in his power to invite them to follow him, which they continued to do till he stopped, and began scratching with his foot on the ground, and from that spot he would not move. Either that day or the next, they dug up the earth in the place, and found the body of a man, but it was impossible to discover who it was; and after every requisite step had been ineffectually taken to find out the murderer, the corpse was buried, and the dog discontinued to visit the island. The gentleman, pleased with a creature which had shown such uncommon sagacity, and that faithful attachment to his former master, caressed him greatly, and succeeded in gaining his attachment; he became an inmate of his domicile, and made him the frequent companion of his walks. When he had possessed the faithful animal for some time, he was going to take a boat at one of the stairs in London, when the dog, which had never before been known to do such a thing, seized one of the watermen. The gentleman immediately thought that this fellow was the murderer of the dog's former master, and taxed him with it; and he directly confessed it, on which he was taken into custody, and soon afterwards suffered for the crime.

WILDBRAT.

The fidelity of the dog is immortalised in the noble order of the elephant, instituted by Christian the First, king of Denmark, so far back as the year 1463. The origin was, his being deserted at a most critical period by all his friends and courtiers, at the time he stood in great need of their assistance; and having a favourite dog, called Wildbrat, who loved and constantly attended him, the contrast between this grateful animal, and the infidelity of the vipers he had formerly cherished, struck him so forcibly, that he commemorates the fact by having the following initials placed under the elephant's feet, which hangs at the bottom of the order:—

T.I.W.B.—*Trew* is Wildbrat.

THE REBEL'S DOG.

At the battle of Ballynahinch, Ireland, one of the insurgents who fell in the engagement was followed by a dog. The faithful creature for three days lay across his master's bosom, until he was buried, and then for some time afterwards constantly attended his master's grave, except at intervals when hunger forced him into town in quest of food. His remarkable attachment and fidelity being observed, a person took him under his charge, who, by caressing him, and kind attention, so gained his affections that he seemed at last to forget his grief for the loss of his unhappy master.

DUMB ELOQUENCE.

In the severe winter of 1783, a hairdresser at Hanover went out of the city gate, in the dusk of the evening, with one of his friends, who had business at a neighbouring village, in order to show him the road. As the ground was then covered with snow, they were but a short way in the country, when they met a dog, who came running from a track which lay out of their way, and by his whining and piteous gestures seemed desirous to gain their attention. On their noticing him, he ran back a little part of the way, then returned to them, and, by his actions, indicated his desire that they should follow him. Struck by the expressive countenance of the dog, they agreed to follow him, and therefore turned towards the way from whence he came. They had not gone many yards, when the dog, by his frisking about, appeared to express great joy at this circumstance. He then continued running a little way before them, and at times returned to point out to them the road from whence he came. After following him for some time, the dog suddenly stopped, when, on examining the place, they discovered the body of a man, apparently frozen to death, around whom the dog went moaning in a piteous manner. They conveyed the body to a neighbouring village, where, by proper care, suspended animation was restored; and the dog was thus the providential preserver of his master's life.

MUTUAL ATTACHMENT BETWEEN A DOG AND A HORSE.

The late Mr Thomas Walker, of Manchester, had a dog, which was accustomed to be in the stable with two of his carriage horses, and to lay in a stall with one of them, to which he was particularly attached. The servant who took care of the horses was ordered to go to Stockport (a distance of six miles), upon one of the horses, and took the one to which the dog was attached with him, and left the other with the dog in the stable, being afraid he might lose him. After the man had been gone about an hour, some person coming accidentally into the stable, the dog took the opportunity of quitting his confinement, and immediately set off in quest of his companion. The man, who had finished the business he was sent upon, was just leaving Stockport, when he was surprised to meet the dog he had left in the stable coming with great speed down the hill into the town, and seemed greatly rejoiced to meet his friendly companion, whom he had followed so far by scent. The friendship between these two animals was reciprocal; for the servant going one day to water the carraige horses at a large stone trough, which was then at one end of the Exchange, the dog, as usual, accompanying them, was attacked by a large mastiff, and in danger of being much worried, when his friend, the horse, which was led by the servant with a halter, suddenly broke loose from him, and went to the place where the dogs were fighting, and, with a kick of one of his heels, struck the mastiff such a severe blow, that he drove him into a cooper's cellar opposite; and having thus rescued his companion, returned quietly with him to drink at the conduit.

LODBROG'S DOG.

There is a trait of English history, which seems to be well authenticated, proves that the first landing of the Danes in this country was occasioned by the sagacity and affection of a dog. Lodbrog, of the blood-royal of Denmark, and father to Hinguar and Hubba, being in a boat with his hawks and his dogs, was driven by an unexpected storm on the coast of Norfolk, where, being discovered, and suspected as a spy, he was brought to Edmund, at that time king of the East Angles. Having made himself known, he was treated with great hospitality by the king, and in particular cherished on account of his dexterity and activity in hawking and hunting. Berick, the king's falconer, grew jealous of his attention; and lest it should lessen his merit in his royal master's opinion, and so deprive him of his place, had the treachery to waylay Lodbrog, and murder him; which done, he threw his body into a bush. He was presently missed at court, and the king grew impatient as to what was become of him; when the dog, who had staid in the wood by the corpse of his master till famine forced him thence, came and fawned on the king, and enticed him to follow him. The body was found; and, by a train of evidence, Berick was proved to be the murderer. As a just punishment, he was placed alone in Lodbrog's boat, and committed to the mercy of the sea, which bore him to the very shore the prince had quitted. The boat was known, and Berick, to avoid the torture, falsely confessed that Lodbrog had been murdered by the order of Edmund, which account so exasperated the Danes, that, to revenge his death, they invaded England.

THE PEDLAR'S DOG.

In Lambeth church there is a painting of a man with a dog on one of the windows. Tradition informs us that a piece of ground, near Westminster Bridge, containing one acre and nineteen roods (named Pedlar's Acre), was left to that parish by a pedlar, upon condition that his picture and that of his dog should be perpetually preserved on painted glass on one of the windows of the church, which the parishioners have carefully performed. This gift was made in 1504, at which time the ground was let at two shillings and eightpence per annum; but in the year 1752 it was let on lease at L.100 per year, and a fine of L.800, and is now estimated to be worth L.350 yearly. The reason alleged for the pedlar's request, is, that, being very poor, and passing the afore-mentioned piece of ground, he could by no means get his dog away, who kept scratching a particular spot of earth until he attracted his master's notice, who, going back to examine the cause, and pressing with his stick, found something hard, which he dug up, and on inspection is turned out to be a pot of gold. With part of this money he purchased the land, and settled in the parish, to which he bequeathed it on the conditions above narrated.

THE WATERMAN'S DOG.

In the year 1760, whilst a man of the name of Richardson, a waterman, near Hammersmith, was sleeping in his boat, the vessel broke from her moorings, and was carried down by the side of a west-country barge. Fortunately for the man, his dog happened to be with him, and the sagacious animal awaked him, by pawing his face, and pulling the collar of his coat, at the instant the boat was filling with water; he seized the opportunity, and thus saved himself from otherwise inevitable death.

A DOG RECOGNISES HIS MISTRESS'S PORTRAIT.

A dog, which had been the favourite of an elderly lady, some time after her death, discovered the strongest emotions on the sight of her picture, when taken down from the wall, and laid on the floor to be cleaned. He had never been observed to notice the picture previous to this incident. Here was evidently a case of passive remembrance, or of the involuntary renewal of former impressions.

EXTRAORDINARY INSTINCT.

A dog, the property of a gentleman who died, was given to a friend in Yorkshire. Several years afterwards, a brother of the deceased, from the West Indies, paid a short visit at the house where the dog was then kept. He was instantly recognised, though an entire stranger, in consequence, probably, of a strong personal likeness. The dog fawned upon him, and followed him, with great affection, to every place he went.

MARVELLOUS INCIDENT.

On the 13th of November 1803, as Mr Pettye, a baker, belonging to Briston, in Yorkshire, and his wife, were returning home in their bread-cart, on turning into the yard the cart was overturned, when Mrs Pettye fell with her neck directly under the wheel, and her husband was placed between the wall and the cart. While in this perilous situation, his dog rushed forward, and seized the horse by the nose, which effectually prevented him from stirring, until Mr Pettye, with great difficulty, extricated himself, and came to his wife's assistance.

THE DOG OF THE PRINCE OF ORANGE.

Sir Roger Williams, in his account of the actions of the Low Countries, says, the Prince of Orange one evening having retired into the camp, Julian Romero, with earnest persuasions, prevailed on the Duke D'Alva to hazard a *comisado*, or night attack upon the prince. At midnight, Julian sallied out of the trenches with a thousand armed men, mostly armed with pikes, who forced all the guards that they found in their way into the encampment of the prince, and succeeded in getting even to the front of his tent, and killed two of his secretaries; the prince himself very narrowly escaped, through the wisdom of his dog, which awoke him, by scratching, barking, and crying, while the enemy were approaching; and but for his timely interposition, he would have been taken and slain. The attack was made with such promptitude and determined resolution, that the guards took no alarm, until their fellows were running to the place of arms, with their enemies at their heels. The Prince of Orange always lay on his arms, and had a servant constantly holding one of his horses, ready bridled, yet, in going out of his tent, he could hardly reach his horse before the enemy arrived. One of his equerries was slain in the act of mounting his horse, close behind the prince, as were also several of his servants. The prince, to show his gratitude to his deliverer, not only kindly preserved the faithful animal that had thus been instrumental in saving his life, but also kept one of his race until the day of his death, which example was followed by many of his friends and adherents.

MR LACKINGTON'S DOG.

Mr Lackington, speaking of the portrait annexed to the volume of Memoirs of his Life, says, that, before the original painting was finished, Mrs Lackington called on the artist to examine it. Being introduced into a room filled with portraits, her little dog being with her, immediately ran to that particular portrait, paying it the same attention as he was always accustomed to do the original; which made it necessary to remove it from him, lest he should damage it, though this was not accomplished without expressions of dissatisfaction on the part of the dog.

AN ORDERLY CUSTOMER.

A gentleman at Ramsgate, in the year 1798, had a dog with which he used to amuse his friends and others, by frequently standing on a cliff which looked into the inner basin of Ramsgate pier, and calling his favourite dog, showed him a halfpenny, and then threw it down the cliff among the shingles. The dog immediately took a circuit to the bottom of the cliff, and searched till he found the halfpenny, which he carried directly into the town to a baker's shop, where he obtained a roll for his money. The baker declared he was better pleased with the orderly behaviour of this four-footed customer than with one-half of the bipeds who frequented his shop.

A DOG PROTECTS AN IDIOT.

A poor idiot who lived with his father, and was inhumanly treated by him on account of his infirmity, was one day severely beaten for some trifling cause. The father kept a dog, who was then standing by during his brutal behaviour. The idiot was remarkably fond of the animal, and used to caress him. While his father was beating him, he burst into tears, and exclaimed, as he eyed the dog with compassion, "As there is no one to take my part, I am sure the dog will;" upon which the animal instantly seized the father, and would not let go his hold until he left off beating his son.

A CONSIDERATE MONARCH.

We are told by Plutarch, that there was a certain Roman slain in the civil wars, whose head nobody durst cut off, for fear of the dog that guarded his body, and fought in his defence. It happened that King Pyrrhus, travelling that way, observed the dog watching over the body of the person slain; and hearing that the dog had been there three days without meat or drink, yet would not forsake his dead master, ordered the body to be buried, and the dog preserved, and brought to him. A few days after, there was a muster of the soldiers, so that every man was forced to march past in order before the king. The dog lay quietly by him for some time, and among them happened to be the murderers of his late master; he instantly flew upon them, with more than ordinary fury, seized them by the throats, and frequently turned round and looked at the king. This led him to suspect that they were the murderers, as it did also all that were about him. The men were apprehended, and though the circumstances were very slight which otherwise appeared against them, yet they confessed the fact, and were executed for it.

DOG DETECTS A TRAP-DOOR.

In the Duke of Hamilton's rooms, in Holyrood-house, is a dog's collar, with armorial bearings, which is said to have belonged to a dog who saved the life of a marquis or duke of that family, when on his travels abroad. At an inn this nobleman was put into a bed, made to sink by a trap-door, a method contrived by the host to murder his guests with impunity. But the dog made such a scratching under the bed, and disturbed his master so much, by pulling him by the clothes, &c., that the door was discovered, and by this means his master's life was saved.

UNACCOUNTABLE INSTINCT.

A gentleman, who had been in Ireland for some years, returned to Scotland, and is now residing at Gateside, in the vicinity of Neilston. Two months after his arrival, a favourite dog, which he had left at Belfast with his son, made his appearance *solus* at Gateside. This appeared the more extraordinary, as the animal had never before been in Scotland. In a few days, however, information was received that the dog had been put on board the Rapid steam-boat, under the charge of some person; but it is supposed that after coming on shore at the Broomielaw, he had got the scent of his master's foot, who had been there the day before, and had succeeded in tracing him to his residence, a distance of eight miles.

TRUST NOT STRANGERS.

A serious accident happened on Friday morning, the 30th September, about one o'clock, near Langtown. While Mr Jackson's carts were proceeding on the road to Edinburgh, it is supposed that the carter had fallen off his cart, and the Edinburgh night mail coming forward some time after, the coach ran over the body of the man. The coachman perceiving something wrong, pulled up; and on the guard attempting to lift the body, the man's faithful dog, which had been watching its master, seized the guard, and tore his coat; nor was it till the dog recognised some people who came up, that it allowed the body to be lifted. The unfortunate man was conveyed to his own house in a very dangerous state.

FRIENDLY TRAVELLERS.

An innkeeper, at Astley Chapel, once sent as a present by the carrier, to a friend at Warrington, a dog and a cat tied up in a bag, who had been companions more than ten months. A short time after, the dog and cat took their departure from Warrington together, and returned to their old habitation, a distance of thirteen miles. They jogged along the road, side by side, and on one occasion the dog gallantly defended his fellow-traveller from the attack of a dog they met.

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DOMESTIC ECONOMY AND COOKERY.

OUR object in the present publication is to be simply useful. We are anxious to put into the hands of young women, especially those entering into the management of a family, such a series of practical rules in DOMESTIC ECONOMY and the art of COOKERY, as may lead them to execute with facility and credit the important and respectable duties of the housewife. We are aware that many excellent works already exist, illustrative of these branches of female education; but we also know that there are many thousands of persons who have neither leisure to study such treatises, nor the means of purchasing them. On this account we now place within the reach of *all*, a summary of short, though sufficiently explicit rules, calculated principally for those in the middle and lower ranks of life. The directions given for the preparation of dishes are the *original* composition of an individual well acquainted by experience with both the principles and practice of cookery, and may therefore be depended on as genuine, and every way suitable to govern housewives in the affairs of the kitchen. We take the liberty of commencing with a few familiar observations on the conduct of families generally, as regards their

DOMESTIC MANAGEMENT.

No folly is perhaps so common in the present day as that of families living beyond their incomes. This arises, of course, from a want of reflection on what the consequences must infallibly be of such conduct. It is the duty of all—no matter in what rank of life they move—to regulate their expenditure to their incomes, as nearly as such can be calculated, and, if possible, to live at a somewhat lower rate. If a family have three hundred pounds a-year, it should live upon two hundred and fifty; if it have only one hundred, it should do with at most ninety. A little experience in housekeeping will show the propriety of this regulation; for unforeseen outlays are continually occurring, and must be provided against; besides, there are urgent reasons for making some provision against the day of sickness and death, calamities from which no family is exempted. We are willing to believe that most persons are disposed to live within their means, but their intentions are never so strong as to enable them to withstand the temptation to fall into extravagant habits. They are generally borne away by the bad example offered by acquaintances, some of whom may have better incomes than themselves, or may be reckless of how much debt they contract. Carried away into the commission of excesses by example, and dreading to be ridiculed for "not doing as others do," numberless families bring themselves into a series of distressing pecuniary difficulties, humiliating to good principle, and not unfrequently productive of ruin in their worldly prospects.

We confess it is sometimes no easy matter to resist the stream of dissipation, particularly since the style of living is now so often made the standard of respectability; yet it is worthy of a trial. A great deal may be done to secure comfort, and even luxury, without injury, provided the husband and wife consult coolly on the subject by themselves. Let them ascertain by this species of investigation what it is that constitutes their mutual happiness, and what line of life it is that holds out the promise of being longest pursued without mischief both to themselves and others. The exact length to which they may go in a mode of comfortable living, in a great measure independent of acquaintances, or what they call "the world," is likewise exceedingly worthy of being established in their minds. For want of these inquiries, many families indulge in an extravagant style of living, thinking all the time that they are gaining friends by so doing, and deluding themselves into the notion that they are securing happiness. While making every allowance for families "seeing their friends" occasionally, we cannot shut out the knowledge, that it is by means of "parties" that most of those families who sink into a state of poverty are first indebted for their ruin. An insatiable desire to give and to be at entertainments is a prevailing cause of family distress, and should on all accounts be restrained. We are aware that a wife must in many instances be governed in her conduct in this respect by her husband; but if she be really a good housewife, and prefer the quiet enjoyments of home to the racket of miscellaneous assemblages of people, she will do much to preserve the family from indulging in those expensive modes of living which cannot be safely afforded. One thing is worthy of remark: if she be more fond of gadding than of staying at home, more delighted with "showing off" abroad than pursuing her household duties, she will not be surprised if she find that her husband has grown careless of coming home direct from his daily occupations to his own fireside. Almost in any way it can be viewed, it appears that the propensity to spend money on company is among the most fatal that can well be imagined; for it leads to disasters which years of economy and repentance will fail to obviate, and is absolutely destructive of the principles of moral rectitude.

On this subject, Mrs Child has these observations:—"To associate with influential and genteel people with an appearance of equality, unquestionably has its advantages; particularly where there is a family of sons and daughters just coming upon the theatre of life; but, like all other external advantages, these have their proper price, and may be bought too dearly. They who never reserve a farthing of their income, with which to meet any unforeseen calamity, 'pay too dear for the whistle,' whatever temporary benefits they may derive from society. Self-denial, in proportion to the narrowness of your income, will eventually be the happiest and most respectable course for you and yours. If you are prosperous, perseverance and industry will not fail to place you in such a situation as your ambition covets; and if you are not prosperous, it will be well for your children that they have not been educated to higher hopes than they will ever realise.

If you are about to furnish a house, do not spend all your money, be it much or little. Do not let the beauty of this thing, and the cheapness of that, tempt you to buy unnecessary articles. Doctor Franklin's maxim was a wise one, 'Nothing is cheap that we do not want.' Buy merely enough to get along with at first. It is only by experience that you can tell what will be the wants of your family. If you spend all your money, you will find you have purchased many things you do not want, and have no means left to get many things which you do want. If you have enough, and more than enough, to get every thing suitable to your situation, do not think you must spend it all, merely because you happen to have it. Begin humbly. As riches increase, it is easy and pleasant to increase in hospitality and splendour; but it is always painful and inconvenient to decrease. After all, these things are viewed in their proper light by the truly judicious and respectable. Neatness, tastefulness, and good sense, may be shown in the management of a small household, and the arrangement of a little furniture, as well as upon a larger scale; and these qualities are always praised, and always treated with respect and attention. The consideration which many purchase by living beyond their income, and of course living upon others, is not worth the trouble it costs. The glare there is about this false and wicked parade is deceptive; it does not in fact procure a man valuable friends, or extensive influence. More than that, it is wrong—morally wrong, so far as the individual is concerned; and injurious beyond calculation to the interests of our country. To what are the increasing beggary and discouraged exertions of the present period owing? A multitude of causes have no doubt tended to increase the evil; but the root of the whole matter is the extravagance of all classes of people. We never shall be prosperous till we make pride and vanity yield to the dictates of honesty and prudence. We never shall be free from embarrassment until we cease to be ashamed of industry and economy. Let women do their share towards reformation. Let their fathers and husbands see them happy without finery; and if their husbands and fathers have (as is often the case) a foolish pride in seeing them decorated, let them gently and gradually check this feeling, by showing that they have better and surer means of commanding respect. Let them prove, by the exertion of ingenuity and economy, that neatness, good taste, and gentility, are attainable without very great expense."

"How great is the change (says another respectable female writer*) which is effected in the situation of a woman by the few solemn words pronounced at her marriage! She who the moment before was perhaps a careless member of one family, finds herself, as if by magic, at the head of another, and involved in duties of the highest importance. If she possess good sense, her earnest wish will be to act with propriety in her new sphere. The married and single state equally demand the exercise and improvement of the best qualities of the heart and the mind. Sincerity, discretion, a well-governed temper, forgetfulness of self, charitable allowance for the frailty of human nature, are all requisite in both conditions. But the single woman being in general responsible for her own conduct solely, is chiefly required to cultivate passive qualities. To fall easily into the domestic current of regulations and habits—to guard with care against those attacks of caprice and ill-humour which disturb its course—to assist rather than to take the lead in all family arrangements, are among her duties; while the married woman, in whose hands are the happiness and welfare of others, is called upon to lead, to regulate, and command. She has to examine every point in the new situation into which she is transplanted; to cultivate in herself, and to encourage in her husband, rational and domestic tastes, which may prove sources of amusement in every stage of their lives, and particularly at the latter period, when other resources shall have lost their power to charm. She has to proportion, not, as in the single state, her own personal expenses merely, but the whole expenditure of her household, to the income which she has now to command; and in this part of her duty there is often exercise for self-denial as well as for judgment. The condition of her husband may require her to abandon not only habits of expense, but even those of generosity. It may demand from her a rigid adherence to economy neither easy nor pleasant, when contrary habits and tastes, under more liberal circumstances, have been fixed and cultivated. Such alterations in habit may at first be regarded as sacrifices, but, in the end, they will meet their compensation. Sometimes, however, the means of indulging liberal and generous propensities are extended by marriage. Where this is the case, that extreme attention to economy, which circumscribes the expenditure very much within the boundaries of the income, would betray a narrow and mean spirit, and would have the effect to abridge the blessings which by affluence may be dispensed around.

No woman should place herself at the head of a family without feeling the importance of the character which she has to sustain. Her example alone may afford better instruction than either precepts or admonition, both to her children and servants. By a 'daily beauty' in her life, she may present a model by which all around her will insensibly mould themselves. 'Knowledge is power' only when it fits us for

* Mrs Parkes on Domestic Duties. Longman, London.

the station in which we find ourselves placed. Of all the social domestic and personal obligations of the young wife, her husband is the centre: when they are properly discharged, his welfare and happiness are certainly promoted, and his esteem, affection, and confidence established on a permanent basis. In neglecting them, he is neglected, his respectability diminished, and his domestic peace and comfort destroyed. One who, selfishly regardless of family duties, leads a life of dissipation and amusement, whose heart and soul are in the world, and never at home, is worthless as a wife and mother. She neglects the chief and positive duties of life, without fulfilling those of a minor character with any good effect. At home her example is injurious, and if abroad she possess any influence, it is merely of a temporary nature, resting, probably, on no securer ground than that of fashion. In pourtraying the *beau-ideal* of a married woman, I should describe one not absorbed in any single part, but attentive to the whole of life's obligations—one who neglects nothing—who regulates and superintends her household concerns; attends to, watches over, and guides her children, and yet is ever ready to consider, in moderation, the demands upon her time, which the numerous and various claims of society may make. Such appears to me to be a right sketch of the character of the married woman."

The house being the appropriate kingdom of the wife, it is necessary that she should be thoroughly mistress of all its details, and in no instance be left at the mercy of strangers or servants, who, even if anxious to please, seldom possess an education which renders them competent to carry on a household in its different parts. By a close, yet tempered supervision on the part of the mistress of the establishment, a corresponding degree of comfort, peace, and saving of expense, is produced, and by her laxity or carelessness, exactly the opposite results take place. Without proper discipline and firmness, all the cares of the young wife may be frustrated. We think it is Miss Edgeworth who says, in one of her excellent novels, that the greater proportion of the miseries of life *proceed from taking things for granted*. The good wife takes nothing for granted. She gives forth her orders distinctly, and, if requisite, *sees* them executed. Let those things be impressed on the minds of our fair young countrywomen. William Cobbett, who has written a good deal on the value of industry in household affairs, has well said "that the lover is blind; but that the husband has eyes to see with. He soon discovers that there is something [illegible] beside dimples and cherry cheeks; and I would [illegible] (says he) have fathers seriously reflect, and to be well assured, that the way to make their daughters to be long admired, beloved, and respected by their husbands, is to make them skilful, able, and active in the most necessary concerns of a family. Eating and drinking (continues he) come three times every day; the preparations for these, and all the ministry necessary to them, belong to the wife; and I hold it to be impossible, that, at the end of two years, a really ignorant sluttish wife should possess any thing worthy of the name of love from her husband. A woman who understands all things above mentioned is really a skilful person—a person worthy of respect, and that will be treated as such."

Besides being acquainted with the art of cookery, every woman who aspires to the character of a good housewife, and mother of a family, should be qualified by previous habits and education to act as a good sempstress. The wife of a man in the lower and middle ranks of life who cannot sew plain work, is a being to be pitied, but much more are her husband and family to be commiserated for their unhappy fate. If she have a disinclination to put her hand to this kind of labour, the misery is not the less, while her error is more heinous. Young women are in general but too apt to neglect this useful branch of education, and to address themselves almost exclusively to the acquisition of fashionable accomplishments calculated to make a show in company. But as soon as they are married, and have a family—that is, if not wedded to a man of wealth—they find their deficiencies. They discover that the amount of sewing to be given out is incalculable. Instead of doing so, they ought to be able to cut out and make all their own gowns, bonnets, and other articles of apparel; to mend all kinds of small holes or rents in garments, whether for the male or female members of the family; to darn stockings; and at least be able to sew loose buttons on the clothes of their husband or children. A woman who can do all this will save her husband many pounds in the year, and herself a great deal of trouble and vexation.

DIET.

Experience, and the advice of the best physicians, inform us that plain simple food does not only agree best with our stomachs and constitutions, but keeps us longest in a healthful condition. By adhering to the practice of dining on one substantial dish, and abstaining alike from pickles and stimulating liquors, we have the best chance of escaping epidemical and other diseases, and of enjoying a good state of bodily action and a pleasing serenity of mind. A liberal indulgence in made dishes, as well as in spirituous liquors, whether mixed or otherwise, may not *immediately* cause disease; and on that account little care is often taken as to what is either eaten or drunk. But the mischief lies in the predisposition to disease which such indulgences create. A person, for instance, is always more liable to take colds and sore throats after being intemperate than before. The human being, in short requires no pampering; and the more simple and elementary our food and drink are, we are the more likely to enjoy good health and long life. We are told by those best informed on the subject of diet, that in taking our daily food, we ought to draw our meals to a point; that is, beginning with a sufficient and nutritious breakfast—in the middle of the day taking a good dinner—and from that time till bed-time conveying as little as possible into the stomach, and by all means abstaining from heavy suppers.

A good housewife should endeavour to impress these rules on the minds of those about her, and, by her ingenuity, prepare such meals as will be both gratifying to the palate and good for the health, and of such variety as will not pall by repetition.

Some housewives, under the idea of being great savers, have a practice of making and storing up large quantities of currant jellies, jams, preserves, and pickles. But experience will soon convince the young housewife that there is little economy in laying out money in this way. Currant jellies and jams are certainly useful to form drinks in cases of colds, but the quantity used for this purpose is small in comparison to that which is needlessly devoured by children, or perhaps wasted. The economical should therefore make but a small quantity of such confections, and they will probably find it cheaper to buy from the shops of confectioners, as required, than lay in an expensive store. Pickles are far from being salutary to most constitutions, and the same degree of care should be taken in making such preparations. Scotch marmalade is a confection which, from its agreeable bitter quality, is allowed to be beneficial to the stomach, and may be safely administered.

COOKERY.

It is of great consequence to housewives that they should possess a proper cooking apparatus, for on this depends much of the comfort of their establishment, and the saving of a deal of money. It would be needless to give here any recommendation with respect to the number and variety of utensils, for common judgment directs on this point. But it may be of use to state, that the utmost attention should be bestowed in having a proper kitchen range or grate. In Scotland, in particular, the grates are all too large for small families, and are calculated to consume too much coal. By want of care on this point, a family in Edinburgh, where coal is 10s. per ton, is put to as much expense for fuel as a family in London, where coal is three times the price. One of the chief points in housekeeping, is to cook victuals with the smallest possible quantity of fuel; this may be attained by one of the smallest-sized ranges, having a narrow fire-place in the centre, only large enough for one vessel, with an oven upon the one side and boiler on the other; the boiler also going round the back of the fire-place. Both oven and boiler should thus be heated without disturbing the fire in the grate, or making additional fires on purpose. A range of this description, which will cost in London about L.4, 10s., will at once roast meat in front, boil water, bake a dish in the oven, and keep boiling and simmering at least three vessels on the fire and top of the boiler and oven. Roasting is always best performed with a hook and a twirling bottle-jack; a spit spoils a small piece of meat.

ROASTING.

TO ROAST BEEF.

The best piece of beef for roasting is the sirloin. It should be kept for some time, but the time must be regulated by the state of the weather. It should be wiped, to free it as much as possible from the mustiness that gathers upon all meat when kept for many days. When preparing to be roasted, if too fat, cut out part of the suet, which does admirably for puddings, dumplings, &c.; wash the beef in salt and water; wipe it quite dry, and put it on the spit, balancing it nicely without much handling; place it at a good distance from the fire, to allow it to get warmed to the heart before the outside is scorched. The fire must be quite clear and brisk. Allow a quarter of an hour to every pound of meat, and baste it very frequently. For gravy, use only its own juice and boiling water, of which pour a little over the browned part of the meat.

TO ROAST MUTTON.

The best parts of mutton for roasting are the leg (called in Scotland the gigot), the shoulder, and the loin. The piece may be kept longer than would be desirable for mutton for boiling. It should have a quick fire. A leg will take two hours to roast; but this, as well as the time required for roasting the other parts, must be regulated by the fire and the weight of the meat, and can only be learned by attention. The best sauce for roast mutton is its own gravy, drawn by a little salt and boiling water, poured over the part which is the most browned.

TO ROAST VEAL, PORK, AND LAMB.

The best parts of veal for roasting are the fillet, the breast, the shoulder, and the loin. Directions are given in another place for stuffing the fillet, and the breast should have the stuffing of the same ingredients. Both veal and pork should have a slow fire at first, and finished with a brisk quick fire; they require more time than beef or mutton. Pork should be scored in neat regular slices, to enable the carver to get through the skin. Lamb requires a fire similar to veal and pork. The best sauce for either is their own gravy, drawn by salt and water. Apple sauce is by many considered an improvement, as taking away from the insipid and sickly taste of pork. Lamb should have mint sauce served along with it in a sauce tureen.

TO ROAST PIGEONS.

Pick and wash them well, keeping on the feet; make a stuffing of the liver chopped, crumbs of bread, minced parsley, pepper, salt, and a bit of butter; put this inside; make a slit in one of the legs, and slip the other leg through the slit; skewer them, and roast them for half an hour, basting them well with butter. Serve with brown gravy; the gravy of roast beef does very well for birds of this description.

TO ROAST DUCKS.

Pick and singe them well; dip the feet in boiling water to take off the outer yellow skin; truss them neatly, turning the feet flat upon the back; wash them well inside, and make a stuffing of chopped sage, onions, bread-crumbs, pepper, salt, and a bit of butter; fill the inside with this, skewer them nicely, and roast them before a clear fire.

TO ROAST FOWLS.

Pick and singe the fowls; wash them well inside; break the legs by the middle of the first joint, drawing out the sinews; put a piece of butter and a little white pepper inside; tie the legs down with a small string; spit them, basting well with butter for some time after they are put to the fire. Twenty minutes to half an hour will roast a chicken; from three quarters to an hour will roast a good-sized fowl.

TO ROAST A TURKEY.

Pick and singe your turkey; draw and wash it well inside; break the legs in the middle of the first joint, and draw out the sinews; stuff the breast with minced suet, bread-crumbs, parsley, salt, a little Cayenne, and a scrape of nutmeg; thin it with milk, and stuff the breast. A turkey will take from an hour and a half to two hours; dust with flour, and baste frequently with fresh butter.

TO ROAST A GOOSE.

Pick and singe the goose very carefully; wash and dry it; mince half a dozen onions, a few sprigs of sage, a good piece of butter, a slice of bread grated, black pepper, and salt; stuff the goose with this; spit it, and put it down before a clear brisk fire. It will take two hours and a half to roast.

TO ROAST PARTRIDGES AND PHEASANTS.

Clean the birds well by drawing them as fowls, but leave the head and feet on; make a slit in the neck, and draw out the gizzard by it; make a hole between the sinews of one of the legs, and put the other leg through it; twist the neck round the left wing, and skewer down the pinions; put them down before a clear fire, and baste them with butter; when about half done, dust a little flour over them. A partridge will take from twenty minutes to half an hour, and a pheasant three quarters of an hour. They must be laid on toasted bread, soaked in the dripping-pan, and a little brown gravy poured over them. Melted butter or bread-sauce must be served in a sauce-tureen. Grouse and blackcock should be dressed and served in the same manner.

A BEEF STEAK.

Cut slices of three quarters of an inch or an inch thick, from the rump; beat them, and put them on a gridiron, on a clear slow fire; turn them constantly, to preserve the juice as much as possible; when done, put on a hot plate, and sprinkle a little salt on each side; the juice is much better preserved when the steak is done in a small Dutch oven, with hooks inside, upon which the steak is hung, with a plate underneath to catch the gravy. This method is much superior to the common way of dressing a steak, as it also does it without scorching.

A SUCKING PIG.

Procure a young pig, not exceeding three weeks old; scrape off the hair, by scalding it in boiling water; take out the entrails, and soak it well in cold water; cut the feet off by the first joint, and draw down the skin of the legs over the joint. For stuffing, take a handful of sage, eight or ten onions, a large cupful of grated bread-crumbs, a good piece of butter, and plenty of pepper and salt; sew up the opening, and spit it with the head next the point of the spit; baste frequently with fresh butter, and, when warmed and moistened, keep wiping with a damp cloth, to make the skin clear and crisp. A pig will take two hours and a half or three hours to roast. A little veal or beef gravy poured over the pig, and mixed with the stuffing when the pig is cut up, does very well, and apple-sauce served in a sauce tureen.

A FILLET OF VEAL.

Cut out the knuckle neatly, without disfiguring the veal; make a stuffing of grated bread, minced suet, chopped parsley, a little grated nutmeg, a little grated lemon peel, and pepper and salt. (Eggs may be used in this stuffing, but we do not approve of them, either for this or any stuffing, as they only serve to harden it.) Stuff the flap of the fillet with this; roll it up neatly and firmly; bind it with tape, and roast it before a clear fire; cover the ends with buttered paper, and baste frequently with butter; take off the paper a short time before the meat is done; a little salt laid on the brownest part of the roast, and a little boiling water poured over it, will extract a rich enough sauce. Garnish with sliced lemon.

BOILING.

TO BOIL A TURKEY.

Pick and singe it carefully; cut the legs at the first joint, and pull out the sinews; clean the turkey well inside; pull down the skin, and draw the legs inside; put pepper inside, and make a stuffing of half a pound of suet, a cupful of bread-crumbs, a few sprigs of chopped parsley, some white pepper, salt, and a little mace or grated nutmeg; stuff the breast with this; skewer it down, and boil it in a cloth, and boil according to the age and size of the turkey; if young, an hour will be enough; if old and tough, it will require two hours or two hours and a half. Serve with parsley, celery, or oyster-sauce poured over it.

TO BOIL A ROUND OF BEEF.

Wash the meat well; if large, cut out the bone; roll it up firmly, and bind it with tape; it must be put in with as much cold water as will entirely cover the meat; scum it frequently; keep the pot closely covered, and boil slowly and equally, allowing a quarter of an hour to every pound of beef. The vegetables should be boiled separately, as they are apt to have a greasy flavour when boiled along with the meat. The beef should be carefully wiped, or have boiling water thrown over it before dishing. Garnish with carrot, and either greens or cabbage. When cold, cover it with a cloth to keep it moist. If the beef is not to be used at all when hot, it will improve it very much to let it cool amongst the liquor in which it was boiled.

TO BOIL A LEG OF MUTTON.

A leg of mutton will be tough and hard if newly killed; it should be kept for four or five days, to make it tender; press down the shank, and cut a small piece off it; put it on with cold water; when it boils, scum it carefully and frequently; two hours of slow equal boiling will be sufficient for a good-sized leg of mutton. The vegetables may be boiled along with the meat, carrot, and turnip, and laid round it when dished. Melted butter, with capers, is the most appropriate sauce for boiled mutton. Excellent broth may be made next day of the liquor, with sliced carrots and turnip, a grated carrot, a few onions, a cupful of barley, and a little shred cabbage.

TO BOIL LAMB.

Lamb, when slowly and nicely boiled, is a very delicate and excellent dish; a leg of lamb will take an hour and a half to boil; it may be garnished with the loin cut into steaks, fried, and laid round it; pour parsley sauce, or melted butter, and a spoonful of vinegar over it.

TO BOIL HAM.

Put on the ham with plenty of cold water, and when it boils, scum it frequently, to remove the grease which is constantly rising to the top; half an hour before dishing, take it off and skin it; strew fine bread-crumbs over the ham, and set it before the fire to brown slightly. Garnish with greens or cabbage.

TO BOIL A TONGUE.

Soak the tongue in water all night before using, if hard; put it on with cold water, and boil it from two hours and a half to three hours; scum it before dishing, and glaze it, if convenient. Garnish with greens or cabbage.

TO BOIL FOWLS.

Choose white young fowls; pick them carefully, and singe with white burning paper; wash them well; cut the legs off by the first joint; draw down the skin of the body over the legs; tie a piece of tape round them; boil them in plenty of water slightly warmed. For chickens, twenty minutes to half an hour will be enough; from that to an hour and a half for older fowls. For particular parties, fowls ought to be boiled in a cloth to keep them perfectly white; if not, a little broth may be made, by adding a little rice well washed, a few sliced onions, a little shred parsley, and a blade of mace. Serve with parsley, celery, or egg-sauce.

TO BOIL VEGETABLES.

All vegetables, with the exception of potatoes, ought to be put upon the fire in boiling water and salt. They should be soaked amongst cold water and salt until they are to be boiled. A small bit of soda, the size of a nut, will preserve their colour, and will also make them more tender. Green peas should have a small bit of white sugar boiled along with them, and some salt. A few leaves of mint may be boiled along with green peas, if the flavour be liked. All vegetables ought to be boiled in an open pot, so that the colour may be preserved; and they ought also to be boiled very quickly. We do not mean to give full directions for every different vegetable; but by attending to the above rules, the young cook cannot go far wrong; only, we may remark, nothing looks worse at a table than ill-cooked vegetables. Give them plenty of time to boil thoroughly, but they should not be allowed to stand for any length of time after they are ready, as they lose both flavour and colour by it. Allow them to stand for a few minutes in a drainer, to drip all the water from them before going to table.

TO BOIL RABBITS WHOLE.

Wash them well in warm water; make a stuffing of suet, bread-crumbs, parsley, onions, pepper, and salt, minced altogether; sew this into the belly of the rabbits; truss them nicely, as for roasting; put them in a cloth, and boil slowly for an hour in as much water as covers them; make a sauce of melted butter and flour thinned with milk, a good many onions parboiled, white pepper and salt, pour this over the rabbits when to be served.

PIG'S CHEEK.

Take the half of a pig's head; clean and wash it well; put it on to boil with rather more cold water than will cover it; boil it till all the bones will pull out from the meat; cut it down, while it is hot, into handsome pieces of an inch square; season it with black and Jamaica pepper and salt; put it into a stew-pan, cover it with a plate on the top, and press it down with weights; when it has stood in this manner in a cool place for a day, turn it out, and garnish with parsley. The head will be the better of lying amongst salt for a day or two previous to being boiled.

SOUPS.

BROWN SOUP.

Take an ordinary sized hough of beef; have it broken in several places; cut the beef from the bones; take out part of the marrow, and lay on the bottom of your stock-pot; lay the meat above, and then the bones, and place it on the fire to brown; let it brown for nearly an hour; add a pint of water, to draw the juice from the meat; let it stand a little longer, then fill up the pot with cold water; put in two carrots and turnips, a dozen onions, whole black and Jamaica pepper, a stalk or two of celery, and a bunch of sweet herbs; let it boil slowly for six hours, then put it gently through a hair sieve; you may fill up your pot with more water and vegetables as above, and boil for six hours more. This forms a stock for mock-turtle or any other soup. It is advisable to make brown soup on the day before being used, as the fat can be better taken off when the soup is cold. Vermicelli or vegetable soups may be made by boiling or preparing them separately, and adding them to brown soup.

MOCK-TURTLE SOUP.

Take a calf's head, and wash it well; put it on to scald for a few minutes; take it off, and put it amongst cold water, and scrape off the hair. When it is perfectly clean, put it on to parboil; when the bones are loosened, take it off; and when cold enough, cut it into handsome pieces of an inch square; scrape and cut the tongue in the same manner; take the stock which has been made from brown soup, or the liquor in which the head was parboiled, and four pounds of shin of beef, and a knuckle of veal well broken; add to this a dozen onions, a carrot and turnip, a bunch of sweet herbs, and black and Jamaica pepper, whole; let it boil slowly for four or five hours; strain this, and, when cold, take off the fat; put half a pound of butter into a stew-pan, and, when melted, put in two handfuls of flour, and let it brown nicely, stirring it all the time; add a little of the stock, a few onions, a sprig or two of sweet basil, and a few bunches of parsley; let all this boil slowly for nearly an hour; then strain it through a sieve into your pot, where you have previously the stock and hash; add the juice of one lemon, a wine-glassful of ketchup, a little Cayenne pepper and salt to taste, four glasses sherry or cape wine, and let the whole boil for an hour. When to be served, add two dozen egg-balls. This soup will keep for a fortnight.

OX-TAIL SOUP.

Take two or three well-sized ox-tails; divide them at the joints; soak or wash them in salt and water, and dry them; take two or three pounds of a shin of beef, a carrot and turnip, a bunch of sweet herbs, a head of celery, and some black and Jamaica pepper-corns; add to this three quarts of cold water; let it boil for two hours; strain it, and put in the tails to stew amongst it till tender; cut carrots in straws and scooped turnips; stew them amongst butter, and when soft, drain them, and add them to the soup. This soup may be thickened by browning a little flour and butter, but it is generally preferred clear.

HARE SOUP.

Take a fresh hare, and, when skinned, wipe it well with a cloth; cut off the belly, and take out the entrails, taking great care not to lose any of the blood; cut the hare into small pieces, and wash them well, and put the washings and the blood through a fine sieve into your pot, along with the meat, and two or three pounds of beef cut into pieces, or the stock of beef previously made, two carrots, and two turnips, six onions, a few sprigs of thyme, some black and Jamaica pepper-corns, and four table-spoonfuls of flour mixed with cold water; keep stirring this until it boils; let it boil for an hour and a half; pick out the best pieces of the hare, and beat the rest of the meat and soup through a sieve; put it again on the fire, with a few fresh onions, a stalk or two of celery cut down, the best pieces of the hare, and a glass of mushroom ketchup; boil this for half an hour, and serve the pieces of hare in the tureen along with the soup. Two glasses of port wine to the tureen of soup will be sufficient to give it a mild flavour, which is all that is desired, by putting wine in the soup.

MULLIGATAWNY SOUP.

Make a stock of beef or veal, with vegetables and herbs; take then a good large fowl, parboiled, skinned, and cut into handsome pieces, or veal sliced and fried; take a dozen good large onions cut down, half a pound of sweet butter, two handfuls of flour, and two dessert-spoonfuls of curry powder; brown them well in a stew-pan, stirring all the time; add a little of the stock, and rub this through a sieve into your stock; put in the meat or fowl, and boil for half an hour; add the juice of a lemon, and two glasses of sherry wine. Before serving, put in two table-spoonfuls of rich cream. A dish of rice should be served with mulligatawny soup.

KIDNEY SOUP.

Make a stock of three or four pounds of a shin of beef; brown it, as directed for brown soup, and add two carrots, two turnips, a few onions, a stalk of celery, and some whole black and Jamaica pepper; let all this boil slowly for five or six hours, and, when ready, put it through a sieve; cut down two beef kidneys, and stew them amongst some of the stock for an hour; when ready, put them amongst the stock, and strain the soup in which they were stewed into the soup.

PIGEON SOUP.

Take three or four pounds of the leg or neck of beef, two carrots, two turnips, four onions, some whole black and Jamaica pepper, a head of celery; boil this slowly for two or three hours; brown a good piece of butter in a stew-pan, and put in a handful of flour; brown them together for a few minutes, and add the strained stock to this; stew or fry the birds, and put them amongst the stock; season with white pepper and salt. Chopped lettuce may be added to this soup if approved, and a glass of port wine is by some considered a great improvement.

PEAS SOUP.

Take a good marrow-bone, or the bones of cold roast beef, which make better soup than any other kind of meat whatever; a shank or slice of ham may be added, if the flavour be liked; break the bones in several places; put in as much water as you think will make a sufficient quantity of soup, allowing a little for boiling down; take two pounds of the best split peas; wash them, and put them on with the cold water and the bones; add to this two carrots and two turnips, a stalk of celery, half a dozen onions, a bunch of thyme, and some whole black and Jamaica pepper. Let all this boil for two hours, stirring often, as it is very apt to stick to the bottom of the pot. When the peas are quite soft and broken down, take it off, and put it through a sieve into another pot; rub it well through until all the pulp be mixed with the soup; add salt melted in a little water, and boil for a few minutes; and serve with toasted bread, cut into little square pieces, and put into the soup.

LEEK SOUP.

Take three or four pounds of a coarse piece of beef—the shin is considered the best; put it on with as much water as you think will make a sufficient quantity of soup; let this boil for two hours, and take one or two bunches of leeks, in proportion to the quantity of water; cut them into pieces of an inch long, and wash them well. (They must be particularly well washed, as the sand is apt to lurk about the folds of the leeks more than any other vegetable.) Put them into the soup, and let them boil for an hour. The beef, if not too quickly boiled, will eat very well. A fowl is considered a great improvement to leek soup, to be boiled along with the beef. It is then called in Scotland cockaleekle.

HOTCH-POTCH.—(A SCOTCH DISH.)

Put on as much water as you think will make a sufficient quantity of soup; when it boils, put in three or four pounds of the back ribs of mutton, six young turnips cut into squares, six carrots cut down and two grated, a stock of cauliflower and a stock of lettuce cut down, a few young onions, and a peck of green peas, the one half along with the other vegetables, and the other half about half an hour before the soup is ready for dishing. When the meat has boiled for an hour and a half, take it out, and cut it into chops, and add it to the soup before dishing. This is considered a very excellent soup.

MUTTON BROTH.

Take of the back ribs or breast of mutton three or four pounds; to this add water in proportion; and when the water boils, put in a breakfast-cupful of barley; scum this, and let it boil for an hour; add to it one carrot grated and one cut small, two small turnips, and six onions sliced; boil for an hour more, and serve the meat, with boiled carrot and turnip laid round it, and a little melted butter over it, or in a tureen. Beef broth is made in the same manner, only substituting beef for mutton, and greens and leeks for carrot and turnip.

CHEAP BROTH, WITHOUT MEAT.

Put a table-spoonful of butter amongst a small potful of cold water, a tea-cupful of rice washed, or half a cupful of barley, a carrot and turnip grated, and a few sliced onions; boil this for an hour and a half. Do not put in the rice until the broth be nearly ready.

POTATO SOUP.

This soup may be made of any bones or trimmings of meat; the bones of cold salt meat or roast beef bones are preferable; boil them for an hour and a half amongst as much water as you think will be sufficient for the quantity of soup you want; put this through a sieve to keep back all the pieces of fat or loose meat; add then as many parboiled potatoes as you think will make it thick enough, and half a dozen sliced onions, a small carrot grated, and a few bits of celery; season this with white pepper and salt, and boil for half an hour more. This soup may be made very well from dripping, and seasoned with a few onions and pepper and salt.

STEWING.

TO STEW BEEF.

Take six, eight, or ten pounds of a brisket of beef; let it brown for ten minutes in the bottom of your stew-pot; when sufficiently browned, lift it out, and lay two or three skewers in the bottom of the pot; put in [illegible], along with as much water as will half cover [illegible] stew it slowly for two hours, and, when ready, strain off the gravy, and thicken it with a little browned butter and flour; cut down into handsome shapes a boiled carrot and turnip, and add them to the gravy; season highly with pepper, salt, Cayenne, and a glass of ketchup; boil all together for a few minutes, and pour over the beef. The meat will be improved by lying in salt for two days before being used.

TO STEW A SHOULDER OF MUTTON.

Take a pretty large shoulder of mutton. When to be used, cut out the shoulder or blade-bone without destroying the meat; make a stuffing of bread-crumbs, minced parsley, a few sprigs of green or dried sweet herbs, a quarter of a pound of minced suet, a shred onion or two, and pepper and salt; lay this inside the shoulder, and roll it up, and skewer or bind it firmly with tape; rub the bottom of a stew-pan with suet or butter, and brown the mutton. When sufficiently brown, lay two skewers in the bottom of the pan; add some stock or boiling water, and let it stew for an hour and a half; the gravy drawn from itself will be sufficiently rich for sauce, seasoned with pepper and salt, and scummed before being poured over the meat.

STEWED VEAL.

The best parts of veal for stewing are the fillet, the breast, and the shoulders; the shoulder must be stuffed when the knuckle is cut out, which must be done neatly, without disfiguring the meat; the stuffing should consist of bread-crumbs, minced meat, chopped parsley, grated lemon peel, white pepper and salt; fill the shoulder and sew it up; rub the bottom of a large stew-pan with butter; lay in the veal, and brown it on both sides; when sufficiently brown, put in a pint of cold water, and stew it slowly for two hours, or, if large, two hours and a half. Before it is to be dished, draw off the gravy, and if not thick enough, brown a little butter and dust in a little flour; put it amongst the gravy, and season with Cayenne, salt, and the squeeze of a lemon (a glass of sherry will be an improvement); scum the sauce, and pour it over the meat before dishing.

TO WARM A COLD GIGOT OF BOILED MUTTON.

When there is any left of a cold leg or gigot of mutton, it is not good to be eaten when cold; it can, however, be warmed up the second day, so as to taste as well as when newly cooked; take the mutton and lay it upon an inverted pie-dish in an oval pot, with as much water as will steam it without touching the meat; let it lie in this for an hour, and when to be dished, pour some melted butter, with a spoonful of vinegar, over it.

TO STEW KIDNEYS.

Cut the kidneys into slices, wash them, and dry them with a clean cloth; dust them with flour, and fry them with butter until they are brown; pour some hot water or beef stock into the pan, a few minced onions, pepper, and salt, to taste; let them stew slowly for an hour, and add a spoonful or two of mushroom ketchup before dishing.

MINCED COLLOPS.—(A SCOTCH DISH.)

Take two pounds of beef, and having cut out the skins and gristles, mince it very fine, with a proportion of suet; either mince a few onions with the collops, or fry them in butter before putting the collops into the pan; beat them, and stir in a little flour, some water or stock, and season with pepper and salt to taste; add a little ketchup before they are dished.

TO STEW PIGEONS.

Pick and wash the pigeons well, trussing them as fowls for boiling; put a piece of butter and pepper inside; dust them with flour, and brown them in a covered stew-pan with a good piece of butter; put in a little more flour; add some stock or water; season them highly, and let them stew slowly for twenty minutes or half an hour. Before dishing, add half a glass of port wine, if the flavour be approved.

TO STEW RABBITS.

Wash the rabbits well, cut them into pieces, and put them on to scald for a few minutes; melt a good piece of butter; fry the rabbits in this for a few minutes; when slightly browned, dust in some flour; then add as much stock or water as will make sufficient sauce; put in half a dozen large onions, or more in proportion if small, two spoonfuls of mushroom ketchup, some white pepper and salt to taste; stew for an hour slowly.

TO MAKE POTATO-STEW.

Take any cold fat meat you may have, salt or fresh, or a good bit of fresh dripping; pare some potatoes, and cut them in pieces; lay a few slices of your meat, or pieces of dripping, and then the potatoes, two or three sliced onions, some black pepper and salt, and a little water; cover it up, and let it stew for an hour, taking care not to let it stick to the bottom of the pan. This is a very savoury and cheap dish.

AN IRISH STEW.

Take two or three pounds of back ribs or loin of mutton; cut it into chops; put it in a stew-pan with pared potatoes, sliced onions, pepper, salt, and a little water; put this on to stew slowly for an hour, shaking it occasionally to prevent it sticking to the bottom of the pan. Cold mutton or lamb is almost as good made up in this manner as fresh meat.

PIES AND DUMPLINGS.

VEAL PIE.

Cut chops from the back ribs or loin; trim off the bones and flatten them; shake minced parsley, flour, white pepper and salt, over each layer of the meat; add a little gravy drawn from the trimmings, and cover the pie. Some add slices of bacon.

PIGEON PIE.

Pick and clean the birds well, cutting off the wings, and trussing them in the same manner as boiled fowls; put a little bit of butter, flour, shred parsley, pepper and salt, in the inside of each bird; lay slices of beef or veal in the bottom of the dish; lay in the birds, and the wings and gizzards round them, and, if approved, a few sliced hard-boiled eggs; add water or gravy; cover the pie, and bake for an hour.

GIBLET PIE.

Clean and scald the giblets; cut them into neat pieces; lay slices of beef, mutton, or veal, in the bottom of the dish; put in the giblets, and strew in a small shred onion and parsley, pepper, salt, and a little flour, to thicken the gravy; cover the pie with a common or puff paste.

RABBIT PIE.

Soak and wash the rabbits well, and cut them into pieces; lay some thin slices of bacon in the bottom of your pie-dish, or, if the bacon flavour be not liked, some slices of beef may be substituted, or the pie may be made without either, only this serves to enrich it; lay in the rabbits; season it well with pepper and salt, and a dust of flour; add some stock or water; cover with paste, and bake for an hour. The oven should not be too hot.

BEEFSTEAK PIE.

Take some slices of beef from the rump, or hock-bone, tender and well mixed; flatten them, and season with pepper and salt; roll them up, or lay them in the dish; put in some stock, gravy, or water, and a little flour to thicken it; cover it with paste, and bake for an hour.

LAMB PIE.

Cut chops from the back ribs, loins, or from the thick of the leg; lay the meat in your dish, and season with white pepper and salt; add some gravy or water; cover, and bake for three quarters of an hour.

ROOK PIE.

Skin the birds, cut out the backbones, and steep them in water for twenty-four hours, to extract the bitter flavour; season them with pepper and salt; lay a beefsteak in the bottom of the dish; add a little good gravy, and cover with a common crust. They will require three quarters or an hour's baking.

MINCE PIE.

Mince a pound of rich beef-suet, a pound of grated bread, a pound of apples pared and cored, minced separately from the suet, a pound of currants washed and picked, a pound of stoned and chopped raisins, an ounce of ground cinnamon, an ounce of ground ginger, an ounce of orange and an ounce of lemon peel candied, a tea-spoonful of Jamaica pepper and a little salt, half a pound of raw sugar, one nutmeg grated, two glasses of brandy and two of sherry; mix all together, and lay the bottom of your pan or dish with rich paste; fill in the mince, and cover the top with barred paste. A marrow pasty is made in the same way, with marrow instead of suet. This will make a great many mince pies; but a proportion of the ingredients may be taken, or it may be put into a can, and it will keep for a long time. Add a little more spirits before using.

AN APPLE PIE.

Pare and core ten or a dozen large apples; cut them down, and lay them neatly in a baking-dish; season with cinnamon, sugar, and a few cloves; add a little water, and cover with a puff paste, iced on the top, and bake in an oven.

A BEEF DUMPLING.

Take a pound of suet; mince it very fine; mix it up with a pound of flour and a little salt; pour in as much cold water as will allow it to mix up to a paste; roll it out, and lay in slices of beef as for steaks, pepper, and salt; dip a cloth in water, and shake a little flour over it, and boil the dumpling in it, or in a basin tied in a cloth; boil it for an hour and a half or two hours; a few sliced onions put in along with the beef will be an improvement. A pound of suet will make a very large dumpling; for a small family, half a pound will be sufficient, and the same proportion of flour.

AN APPLE DUMPLING.

Take a pound of fresh suet; mince it very fine; mix it with a pound of flour and a little salt; pour in some cold water, and work it up to a proper paste, but do not handle it much, as that makes it heavy; roll it out, and have your apples pared and cored; lay them on the paste, with plenty of brown sugar, cinnamon, and a few cloves; gather it up, and boil it either in a buttered basin tied in a cloth, or in a cloth dipped in water, and a little flour sprinkled over it without the basin; boil it for three hours. Serve with cream in a sauce-tureen. If for a small family, half a pound of suet will be enough, as a pound will make a very large dumpling.

A GOOSEBERRY DUMPLING.

Make the paste as directed for apple dumpling, and have the gooseberries picked; lay them in the paste along with a good handful of brown sugar; gather it up, and boil as above. Serve with cream.

PUDDINGS.

PLUM-PUDDING.

Take a pound of the best muscatel raisins stoned and minced, a pound of currants washed and picked, a pound of rich beef-suet minced, and a pound of stale bread-crumbs, six eggs well beaten, an ounce of cinnamon and an ounce of ginger in powder, half a pound of sugar, one nutmeg grated, the grate of a lemon, a tea-spoonful of Jamaica pepper, and a little salt; mix this all together with as much milk or cream as will make it sufficiently thin, and add a glass of rum or brandy; butter a pudding-pan well, or if to be boiled in a cloth, wet it and dust it with flour; boil it slowly and regularly for four or five hours; turn it carefully out, and serve with pudding sauce. This will make a very large pudding; but the proportion of the ingredients may be taken, as three quarters of a pound of each, or half a pound, if sufficient.

PLAIN PUDDING.

Take half a pound of suet minced, a good slice of stale bread broken down, a quarter of a pound of currants cleaned, a little cinnamon and ginger, some brown sugar, and a scrape of nutmeg, a little spirits of any kind, two eggs, and milk to make it up to the proper consistency wanted; boil for two or three hours in a pudding-pan or cloth, and serve with a little melted butter, sugar, and a scrape of nutmeg.

AN APPLE PUDDING.

Pare, core, and cut down, as for a pie, six or eight apples; butter a pudding-pan well; butter also a few slices of bread with sweet butter, and line the pudding-pan with the bread and butter; lay in the apples; season with ground cinnamon, sugar, and a few cloves; cover the top with a slice of bread and butter, and bake before the fire in a Dutch oven. When done, turn it out, and serve with cream in a sauce tureen.

A BREAD AND BUTTER PUDDING.

Beat four eggs well, with a little ginger, a little cinnamon, and a scrape of nutmeg; butter two or three slices of bread, and also a pudding-pan or shape; lay a slice of bread in the bottom of the pan; shake a few currants over it, then another slice of bread and butter, then a few currants, and so on till all the bread is in; mix up the eggs with milk, and pour it over the bread; either bake it before the fire in a Dutch oven, or steam it, and serve with pudding sauce.

PUDDINGS IN HASTE.

Take half a pound of suet minced, the same of grated bread, a quarter pound of currants, the grate of a lemon, a scrape of nutmeg, some sugar, and a little salt; mix this up with three or four eggs, into little balls; put them in a pan of boiling water, and boil them for half an hour; when ready, they will float on the top of the water; pour over them a sauce made of a little melted butter, a little sugar, a small quantity of spirits or wine, and a scrape of nutmeg.

A BREAD PUDDING.

Boil as much milk as you think will be sufficient for the size of the pudding you want; break down a thick slice of stale bread, and a small piece of butter, into a basin; when the milk is just rising in the pan, take it off and pour over the bread, and cover it up for a few minutes; beat three or four eggs, with a tea-spoonful of ground cinnamon, and the same of ginger, the grate of a lemon, and sugar to taste; stir this amongst the bread and milk; a little rum may be added, stirring all the time. This pudding may be baked before the fire, or boiled in a pudding-pan well buttered, and turned out. Serve with pudding sauce.

A BATTER PUDDING.

Take four eggs and beat them well, with as many table-spoonfuls of flour, a little cinnamon and ground ginger, the grate of a lemon and the grate of a nutmeg; mix this with milk, until it is rather thicker than the consistency of a pancake, and boil it in a buttered pudding-pan for an hour.

A CUSTARD PUDDING.

Take four eggs and beat them well, with two spoonfuls of flour; season with sugar, cinnamon, and lemon grate; pour on [illegible] boiling milk, and either boil it in a buttered pudding-shape, or bake for half an hour before the fire in a Dutch oven.

A RICE PUDDING.

Take a cupful of rice well washed, and boil it amongst water; when ready, drain the water off, and put it on again with a good piece of butter, or a little suet minced very fine, and as much milk as you think enough for the size of the pudding; when cool, mix this with four beat eggs, cinnamon, ginger, nutmeg, and the grate of a lemon; sweeten with sugar to taste, and bake for half an hour before the fire in a Dutch oven.

A RICE PUDDING WITHOUT EGGS.

Take a quarter pound of rice, washed well, and two or three table-spoonfuls of brown sugar, a little ground cinnamon or nutmeg, and a good quantity of milk; a few currants may be added, and bake in an oven.

POTATO-PUDDING WITH EGGS.

Pare and boil a few potatoes; when ready, pour and mash them with a good bit of butter; beat them with a fork, to make them light; beat three eggs, and add a little cinnamon, ginger, nutmeg, the grate of a lemon, and a little brown sugar; mix the potatoes with milk, till the consistency of a batter pudding; pour in the eggs, and bake it in a Dutch oven before the fire.

MISCELLANEOUS DISHES.

A SCOTCH HAGGIS.

Procure the tripes and pluck of a sheep, and clean the tripes very carefully; parboil the heart and lights, half of the liver, and a small part of the tripe, for an hour and a half; let them cool, and then mince them very fine; mince also a pound of fresh suet, and grate the parboiled liver; mix this along with two handfuls of oatmeal (previously browned before the fire), a few onions, black and Jamaica pepper, and salt; take the large bag, and wash it first with cold water, then with boiling water; when quite clean, fill in the mince, but do not let it be more than half full, else the bag will burst in the boiling; add a little of the liquor in which the meat was parboiled, and sew up the bag; put it on the fire in boiling water, and prick it frequently with a large needle, to let the air escape; boil it for three hours, with a plate in the bottom of the pot.

POACHED EGGS.

Put a pan upon the fire half filled with boiling water, and put in some salt; when it has boiled through, take it off, and break the eggs gently into it, and let it stand upon the table for three or four minutes; in the meanwhile, toast some slices of bread on both sides; pare off the crust, and butter it; lift the eggs out with a fish-slice or flat spoon, and let them drip for half a minute, and lay them upon the toast. This is by far the best way of poaching eggs, as the boiling breaks them. A spoonful of vinegar dropped into the water serves to firm them.

POTTED HEAD.

Take the half of an ox head and wash it well, taking out all the blood and slimy parts from the nose, and the black part of the eyes; put it on the fire in as much cold water as will more than cover it; boil it until the bones shake out of the meat; strain the soup through a sieve, and let the meat be quite cool before cutting it down; scum all the fat from the stock, and preserve it for other purposes; cut down the meat into neat pieces of half an inch square; put them to the soup, and season with black and Jamaica pepper and salt to taste; allow it to boil altogether for half an hour; dish it into small shapes, and, when cold, turn it out. This is a cheap and excellent dish, and will keep for a fortnight. If it be observed to be getting soft and old tasted, put it on to boil for a few minutes; dish it again, and it will keep for a few days longer.

WHITE ROUX.

Take half a pound of butter; put it into a small stew-pan, and, when melted, shake into it two handfuls of flour; keep stirring constantly for ten or fifteen minutes, but do not let it get brown; dish it up in an earthen pot, and it will keep for weeks. This will be found very useful for sauces or gravies, as, by adding a spoonful of it, it will thicken them, without the trouble of making it every time. Brown roux is made in the same way, only allowing it to brown, and is used for brown sauces, where the other is for white sauces—as for veal and other white meats. We have said, in our directions, where a sauce of this kind was requisite to brown or melt the butter; but if this be made previously, it will do equally well just put amongst the gravy and allowed to boil through.

BROILED CHICKEN.

Pick and singe the chicken; wash and truss it, and cut it down the back; season it with white pepper and salt in the inside; lay it on a gridiron, at a good distance from the fire, to allow it to be done through, before being scorched outside; keep the skin side uppermost, and rub it with butter while broiling; if wanted very light, the skin may be taken off. Serve with parsley-sauce, or plain melted butter.

FRICASSEED CHICKEN.

Cut down the chicken, and stew it slowly in veal stock, or a little gravy made from any trimmings of meat you may have; cover it up, and allow it to stew for half an hour, with two or three onions and a blade or two of mace. The sauce must be strained, and thickened with a little white roux, if you have any, or a little butter and flour. When to be served, put in a glassful of cream, and the beat yolk of an egg; it must not boil after the cream is added, as it will break and curdle. The grate of a lemon and the grate of a nutmeg will improve the flavour.

POTATO-BALLS.

Wash, pare, and boil some dry mealy potatoes; pour the water from them, and beat them with a bit of butter; season them with an onion shred very fine, white pepper, and salt; roll them up into balls the size of an egg, and either fry them in fresh dripping, or brown them below a roast.

POTATO-FRITTERS.

Boil and mash some potatoes; add a bit of butter, white pepper, and salt; thin them with milk, till they are of the consistency of thick pancake batter; drop them into a frying pan of boiling dripping. Brown them, and serve very hot.

TO FRY TRIPE.

The tripe must be washed well, and boiled for three hours; take the thickest parts, and dry them well with a cloth; make a batter of three eggs, three table-spoonfuls of flour, a little salt, and a little sweet milk on small beer; dip the tripe in this, and fry it in a pan, with as much fresh dripping as will almost cover it; when nicely browned, take it out, and lay it before the fire for a few minutes before serving, to absorb the dripping. Garnish with fried parsley.

SCOTCH COLLOPS.

Cut the meat into slices, and beat them well; put a good piece of butter in a frying-pan, and, when hot, lay in the meat; strew sliced onions and pepper and salt over it; fry slowly, having the pan covered; when ready, draw aside the collops, and put in a little flour, some stock or boiling water, and a little ketchup. Serve hot.

TO FRY SAUSAGES.

Cut the sausages into links, and fry them in butter; when ready, lay them on toasted bread, cut into small pieces. Poached eggs may be laid round the dish if approved.

TO FRY LIVER.

Cut down and wash a fresh sheep or calf liver; dry it, and dust it with flour; fry it with a good piece of butter; when put in the pan, strew some finely minced onions and pepper and salt over it; fry it slowly, and when sufficiently done, lift it out, and pour a little water or gravy into the pan; toss it round for a minute or two, and pour it over the liver.

TO DRESS TRIPE.

Choose the thickest and fattest parts of the tripe; soak and wash it well in cold water; put it on to boil with as much water as will cover it; let it boil slowly for four hours; when to be used, cut down half a dozen onions, or boil them whole amongst a little of the liquor in which the tripe was boiled; melt a table-spoonful of butter, the same of flour, and a little sweet milk; add the onions to this, and a little salt, and pour it over the tripe before dishing. The onions should never be added, unless to be used immediately, as they are very apt to sour the tripe.

TO DRESS A VEAL PLUCK.

Parboil the heart and lights for an hour; take them out, and when sufficiently cold, mince them down; put them in a pan, with minced onions and parsley, a little flour, salt, pepper, and one or two table-spoonfuls of mushroom ketchup; thin this with a little gravy, or some of the liquor in which the pluck was boiled; let it [illegible] for half an hour; cut down the liver, and [illegible]ngst butter, and lay round the mince.

ANOTHER WAY.

The heart may be stuffed with bread-crumbs, onions, and parsley minced, pepper, salt, a little suet, and then roasted; the lights may be dressed as above, and the liver fried, and the hash and liver laid round the heart.

A HARRICO OF MUTTON.

Take two or three pounds of the back ribs or loin of mutton; cut it down into chops; skin and flatten them; season them with pepper and salt; rub them with flour, and fry them in butter or fresh dripping, and put them on to stew with their own gravy. A little stock may be made of the trimmings of the chops, an onion or two, and a piece of carrot and turnip; or, put a little water to them, and let them stew for a short time very slowly; parboil a carrot and turnip; cut them down into neat shapes, along with a few onions, and add them to the chops; season it well, and let it all stew for a quarter of an hour. Dish the chops neatly, and pour the sauce and vegetables over them.

DRESSED MUTTON CHOPS.

Cut the chops from the back ribs or loin; trim and flatten them neatly, cutting off the skin; dust them with flour, and dip them in beat egg; strew bread-crumbs, chopped parsley, onions, white pepper and salt, over them; fry them in butter. They will keep for several days.

VEAL CUTLETS.

Slice the cutlets from the back ribs, loin, or fillet; trim and flatten them; dust them with flour; rub them with beat egg; and strew bread-crumbs, parsley and onions shred fine, lemon grated, and white pepper and salt, over them; fry them in butter; when nicely browned, lay on a dish before the fire; dust a little flour amongst the butter, a little stock or water, the juice of a lemon, a little Cayenne pepper, a spoonful of ketchup, and half a glass of sherry wine; put this through a sieve, and lay the cutlets neatly round a dish; pour the sauce in the middle, and serve hot.

TO MASH POTATOES.

Wash and pare your potatoes; boil them with a handful of salt; when ready, pour them, and put in a piece of butter and a little milk; an onion, chopped very small, gives them a fine relish.

A POTATO-PUDDING WITH MEAT.

Mash some potatoes, and add a good large cupful of milk, an onion shred very fine, pepper and salt; take some beef, mutton, or pork, and cut it into slices; season them with pepper, salt, and a finely-shred onion; put a layer of this in a baking dish, and a layer of potatoes, above them a layer of meat; finish with potatoes, and stick bits of butter over the top, and bake in an oven.

TO DRESS A LAMB'S HEAD.

Cut the neck from the head; split up the forehead, and take out the brains; wash the head carefully, taking out the slime from the nose and the black part of the eyes; put it on with the neck, heart, and lungs, to boil; by adding a tea-cupful of rice, a little parsley, a few sliced onions, and a blade of mace, you may have some good broth; let the head, &c., boil for an hour and a quarter; take them out and dry the head and neck; rub it over with an egg well beaten; strew crumbs of bread, pepper, and salt over it; stick pieces of butter over the head and neck, laying the head flat upon a dish before a clear fire, and brown them nicely; mince the lungs and heart with two onions, a little parsley, pepper, salt, and a little flour; add some of the liquor in which the head was boiled, a grate of nutmeg, and a table-spoonful of ketchup; let it stand at the side of the fire for half an hour; take the brains, and beat them well with two eggs, two table-spoonfuls of flour, an onion, and a sprig of parsley shred small, a little white pepper and salt, and two or three table-spoonfuls of milk; have a frying-pan with a little butter, and drop the batter into it in spoonfuls; brown and turn them; take the liver, wash and dry it, and dust it with flour; fry it with butter; lay the head and neck flat upon your dish; lay the hash round it, and then a slice of liver and a braincake alternately around the hash. This is a very cheap and handsome dish.

TO DRESS A SHEEP'S HEAD.

Split, scrape, and wash the head very clean; score it across, and lay it flat upon a dish; strew bread-crumbs, minced parsley, pepper and salt, over it; stick pieces of butter over that, and bake it before the fire in a Dutch oven. A sauce may be made of the brains by parboiling and mincing them down, and stirring them among melted butter, seasoned with a little Cayenne.

A HASH OF COLD MEAT.

Cut the meat into small pieces; brown some butter in a stew-pan, and put in the meat; dust in a little flour, some sliced onions, pepper, and salt; put in as much water, or stock, or the gravy of roast meat, as will bring it to a proper thickness, and stew it for half an hour. A little mushroom ketchup is a great improvement.

LIGHT DISHES AND CONFECTIONS.

ARROW-ROOT.

Make some arrow-root, by breaking it with a very little cold water; pour boiling milk into it until it becomes quite thick; sweeten it with pounded loaf sugar, and season with a little nutmeg or ground cinnamon; put it into a shape, and set it in a cool place to fasten; when to be turned out, run a knife round the edge of the shape, and turn it out. It looks very nice garnished with spoonfuls of red currant jelly laid round it.

RICE.

Wash and pick two or three ounces of rice; boil it in sweet milk till quite soft; sweeten and season it with cinnamon or nutmeg; put it in a shape, and set it in a cool place to fasten; turn it out, and garnish with jelly, which must be eaten along with the rice.

GOOSEBERRY JAM.

Pick and clean your gooseberries, and to every pound of fruit take a pound of brown sugar; boil them in a preserving pan; keep stirring till they boil; boil them for twenty minutes or half an hour; after they come to the boiling point, scum it before dishing. Put into earthen pots, and paper when cold.

RASPBERRY AND STRAWBERRY JAM.

Take equal weight of fruit and lump sugar; pick the fruit, and put it on with the sugar in a preserving pan; put a spoonful or two of water in the bottom of the pan, and stir it frequently till it boils; allow it to boil for half an hour; scum it, and fill it into earthen pots; when cold, cover the tops with paper.

RED CURRANT JELLY.

Take some fresh red or white currants; pick the stalks from them, and put them on the fire in a preserving pan; when warmed, take them off, and squeeze them through a cloth. For every Scotch mutchkin or English pint of juice, take a pound of lump sugar, and boil for twenty minutes, or, if the fruit was wet before being gathered, allow it half an hour; scum it before dishing it, and, when cold, cover the tops of the pots with paper.

ORANGE MARMALADE.

Take six or eight pounds of bitter oranges, and the same weight of loaf sugar; pare off the yellow skin, taking off as little of the white interior part as possible; cut the parings down into small stripes, or cut them again across, which will make them still smaller; put them on in a brass preserving pan, with as much water as will cover them; boil them for an hour, to take out the bitter, and strain them through a sieve; quarter the oranges, and scrape out the pulp, keeping out the seeds. When the pulp is all scraped off, steep the white skin in a basin of cold water; when they have soaked a little, scrape them again, and you will by this means use almost every part of the orange; put the pulp and the parboiled chips on to boil, with the sugar and half of the water in which the skins were soaked; keep stirring till they boil, and allow it to boil for half an hour; scum it, and [illegible] it into earthen pots, and, when cold, cover the tops with paper. If the flavour of lemon be liked, four lemons will be sufficient for this quantity of marmalade. The outer yellow rind should be grated, and the pulp scraped down amongst the oranges.

CUSTARDS.

Boil a quart of sweet milk, with a stalk of cinnamon, a little of the rind of a lemon, a bay leaf, or two or three bitter almonds, with sugar to taste; beat the yolks of six eggs, with a spoonful of flour, and a little milk; pour the boiled milk through a piece of muslin into a basin, and stir the eggs into it; set it on the fire, stirring constantly; let it come to the boiling point, but not more; stir it till cold, and fill the cups, strewing a little cinnamon or grated nutmeg over the top.

CHEESE-CAKES.

It is often inconvenient to procure curd for making cheese-cakes, but there is an excellent substitute in potatoes, and, at the same time, more economical. Pare and boil a few potatoes; beat them very finely, with two ounces of melted butter, two of sugar, the grate of two lemons, a little cinnamon, the yolks of four or six eggs, and a glass of brandy (currants may be added, to make them richer); mix all the ingredients well together; line patty-pans with puff paste, and fill them up; bake for fifteen or twenty minutes in a quick oven.

PANCAKES.

For every pancake that is wanted, allow one egg, and a proportion of one table-spoonful of flour to each egg, a little sugar, a little ginger, and a little cinnamon or nutmeg; put in as much milk as will make a thick batter; put a small piece of sweet butter in a frying-pan, and when hot, pour in the batter; brown it equally, and turn it, or brown the upper side before the fire, which makes them lighter; roll them up, and strew white sugar over them.

APPLE FRITTERS.

Make a thick batter, as for pancakes, only substituting beer for milk; mix minced apples amongst it; melt a piece of butter in the frying-pan, and drop the fritters into it; brown them nicely on both sides, and strew sifted sugar over them.

ANOTHER WAY.

Make a batter the same as above, only a good deal thicker; pare and slice two or three large apples; dip them in the batter, and fry them in plenty of butter or fresh dripping.

BLANCMANGE.

To a quart of sweet milk or cream, take an ounce and a half or two ounces of isinglass—(but the quantity of isinglass required must depend greatly upon the shape or mould; if it be a plain oval or round shape, it does not require so much isinglass as if it were a branched shape, where it depends upon the strength of the isinglass alone)—boiled for a quarter of an hour, with the rind of a lemon, a blade of mace, and white sugar to taste; blanch and pound to a paste six or eight bitter almonds, and four times that number of sweet ones, with a little water; put this gradually to the hot milk, and strain it through a muslin sieve; let it settle for a little; then pour it into the mould, keeping back the sediment; when to be turned out, lay a cloth dipped in hot water round it for a few moments; run a knife round the edges, and turn it out.

CALF'S-FEET JELLY.

Take two cow's feet, well cleaned; take off the hoofs, and break the feet in several places; put them on with two Scotch pints of cold water; boil them slowly until the bones loosen from the meat; strain it, and let it stand till cold: it should now be quite firm, and if not, put it on again to boil down for an hour; when cold, take off the fat carefully from the top; put the jelly into a preserving pan (keeping back the sediment) with the peel of three lemons and the juice, two stalks of cinnamon, half a bottle of sherry or Madeira wine, eight eggs, well whisked, and white sugar to taste; stir it all together, and put it on to boil for a quarter of an hour or twenty minutes; take it off, and let it settle, with a cloth over it, for a few minutes; then pour it through a clean jelly bag until it be quite clear; keep the bag covered, and let it stand near the fire. Plain, and almost as good jelly, may be made with ale instead of wine, and vinegar instead of lemons. Many persons keep back the yolks of the eggs, but it is equally clear, and a great deal more firm, when they are added to the jelly.

ITALIAN CREAM.

Whisk up a pint of rich cream with the rind of two lemons rubbed off with sugar, the juice of the lemons, and pounded sugar to taste; when well whisked, add half an ounce of isinglass, melted with a little boiling water, and a glass of brandy; whisk it up till it is quite stiff; fill the shape, and set it in a cool place to freeze. Salt is a very good substitute for ice, to place the shape amongst damp salt in a cool cellar. This cream will have a delightful flavour, and also a beautiful colour, by rubbing a little raspberry preserve through a fine sieve amongst the cream.

PUFF PASTE.

To one pound of butter take a pound and a half of flour; mix the third part of the butter amongst the flour, by rubbing it through the hands; if the butter be sweet, add a little salt; put in as much water as will make it into dough; work it up quickly, and roll it out; take the other two-thirds of the butter which remains, and divide it into four or five parts, and stick one of the parts in small bits over the paste; strew a little flour over it; fold it together, and roll it out again, and so on till all the butter is used. If it has to stand for any time before being baked, cover it with a damp cloth.

COMMON PASTE.

Take three quarters of a pound of butter to two pounds of flour; rub the butter amongst the flour, and add as much water as will make it into a paste; if the butter be fresh, add a little salt; knead it up quickly, roll it out, and cover your pies. This quantity of flour and butter will make as much paste as will cover two or three pies; when only one is to be made, a proportion of the ingredients must be taken; but this is left to the judgment of the cook.

SWEET PASTE.

Take a pound of fine flour, and half a pound of fresh butter, the beat yolks of two eggs, two ounces of pounded white sugar; make it into a paste with hot milk, and knead it until it is quite smooth. Fruit pies, and all sweet pies, should have the white of an egg well beaten with fine pounded sugar, laid on the top with a feather brush.

SHORTBREAD.

To two pounds of flour, add six ounces of fine sugar pounded, an ounce of lemon, and an ounce of orange-peel, candied, cut into small pieces, and mixed amongst the flour; melt a pound and a half of butter, and pour it amongst the flour, and knead it up quickly; roll it out into cakes of an inch and a half thick; pinch them neatly round the edges, and prick them on the top with a fork. This will be equally good, although not so rich, by leaving out the peel, and it may be made richer by adding chopped almonds.

TO MAKE EGG-BALLS FOR MOCK-TURTLE SOUP.

Boil four or five eggs till they are quite hard; take out the yolks, and beat them in a mortar with salt and Cayenne pepper; make them into a paste with the white of one or two raw eggs; roll them into small balls of the size of a marble; roll them in flour; fry them in butter, and put them amongst the soup.

SAUCES.

[*General Directions.*—Care must be taken, in preparing the following sauces, to remove them from the fire on their reaching the boiling point, as they become thin by boiling.]

MELTED BUTTER.

Take two ounces of butter, and two table-spoonfuls of flour; add to this a small cupful of cold water; toss it round well, and do not allow the flour to get into lumps, which it will do if the water be not put in by degrees; keep stirring or tossing it round till it boil. In stirring melted butter, it should be always stirred one way, as there is a danger of its oiling; if it should oil, it may be recovered by putting a little cold water into it.

CAPER SAUCE.

Melt a piece of butter, and, when to be used, stir in two table-spoonfuls of capers; the one-half of them may be minced, to give the flavour more freely to the sauce; add a little vinegar or lemon-juice.

MINT SAUCE.

Take a few leaves of fresh green mint; wash them, and chop them very fine, and mix them with vinegar and brown sugar.

APPLE SAUCE.

Pare and cut down two or three baking apples; put them on with a little water to stew very slowly, until quite soft; beat them up with sugar and a small bit of butter, and serve in a sauce tureen.

BREAD SAUCE FOR GAME.

Crumble down a thick slice of bread; put it on in a sauce-pan, with as much sweet milk as will make it a thick sauce; beat it well with a spoon, till quite smooth: season with white pepper, and serve in a sauce tureen.

CAUDLE SAUCE FOR PLUM-PUDDING.

Melt some butter, and stir into it a glass of sherry, half a glass of brandy or rum, the grate of a lemon, the grate of a nutmeg, and sugar, to taste; do not allow the sauce to boil after the spirits are added to it.

OYSTER SAUCE.

Take a hundred fresh oysters, and scald them for a few minutes; take a good piece of butter; melt it in a pan; shake in some flour; stir it constantly until it be of a nice light brown; pour in some stock, or the liquor of the oysters, to thin it; season it highly with Cayenne pepper and salt to taste, and some mushroom ketchup, but do not add the salt until you have put in the ketchup; pick and beard the oysters, and put them amongst the sauce. Half a glass of sherry will be a great improvement.

PLAIN OYSTER SAUCE.

Melt a good piece of butter, and add to it half a hundred oysters, scalded and picked, and season with Cayenne. A spoonful of ketchup will make this a very nice sauce.

LOBSTER AND CRAB SAUCE.

Melt the butter as directed above; pick out the red meat of a boiled lobster, or the meat from the claws of a boiled crab; chop it down very fine, and put it amongst the butter; season with Cayenne pepper.

PARSLEY SAUCE.

Melt a good piece of butter; scald some parsley, by immersing it in boiling water for a minute or two; chop it down, and add it to the melted butter.

EGG SAUCE.

Melt a good piece of butter the same way as for other sauces, only substituting milk for water; boil one or two eggs very hard; peel and chop them down, and mix them amongst the melted butter; add a little Cayenne.

CELERY SAUCE.

Cut down a head or two of celery into pieces of an inch long; parboil them in water; make a sauce, the same as for egg sauce, either of milk or cream; put the celery to this, and season with grated nutmeg and white pepper; let it come to the boil, but not more, as the cream is apt to break by boiling.

ONION SAUCE.

Parboil a dozen young onions; make a sauce of melted butter; if the sauce be wanted very white, use cream or milk instead of water; put the onions to this, and season with white pepper and salt. If the onions be old and large, they should be beat through a sieve and put amongst the sauce.

FISH.

TO BOIL SALMON.

Clean the fish well with a wet cloth, without either washing or scaling it; put it on in a fish-kettle, with plenty of cold water, and a handful of salt; allow twelve minutes for every pound of fish, and, when ready, lift the drainer, and place it across the top of the fish-pan to drip before dishing. It should be served on a dish covered with a napkin, and garnished with green parsley. For sauce, plain melted butter, or parsley, or lobster-sauce, may be served, besides a sauce-tureenful of the liquor in which the fish was boiled, as that is sometimes preferred to any other sauce.

TO BROIL SALMON.

Cut slices from the thick of the fish, dry them, and dust them with flour. Broil them on a gridiron over a clear fire; when ready, rub them over with butter, and serve hot, with any of the sauces used for salmon.

TO KIPPER SALMON.

Cut up and clean the fish without washing; rub it over with salt, raw sugar, and a little saltpetre. The fish should lie for two days with a board placed above to press it down; it should then be hung with pieces of wood across, to keep it from folding together. When to be dressed, it must be cut into slices, and broiled on the gridiron; and when done, rubbed over with sweet butter.

TO BOIL TURBOT.

Choose a thick fish, and of a cream-coloured white; before boiling, it should be soaked in salt and water, with the addition of a little vinegar; put it on in a fish-kettle, with plenty of cold water, a handful of salt, and a cupful of vinegar. A turbot should be boiled for half an hour after it has come to the boil. It may be garnished with any small fish fried, or with parsley. For sauce, lobster or oyster sauce should be used, or plain melted butter.

TO DRESS TURBOT.

Cut a small turbot into slices; dip them amongst beat eggs; roll them in bread-crumbs, minced parsley, white pepper, and salt; bake them in a dish well buttered, and baste frequently. The sauce used for this is made of the trimmings of the fish, butter, and flour, browned and thinned with stock or water, to which must be added part of a lobster parboiled, or oysters scalded and pickled, and seasoned with Cayenne and salt, and a little mushroom ketchup; lay the fish neatly on a dish, and pour the sauce round them; or, the fish may be prepared as above, and fried amongst butter, and served with plain sauce.

TO BOIL HALIBUT.

Wash and clean the fish well, and boil it in cold water, with a handful of salt; scum it well. Ten minutes is considered enough for every pound of fish. Garnish with parsley, and serve with melted butter or oyster-sauce.

TO DRESS HALIBUT.

Cut the fish into slices, rub it over with flour, dip it in beat egg, and strew bread-crumbs over it, and fry amongst fresh dripping; or, it may be fried without the eggs and bread-crumbs, only dusted with flour, and fried with butter, and served with plain melted butter or oyster-sauce.

TO FRY FLOUNDERS.

Clean them well, taking out the gut; dry them with a cloth, dust them with flour, dip them in beat egg, strew bread-crumbs over, and fry amongst as much dripping as will cover them. When done to a nice light brown, lay them before the fire for a few minutes, and dish them with the back downwards. Garnish with parsley.

TO DRESS A COD-HEAD AND SHOULDERS.

Procure a good grey cod, clean it well, and take out the gills; lay it all night amongst salt. When to be used, cut off the head, and as much of the shoulders as you think may be required for the size of the dish you want; skin it, and bind it with a cord to keep it firm; a small piece of the tail part put into the mouth preserves it from breaking down; boil it in cold water, with a handful of salt, from twenty minutes to half an hour. When ready, set it on your drainer, over the top of your fish-pan, to drip; brush it over with a beat egg; strew bread-crumbs over it, and stick pieces of butter thickly over the top; set it before a clear fire to brown; take a piece of butter, and brown it with flour in a stew-pan; thin this with beef stock or gravy, or the skin and trimmings of the fish, boiled with an onion and a sprig or two of parsley, and strained amongst the butter; then add a little Cayenne pepper, salt, the squeeze of a lemon, two or three spoonfuls of ketchup, and a glass of sherry wine; scald and pick a hundred oysters, and put amongst the sauce. When dished, lay the sauce round the fish, not over the top, as that spoils the appearance of the fish.

ANOTHER WAY.

Clean the fish as before, and boil it with the skin on; boil it for half an hour, and when to be dished, scrape off the skin, and pour oyster-sauce over the fish,

TO DRESS THE MIDDLE CUT OF A COD.

Clean and skin the fish, and make a stuffing of bread-crumbs, parsley, and onions chopped small, pepper and salt, and a bit of butter; skewer this into the open part of the fish, and rub it over with beat egg; strew bread-crumbs, and stick pieces of butter over it, and set before the fire to bake; serve with beat butter or oyster-sauce.

TO FRY COD.

Cut slices from the tail about an inch thick; dust them with flour, and rub them over with beat egg; strew bread-crumbs over them, and fry them with dripping. When nicely browned, lay them on a drainer before the fire for a few minutes. Garnish with parsley, and serve with oyster-sauce.

TO DRESS HADDOCKS.

Take two good well-sized haddocks; gut and wash them clean, but do not scrape them; they are firmer and better if they lie all night among salt; dry them, and cut off the fins; slip a knife in at the neck, and take off the skin, taking care not to tear the fish; cut them neatly from the bone, dividing each side into two parts; dust them with flour, and dip them amongst an egg well beaten; then strew bread-crumbs over them. In the meanwhile, have some fresh dripping in a flat pan, sufficient to cover the fish; be careful that the dripping is not too hot to scorch the fish; the best means of knowing this, is, when it gives over crackling, and settles quietly in the pan; then put in the fish, and turn them carefully. When they are nicely browned, lay them before the fire on a drainer for a few minutes to drip. Garnish with fried parsley; put the dripping through a hair sieve, and it will serve again.

TO FRY WHITINGS.

Clean the fish without washing, as that softens them, and from the delicate nature of the whitings, they will not fry whole after being much handled; dust them with flour, and dip them amongst beat egg, and strew bread-crumbs over them, and fry them amongst dripping, with the tail turned through the eyes. Garnish with fried parsley.

TO BAKE HADDOCKS.

Take two or three good haddocks, clean them, and lay them all night amongst salt. When to be used, skin them, and cut off the heads; make a stuffing of bread-crumbs, chopped onions and parsley, pepper and salt, and a little bit of butter; sew this into the belly of the fish; rub them over with butter, and strew bread-crumbs over them, and bake them in a Dutch oven before the fire.

FISH AND SAUCE.

Take two or three haddocks, clean them, and lay them all night amongst salt. When to be used, skin them, and cut off the heads, tails, and fins; boil these for half an hour, or three-quarters, to make a little stock for the fish; brown a little flour and butter slightly in a stew-pan; strain and pour in your stock amongst the butter; add sliced onions and chopped parsley, salt and a little Cayenne pepper, and a spoonful of ketchup; when this is nearly ready, put in your fish, cut into several pieces, and boil for ten minutes.

TO BOIL SKATE.

Choose a nice thick grey skate, with prickly back; it is more generally liked when salted slightly, and hung for a day; boil it in cold water, and before serving, scrape off the skin; serve with melted butter, or lobster or oyster sauce.

TO FRY SKATE.

Clean and skin the fish, and cut it into slices; rub it with flour, dip it in beat egg, strew bread-crumbs over it, and fry amongst butter or fresh dripping; it may be fried without the egg and bread-crumbs, only rubbed with flour; serve with plain beat butter, or parsley sauce.

TO CRIMP SKATE.

Clean and skin the fish, and cut into slices; roll them up and tie them with tape, or fasten them with a small wooden skewer; boil them in cold water, with a good handful of salt; drain them, take off the tape or skewer, and serve with plain melted butter, or parsley sauce.

TO STEW OYSTERS.

Pick and beard the oysters, and put them in a pan with a very little of their own liquor, a good piece of sweet butter, a little flour, and some Cayenne pepper. Let them stew for a few minutes, and add a table-spoonful or two of sweet cream. Serve hot.

TO SCALLOP OYSTERS.

Pick and scald the oysters in their own liquor; strain them from the juice; lay them on a dish, and heap bread-crumbs over them mixed with pepper and a little fine salt; stick pieces of butter thickly over the bread-crumbs, and bake before the fire.

TO FRY OYSTERS.

Make a batter of eggs, flour, pepper and salt, and dip the oysters amongst it, having first washed them in their own liquor; brown a piece of butter in a frying-pan, and fry them over a quick fire. A sauce may be made of their own juice poured amongst the butter (having first lifted out the oysters), and thickened with flour, and seasoned with Cayenne and a little ketchup. A grate of lemon peel may be added, if the flavour be liked. Mussels may be dressed in the same manner.

TO BAKE HERRINGS.

Take ten or a dozen fresh herrings; clean them, by wiping them with a wet cloth, but do not wash them, as that takes away the richness of the fish; split them, and cut out the centre bone; cut off the heads, and roll them up with pepper and salt inside; lay them neatly in a pie-dish, and stick bits of butter over the top; shake pepper and salt, and pour vinegar over them, and bake in an oven.

TO BOIL HERRINGS.

Clean the herrings in the manner directed above; boil them in a flat pan, with half water half vinegar.

BREAD.

It is more difficult to give rules for making bread than for any thing else, it depends so much on judgment and experience. In summer, bread should be prepared with cold water; during a chilly, damp spell, the water should be slightly warm; in severe cold weather, it should be mixed quite warm, and set in a warm place during the night. If your yeast is new and lively, a small quantity will make the bread rise; if it be old and heavy, it will take more.

Flour bread should have a sponge set the night before. The sponge should be soft enough to pour, mixed with water, warm or cold, according to the temperature of the weather. One gill of lively yeast is enough to put into sponge for two loaves. I should judge about three pints of sponge would be right for two loaves. The warmth of the place in which the sponge is set should be determined by the coldness of the weather. If your sponge looks frothy in the morning, it is a sign your bread will be good; if it does not rise, stir in a little more emptings; if it rises too much, taste of it, to see if it has any acid taste; if so, put in a tea-spoonful of pearl-ash when you mould in your flour; be sure the pearl-ash is well dissolved in water; if there are little lumps, your bread will be full of bitter spots. About an hour before your oven is ready, stir in flour into your sponge till it is stiff enough to lay on a well floured board or table. Knead it up pretty stiff, and put it into well-greased pans, and let it stand in a cool or warm place, according to the weather. If the oven is ready, put them in fifteen or twenty minutes after the dough begins to rise up and crack; if the oven is not ready, move the pans to a cooler spot, to prevent the dough from becoming sour by too much rising. Common sized loaves will bake in three quarters of an hour. If they slip easily in the pans, it is a sign they are done. Some people do not set a soft sponge for flour bread; they knead it up all ready to put in the pans the night before, and leave it to rise. White bread and pies should not be set in the oven until the brown bread and beans have been in half an hour. If the oven be too hot, it will bind the crust so suddenly that the bread cannot rise; if it be too cold, the bread will fall. The chief error fallen into in preparing bread at home, is the giving of it too firm a consistency, and not raising it so well as the bread of bakers.

Those who make their own bread should make yeast too. When bread is nearly out, always think whether yeast is in readiness; for it takes a day and night to prepare it. One handful of hops, with two or three handfuls of malt and rye-bran, should be boiled fifteen or twenty minutes, in two quarts of water, then strained, hung on to boil again, and thickened with half a pint of rye and water stirred up quite thick, and a little molasses; boil it a minute or two, and then take it off to cool. When just about lukewarm, put in a cupful of good lively yeast, and set it in a cool place in summer, and warm place in winter. If it is too warm when you put in the old yeast, all the spirit will be killed.

In summer, yeast sours easily; therefore make but little at a time. Bottle it when it gets well a-working; it keeps better when the air is corked out. If you find it acid, but still spirited, put a little pearl-ash to it, as you use it; but by no means put it into your bread unless it foams up bright and lively as soon as the pearl-ash mixes with it. Never keep yeast in tin; it destroys its life.

The most wholesome bread that can be eaten is that made from wheat ground altogether, that is, the fine and the common flour mixed, with the addition of the rougher particles of the inner rind of the grain. This mixed flour makes excellent and nutritious brown bread, and to most people it is much more pleasant to the palate than pure white bread; but it is seldom prepared for sale by bakers, from the prejudices of the public in favour of clear white loaves, and will in most places require to be made at home. Those accustomed to make white bread will have no difficulty in managing it. The inhabitants of London have a strong prejudice against any bread but that which has a certain degree of whiteness, and suffer accordingly. To procure the necessary standard whiteness, the very best wheaten flour or certain adulterating substances must be employed; and as the finest flour is too dear, the process of adulteration is preferred. The principal substances alleged to be employed by various bakers in the adulteration of bread, are, gypsum, or plaster of Paris, chalk, Cornish pipe-clay, bean-flour, peas-meal, potatoes, bone-ashes, alum, carbonate of ammonia, and blue vitriol. The object in using these is, generally speaking, to bleach the bread white, and raise it, so as to have the appearance of lightness. Some of the ingredients are far from being noxious, but others are most injurious to the stomach, cause contraction of the intestines, and so hurt the health of the consumers.

BEER.

Beer is the best family drink, and is preferable to either porter or strong ale. Beer may be easily brewed. The utensils are a large pot, a tub, and barrel. The estimate is a handful of hops to a pailful of water, and a half-pint of molasses. Malt mixed with a few hops makes a weak kind of beer; but it is cool and pleasant, and needs less molasses than hops alone. The rule is nearly the same for all beer. Boil the ingredients two or three hours; pour in a half-pint of molasses to a pailful while the liquor is scalding hot; strain the beer, and when nearly lukewarm, put a pint of lively yeast to a barrel; leave the bung loose till the beer is done working, which can be ascertained by observing when the froth subsides. Beer keeps better bottled than in casks. The beer should have an agreeable bitterish taste; should sparkle in some degree when poured out; but it is not necessary that it should have more than a mere surface of cream or froth. If any kind of beer turn sour, it may be cured in drinking by putting a pinch of the carbonate of soda into the glass. This makes it effervesce, and gives it an agreeable pungency, while no injury ensues to the drinker. Carbonate of soda is a white flour-like substance, which may be purchased from chemists.

Inasmuch as the brown bread above noticed is better for our constitutions than white, so is good plain beer better as a beverage than porter. London porter, however innocent to strong constitutions and those who take a great deal of exercise, is allowed to be injurious in many respects, if not procured unadulterated. Many people think that porter should have froth on its surface, otherwise it is not fresh, and so, to give it the desired head, a variety of ingredients, particularly green vitriol, alum, and common salt, are used: other compounds are also in requisition, as the extract of a poisonous berry named cocculus indicus, extract of quassia and liquorice, powder of gentian root, sulphate of iron, sugar boiled down, &c., nearly all of which less or more injure the stomach, promote headach, and cause other evils. There is no doubt that there is much genuine London porter used; but it would be advisable to be careful from what source it is procured, as well as to remember that frothing is no proof of its purity or excellence.

GINGER BEER.

Ginger beer is made in the following proportions:— One cup of ginger, one pint of molasses, one pail and a half of water, and a cup of lively yeast. Most people scald the ginger in half a pail of water, and then fill it up with a pailful of cold; but in very hot weather some people stir it up cold. Yeast must not be put in till it is cold, or nearly cold. If not to be drunk within twenty-four hours, it must be bottled as soon as it works.

SEASONS FOR MEATS, &c.

Among the best works on cookery now in use, are the "Cook and Housewife's Manual, by Mistress Margaret Dods, of the Cleikum Inn, St Ronan's," and the "Practice of Cookery, by Mrs Fraser." The work of the former is an instructive and amusing publication, and has had a large sale among the higher classes of families. The accomplished authoress has the following notices of the principal meats, fish, and vegetables, in season in the different months of the year:—

January.—Beef and mutton, which are to be had good all the year round, are both prime in this month, though they begin to get dearer than in the fall of the year; veal to be had good, but dear at this season; house-lamb and pork generally both dear. *Poultry*—Turkeys, geese, ducks, fowls, pullets, tame pigeons, wild ducks, hares and rabbits, plentiful; the latter about the cheapest. *Fish*—Turbot, halibut, skate, cod, haddocks, soles, plaice, flounders, oysters; prime turbot is now scarce; lobsters and crabs hardly to be got at this time; prawns plentiful. *Vegetables*—The same sorts of vegetables are in season, with little variation, from the beginning of November till the end of February: they are Savoys, cabbage, and greens of all the sorts, Brussels sprouts, broccoli, sulphur-coloured and purple; spinach, leeks, onions, beet-root, parsnips, turnips, celery, carrots, potatoes, cresses, parsley, cucumber, endive, and forced asparagus, and mushrooms.

February.—Meat the same as in January, but veal and house-lamb generally rather cheaper. *Fish* the same, but cod and haddocks fallen off; lobsters more plentiful; barbel and dace got. *Fowls* and *Game* the same, and spring chickens and ducklings in addition, but always enormously dear. Pea and Guinea fowl now come in, and continue till July. *Vegetables* the same.

March.—Meat as in January, and grass-lamb; house-lamb now cheaper; and mountain-mutton, which begins to fall off about mid-winter, now not so good, particularly in severe seasons; veal gets cheaper. Poultry the same as last month's; no hares, close-time till September; green geese, ducklings, tame pigeons (cheaper); wild pigeons; moor-game close. *Fish*—Salmon is now got, but dear; indeed, it is to be had in London almost the whole year round. Fish, in an open spring, are plentiful about this time, but still more so in April; mackarel, shrimps, and prawns, are now seen. *Vegetables*—Forced cucumbers, young turnips, and turnip tops, spinach, broccoli, radishes, and forced salad herbs.

APRIL.—*Meat of all kinds*—Veal and lamb get cheaper. Poultry same as last three months. *Vegetables* same as the last months, with chervil and lettuce; vegetables now begin to get cheaper. *Fruits*—Green gooseberries and rhubarb for tarts. White fish plentiful.

MAY.—The same in meat as the preceding months, and about Whitsuntide buck-venison comes in season. *Fish*—Turbot, lobster, trout, salmon, eels, and plenty of the smaller white fish in favourable weather; oysters go out of season till August. *Vegetables* of all kinds as before, with forced peas and early potatoes; sea-kale, saladings, and carrots, are now obtained of natural growth.

JUNE.—*Meat of all kinds*, and generally begins to get cheaper. *Fish*—Salmon, turbot, skate, halibut, lobsters, soles, eels, in high season, and getting cheaper. *Vegetables* in great plenty and variety, and cheaper; early cauliflower got, asparagus plentiful, and about the cheapest towards the end of the month. *Fruits* in fine seasons are strawberries, early cherries, melons; also apples for tarts.

JULY.—*Meats of all kinds*—Lamb and veal cheap. Poultry of all kinds as before, and also plovers and wheat-ears. Leverets, turkey-poults, and ducklings, are now worth eating, and cheaper. Wild-ducks are often got about this time. *Fish* is now good of all kinds, and the rarer sorts, as turbot and salmon, are about the cheapest. *Vegetables* of all kinds good and plentiful, as cauliflowers, peas, and French and Windsor beans. *Fruits*—All the small fruits at their best.

AUGUST AND SEPTEMBER.—*Meat of all kinds, and cheap*—Mountain-mutton now excellent. Grass-lamb growing coarse. Veal scarcer. Poultry as before; with moor-game of all kinds after the 12th of August, and partridges and hares from the beginning of September. Geese and ducks now full-grown. *Fish*—Cod becomes good, turbot goes rather out, as does salmon. Fresh-water fish now plentiful, as pike, carp, perch, and trout. Herrings, which are in season from July till March, are now excellent. *Fruits* of all kinds plentiful. Mushrooms most plentiful at this time, also cucumbers.

OCTOBER.—Meat as before, and doe-venison. Pasture-fed beef and mutton are probably at the best in this month. Poultry and game in all variety, but young fowls get dearer. Pheasants now got, and generally wild pigeons, snipes, and wild ducks, begin to appear. *Fish*—Cod, haddocks, brill, tench, and all sorts of shell-fish. Oysters, which come in at London in August, and at Edinburgh in September, are now excellent. *Vegetables*—Beans, broccoli, and cabbage of all kinds; beet, onions, leeks, turnips, carrots, lettuce, cresses, endive, celery, cucumbers, spinach, and dried herbs. *Fruits*—All sorts of apples and pears.

NOVEMBER AND DECEMBER.—*Meat*—Beef and mutton prime. House-lamb and veal. Sucking-pig. Buck-venison goes out. *Fish*—All good about this time. Salmon dear. *Poultry* gets very dear in large towns about this season, but is to be got of all kinds; also woodcocks and snipes.

It is, however, quite impossible rigidly to fix the seasons of provisions, and much less their price. Meat, generally speaking, is cheapest in the latter end of autumn, and dearest in spring. Beef is found prime all the year round, but small natural pasture-fed beef is at the best in October; so is hill-mutton: both fall away in the winter, and are lean in spring. Beef and mutton may be cured for winter-store, or for hams, with most advantage about the beginning of November, both from quality and price.

ON CHOOSING PROVISIONS.

Mrs Fraser's work on cookery is of a useful nature, and has been many years in repute among practical cooks in Edinburgh. Some of her remarks on the choosing of provisions are worthy of being attended to.

Beef.—Ox beef, if young, has a fine, smooth, open grain, of a pleasing carnation red, and is very tender; the fat rather white than yellow, and the suet white. The grain of cow beef is closer, and the fat whiter; but the lean not so bright a red as the other. The grain of bull beef is still closer, the fat hard and skinny, the lean of a deep red, and smells stronger than cow or ox beef.

Mutton.—If young, it will feel very tender; but if old, it will be hard, and the fat fibrous and clammy. The grain of ram mutton is close, the flesh of a deep red, and the fat spongy. The flesh of ewe mutton is paler than the wedder, and the grain closer. Short-shanked mutton is the best.

Lamb.—If the vein in the neck of the fore-quarter appears of a fine blue, it is fresh; but if green or yellow, it is stale. If the hind-quarter has a faint disagreeable smell near the kidney, or if the knuckle be limber, it is not good. The head is good when the eyes are bright and plump, but stale if sunk and wrinkled.

Veal.—The flesh of cow-calf is whiter than that of bull, but not so firm; the fillet of the former is generally preferred, on account of the udder. If the vein in the shoulder is not of a bright red, it is not fresh; and if there be any green or yellow spots in it, it is bad. A good neck and breast will be white and dry; but if clammy, and look green or yellow at the upper end, they are stale. The kidney is apt soonest to taint in the loin, and if stale, it will be soft and slimy. A leg is good if it be firm and white; but bad if limber, and the flesh flabby, with green or yellow spots. The same observations with regard to the lamb's head hold as to this.

Pork.—Measley pork is dangerous to eat. It is known by the fat being full of little kernels. If young, the lean will break on being pinched, the skin will dint by pinching it with the fingers, and the fat, like lard, will be soft and pulpy. If the rind is thick, rough, and cannot be easily pinched, it is old. If the flesh is cool and smooth, it is fresh; but if clammy, it is tainted, and the knuckle part will always be the worst.

Hams.—Those are best which have the shortest shank. If, by introducing a knife under the bone, it come out clean, and smell well, it is good; but if it be daubed and smeared, or has a disagreeable smell, it is bad.

Bacon.—If good, the fat will feel oily, look white, the lean will be of a good colour, and stick close to the bone; but bad, or will be soon rusty, if there are streaks in the lean. The rind of young bacon is always thin, but thick if old.

Turkeys.—If a cock-turkey is young, it will have a smooth black leg, with short spurs, the eyes full and bright, and the feet limber and moist; but see that the spurs are not scraped to deceive. When stale, the feet are dry, and the eyes sunk. The legs of the hen, if she is old, will be rough and red; and if with egg, the vent will be soft and open.

Geese.—A yellow bill and feet, with few hairs upon them, are the marks of a young goose; but these are red when old. The feet will be limber if fresh, but stiff and dry if stale. Green geese are in season from May to June, till they are three months old. A stubble goose is good till it be five or six months old, and should be picked dry. The same rules will hold as to wild geese, with respect to their being young or old.

Ducks.—The legs of a new-killed duck are limber; and if fat, the belly will be hard and thick. The feet of a stale duck are dry and stiff. Those of a tame one are of a dusky yellow, and thick. The feet of a wild duck are smaller than a tame one, and are of a reddish colour.

Hares.—When old, the claws are blunt and rugged, the ears dry and tough, and the cleft wide and large; if young, the claws are smooth and sharp, the ears tear easily, and the cleft in the lip much spread. The body will be stiff, and the flesh pale, if newly killed; but if the flesh is turning black, and the body limber, it is stale: they are not always considered the worse of being kept till they smell a little.

Fish.—The general rule for knowing whether fish are fresh or stale, is by observing the smell and colour of the gills, which should be of a lively red; whether they be hard or easily opened, the standing out or sinking in of the eyes, the fins stiff or limber, or by the gills. Fish taken in running water are always better than those from ponds.

Trout.—All kinds of fresh-water fish are excellent; but the best are red and yellow. The female is most esteemed, and is known by its small head, and deep body. They are in high season the latter end of May.

Salmon, when fresh, is of a fine red, and particularly so at the gills; the scales bright, and the fish very stiff. The spring is the best season for this fish. Pickled salmon is good, if the flesh feels oily, and the scales stiff and shining.

Butter.—In buying fresh butter, trust more to taste than smell. In choosing salt butter, trust rather to smell than taste. If it is in a cask, have it unhooped, and probed to the bottom.

Eggs.—To judge properly of an egg, put the greater end of it to your tongue, and if it feel warm, it is new; but if cold, it is stale; or if, by holding it up before the sun or a candle, the yolk appears round, and the white clear and fair, it is good; but if the yolk is broken, and the white cloudy, it is bad.

ADVICES FOR THE ECONOMICAL.

The following are a few short advices on housekeeping not unworthy of attention:—

Some people are fond of corned or slightly salted beef, which forms a good winter dish. When you merely want to cure meat, all you have to do is to rub in salt plentifully, and lay it aside till it is impregnated with the saline properties. A little saltpetre may be rubbed in before applying the common salt, to make the meat tender; but this should only be done in the winter season.

Sufficient care should be taken in summer to preserve fresh meat from wasting. As soon as it is brought into the house, it should be carefully covered from the flies, and put in a cold, and, if possible, airy situation. If it consist of pieces, they should be spread out, separate from each other, on a large dish, and covered. If not to be cooked soon, it should be sprinkled with salt. The fat and flabby parts should be raised up above the lean, and a little salt strewed in. If there be danger of its wasting, in spite of these precautions, it should be scalded.

All herbs should be kept carefully from the air. Onions should be kept very dry. When green peas become old and yellow, they may be made somewhat tender and green by sprinkling in a pinch or two of pearl-ash when they are boiling. Potatoes should, if possible, always be prepared with steam, which renders them drier and more pleasant in eating than boiling with water. They may be easily steamed by a tin pan, with holes in the bottom, and closed with a lid, fitted into a goblet or stew-pan, in which water is put to raise the steam.

It is a good practice to have all stoneware, china, or glass articles, washed in wooden bowls, as it saves the edges from being chipped, or the vessels from being broken.

It is a good plan to put new earthenware into cold water, and let it heat gradually until it boils, then cool again. Brown earthenware, in particular, may be toughened in this way. A handful of rye, or wheat bran, thrown in while it is boiling, will preserve the glazing, so that it will not be destroyed by acid or salt.

Clean a brass kettle, before using it for cooking, with salt and vinegar.

Skim milk and water, with a bit of glue in it, heated scalding hot, is excellent to restore old, rusty, black Italian crape. If clapped and pulled dry, like nice muslin, it will look as well, or better, than when new.

Do not have carpets swept any oftener than is absolutely necessary. After dinner, sweep the crumbs into a dusting-pan with your hearth-brush; and if you have been sewing, pick up the shreds by hand. A carpet can be kept very neat in this way; and a broom wears it very much.

It is not well to clean brass andirons, handles, &c., with vinegar. It makes them very clean at first, but they soon spot and tarnish. Rottenstone and oil are proper materials for cleaning brasses. If wiped every morning with flannel and Jamaica rum, they will not need to be cleaned half as often.

If you happen to live in a house which has marble fire-places, never wash them with suds; this destroys the polish in time. They should be dusted, the spots taken off with a nice oiled cloth, and then rubbed dry with a soft rag.

Feathers should be very thoroughly dried before they are used. For this reason they should not be packed away in bags when they are first plucked. They should be laid lightly in a basket, or something of that kind, and stirred up often. The garret is the best place to dry them, because they will there be kept free from dirt and moisture, and will be in no danger of being blown away. It is well to put the parcels, which you may have from time to time, into the oven, after you have removed your bread, and let them stand a day.

If feather-beds smell badly, or become heavy, from want of proper preservation of the feathers, or from old age, empty them, and wash the feathers thoroughly in a tub of suds; spread them in your garret to dry, and they will be as light and as good as new.

Jamaica rum, constantly used to wash the hair, keeps it very clean, and free from disease, and promotes its growth a great deal more than Macassar oil. Brandy is very strengthening to the roots of the hair; but it has a hot drying tendency, which rum has not.

About the last of May, or the first of June, the little millers, which lay moth eggs, begin to appear. Therefore brush all your woollens, and pack them away in a dark place covered with linen. Pepper, red cedar chips, tobacco—indeed, almost any strong spicy smell—is good to keep moths out of your chest and drawers. But nothing is so good as camphor. Sprinkle your woollens with camphorated spirit, and scatter pieces of camphor gum among them, and you will never be troubled with moths. Some people buy camphor wood trunks for this purpose, but they are very expensive, and the gum answers just as well.

Pulverized alum possesses the property of purifying water. A large spoonful stirred into a hogshead of water will so purify it, that, in a few hours, the dirt will all sink to the bottom, and it will be as fresh and clear as spring water. Four gallons may be purified by a tea-spoonful.

Woollens should be washed in very hot suds, and not rinsed. Lukewarm water shrinks them.

On the contrary, silk, or any thing that has silk in it, should be washed in water almost cold. Hot water turns it yellow. It may be washed in suds made of nice white soap, but no soap should be put upon it. Likewise avoid the use of hot irons in smoothing silk. Either rub the articles dry with a soft cloth, or put them between two towels, and press them with weights.

Do not let knives be dropped into hot dish-water. It is a good plan to have a large tin pot to wash them in, just high enough to wash the blades *without wetting* the handles. Keep your castors covered with blotting paper and green flannel. Keep your salt-spoons out of the salt, and clean them often.

Do not wrap knives and forks in woollens. Wrap them in good strong paper. Steel is injured by lying in woollens.*

* Some of these scraps are from Mrs Child's "Frugal Housewife," a small volume, well worthy of the extensive sale it has met with both in this country and America.

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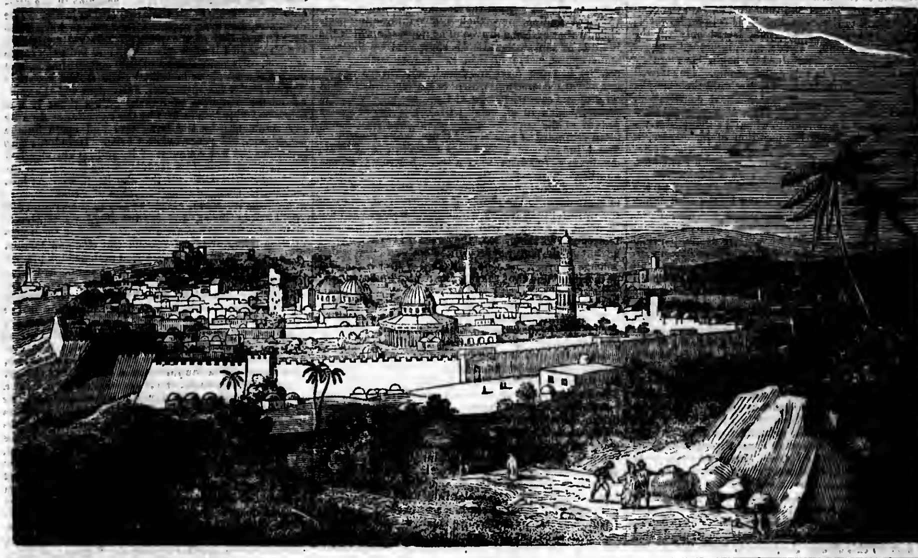
PALESTINE, OR THE HOLY LAND.

VIEW OF JERUSALEM, FROM THE HEIGHTS ABOVE THE VALLEY OF JEHOSHAPHAT.



PALESTINE, or the Holy Land, is that portion of the Asiatic continent, in which took place those remarkable transactions recorded in the books of the Old and New Testament. It lies within the 31st and 34th degree of north latitude, and forms part of Syria, a country situated at the eastern extremity of the Mediterranean Sea, and bounded on the south by the extensive district of Arabia. On the north it has Mount Lebanus, and on the east the river Jordan and the Dead Sea. Within these limits the country measures from two to three hundred miles in length, and about fifty in breadth; and is therefore, in point of size, of nearly the same extent as Scotland. It has been called Palestine, as is supposed, from the Philistines, who were once its possessors; but in the Scriptures, from various circumstances, it has received the appellations of "the Promised Land," "the Land of Canaan," and "the Land of Judea." In modern times, from its connection with the events which occurred within it upon the promulgation of Christianity, it is more generally spoken of under the name of "the Holy Land." In its physical character, this celebrated territory is composed of both a mountainous region and level plains, as will be subsequently described.

The prevailing character of Palestine scarcely corresponds with its ancient fertility. This is chiefly to be attributed to the miserable state of vassalage in which the inhabitants are held. The devastating effects of perpetual wars, and some physical changes, have also contributed to the destruction of agricultural industry. Yet, after all, so excellent would the soil appear to be, and so ample its natural resources, that Canaan may still be characterised as a land flowing with milk and honey. Its pastures are extensive, and of the richest quality; and the rocky country is covered with aromatic plants, yielding to the wild bees who live in the hollow of the rocks such an abundance of honey, that the poorer classes use it as a common article of food. Dates, which are found springing up in the midst of the most arid districts, are also another important article of consumption. If to these we add olive oil, an article so essential to an Oriental, the ancient fertility of even the most barren part of Judæa becomes easily accounted for. Delicious wine is still produced in some districts, and the vallies bear plentiful crops of tobacco, wheat, barley, and millet. Among other indigenous productions may be enumerated, the cedar and other varieties of the pine, the cypress, the oak, sycamore, mulberry-tree, fig-tree, the willow, accacia, aspen, arbutus, myrtle, tamarisk, oleander, oshar, doom, the turpentine, almond, peach, chaste, and locust trees; the mustard-plant, aloe, citron, apple, pomegranate, and many flowering shrubs. Other indigenous productions have either disappeared or are confined to circumscribed districts. Iron is found in the mountain-range of Libanus, and silk is produced in abundance in the plains of Samaria.

Generally speaking, the climate is mild and salubrious. From May to August the sky is clear and cloudless, but during the night there falls a copious dew, which moistens the soil. Intensely cold nights, however, frequently succeed to very sultry days—a vicissitude more than once referred to in Scripture. Rain falls in sufficiency during the rest of the year, to which, in the absence of springs, the fertility of Palestine is mainly attributable. The streams with which it is watered, with the exception of the river Jordan, are merely brooks or torrents fed by the copious periodical rains. In the dry season, not one of them retains its water, and the only resource of the natives is in the wells, or tanks of water collected during the rainy season, when the torrents pour down from the hills with a violence which sweeps every thing before it. To avoid the destruction consequent upon such visitations, is probably the reason why the towns and villages of Palestine are almost uniformly found built upon elevated ground.

With respect to the zoology and ornithology of this country, our information is very imperfect. The other objects of interest which it contains seem to have the effect of almost totally withdrawing the attention of travellers from its natural history. The wilder animals referred to in Scripture, such as the lion, wolf, leopard, &c., have almost totally disappeared. Hasselquist says, that the only animals which he saw were the porcupine, jackall, fox, rock-goat, and fallow-deer. Captain Mangles describes an animal of the goat species as large as the ass, with long knotty upright horns. The horse does not appear to have been adopted till after the Babylonish captivity, the wild ass being deemed worthy even for the purposes of royalty. The breed of cattle reared in Bashan and Gilead were remarkable for their size, strength, and fatness; but this is far from being the case now. In ornithology, the vulture, falcon, jackdaw, green wood-spite, bee-catcher, nightingale, field-lark, goldfinch, partridge, quail, and the quail of the Israelites, the turtle and ring dove, are found, and various descriptions of land and water game are abundant. The Holy Land is infested with a frightful number of lizards, different kinds of serpents, vipers, scorpions, and various insects. Flies of every species are also extremely annoying. Ants are very numerous in some parts: one traveller describes the road from El Arisch to Jaffa, as, for three days' journey, one continued ant-hill.

THE HISTORY OF PALESTINE.

In the patriarchal ages, it appears to have been a pastoral country, inhabited by independent chiefs similar to those who now traverse the extensive plains of Arabia. On the return of the Israelites from Egypt, it is described as a land flowing with milk and honey; very considerable progress had been made in agriculture, and the vices of luxury had made alarming progress. A series of events having delivered this country into the hands of the Israelites, it was divided by Joshua among the ten tribes: Judah, Benjamin, Simeon, Dan, Ephraim, Zebulun, Nephtali, and part of Manasseh, had their portion allotted on the western, commonly called *this* side of Jordan; while Reuben, Gad, and the remaining part of Manasseh, were placed on the eastern side, commonly called *beyond* Jordan. Israel, after remaining without any regular government, but ruled by occasional judges, was at length, on the demand of the people, converted into a monarchy, of which Saul was the first king. Under the reigns of David and Solomon, it became one of the most flourishing kingdoms of Asia. On the east it extended as far as the Euphrates, and having obtained ports on the Red Sea and the Mediterranean, was even as to commerce the rival of Tyre. This prosperity suffered a great declension in consequence of the schism which took place in the kingdom by the separation of the ten tribes, and the establishment of the rival kingdoms of Samaria and Judæa. They continued both considerable, however, till the rise of the great empires of the Euphrates, which were destined to swallow up all the west of Asia. The kings of Nineveh and Babylon experienced such an obstinate resistance, that they conceived it impossible to complete the conquest, unless by carrying captive first Israel and then Judah, into the eastern provinces of their empire. This eclipse, however, of the Jewish name and nation, lasted only till the downfall of Babylon. Cyrus, an enlightened and generous conqueror, determined to begin his reign by an act of clemency to this exiled people. He allowed them to return to their country, to rebuild their temple, and to re-establish their ecclesiastical constitution. Judæa continued thus a province of Persia till after the conquest of Alexander, to whom it submitted without resistance. After the partition of his empire, it fell naturally under the power of the kings of Syria, though exposed also to the invasion of the Ptolemies. Several of the Syrian kings having attempted to enforce the adoption of Grecian idolatry instead of the worship of the true God, were met by the most determined resistance. On this occasion the Maccabees, in a series of glorious conquests with the most unequal means, successfully asserted the religious and political liberties of their country. Judæa now became an independent country, and was governed for more than a century by a race of sovereign high priests called Asmoneans. They could not, however, prevent the country from falling under the wide-spread dominion of Rome, which established the Herods as tributary kings, leaving, however, the civil and ecclesiastical administration to a great extent in the hands of the natives. It was at this crisis that Judæa became the theatre of those events which form the foundation of the Christian faith, but which must be too familiar to our readers to require mention here. Enraged by repeated insurrections, the Romans, under Titus, entered Judæa with a large force, took Jerusalem, rased it to the ground, carried captive the whole nation, and dispersed them through the different provinces of the empire. The Jews have never recovered from this fatal overthrow. Yet, though dispersed among all nations, and every where oppressed and despised, they have never mixed with any other people, but have retained undiminished all the peculiarities of their religion and manners. The Romans, on obtaining full possession of this country, divided the part on this side of Jordan into three tetrarchies, Judæa Proper, Samaria, and Galilee. The country continued long in a troubled state, in consequence of the insurrections of the remaining part of the Jews. On the conversion of the Romans, however, to Christianity, Judæa became an object of religious veneration. The Empress Helena repaired in pilgrimage to the Holy Land, viewed all the spots which had been the scene of the great events of gospel history, and built splendid temples on their site. The Holy Land was now enriched by the crowd of pilgrims who came from all parts of the Christian world. The destinies of Judæa, however, were changed by the invasion of the fanatical followers of Mahomet, in the sixth century, and soon fell under their sway; the caliphs, or Arabian monarchs, however, still viewed her holy places with reverence, and were induced to encourage pilgrimage, from the gain which it afforded. When the Turks, an ignorant and barbarous race, poured in from the north, they no longer observed the same courtesy. They profaned the holy places, and committed outrages of every kind upon the visitants to the Holy Land. The pilgrims on their return related the dangers they had encountered. These representations kindled the religious zeal of the Christians in Europe into a flame, and a general ardour was awakened to "free the holy sepulchre from thrall." Now ensued a series of warlike expeditions, termed crusades, for the recovery of Palestine from the Mohammedans. After various successes and disasters, the crusades terminated at the middle of the thirteenth century, leaving the Holy Land still in the possession of a barbarous Mohammedan people. We shall subsequently advert to some of the scenes distinguished in the wars of the crusades. In the year 1517, Palestine was finally swallowed up in the Turkish empire. After ceasing for many centuries to have any political existence, it was drawn into notice by Bonaparte's invasion of Syria, and his celebrated siege of Acre, in the defence of which British valour was so conspicuously displayed.

Few countries are more unhappily situated, as to political relations, than Palestine. It suffers equally from the tyranny and the weakness of the Turkish government, which has strength sufficient to oppress the people, and deprive them of the fruits of their industry, yet lacks the vigour of defending them against the hordes of Arabs who people the surrounding deserts. The unfortunate husbandman is thus deprived on all hands of any security of enjoying the fruit of his labours. Its lot depends greatly upon the character of the pacha under whose sway it happens to be placed. Palestine, as to administration, is included partly in the pachalic of Acre, and partly in that of Damascus. The former comprehends all the sea-coast, while the latter extends over the interior; and they are separated by a line drawn from north to south through the whole length of Palestine. With regard to the civil government of the country, it has been remarked, that the pachas are so frequently changed, or so often at war with each other, that the jurisdiction of the magistrates in cities is so undefined, and the hereditary or assumed right of the sheiks of particular districts so various, that it is extremely difficult to discover any settled rule by which the administration is conducted. The whole Turkish empire, indeed, has the appearance of being so precariously balanced, that the slightest movement, within or from without, seems likely to overturn it. Every where is seen absolute power stretched beyond the limits of all apparent control, but finding, nevertheless, a counteracting principle in that extreme degree of acuteness to which the instinct of self-preservation is sharpened by the constant apprehension of injury. Hence springs that conflict between force and fraud, not always visible, but always operating, which characterises society in all despotic countries. In the minute subdivision of power, which in all cases partakes of the arbitrary nature of the supreme government, the traveller is often reminded of patriarchal times, when there were found judges and even kings exercising a separate dominion at the distance of a short journey from one another. This affectation of independence is every where exhibited in the Holy Land, from the pachas of cities down to the sheiks of villages, who, aware of the uncertain tenure by which their masters remain in office, are disposed to treat their orders with contempt. Like them, too, they turn to their personal advantage the power of imposition and extortion which belongs to every one who is dressed "in a little brief authority;" and thus they sell justice and mercy to the highest bidder.

Palestine has been conquered and occupied by such a variety of foreign races, that it would be difficult to decide who form the basis of its present population. The Turks, as elsewhere throughout the empire, occupy all the civil and military posts; while the inhabitants of the eastern empire, under the name of Greeks, form a very numerous part of the population. The country districts, however, are filled to a great extent with nomadic Arabs. The dress of this people in the Holy Land is very simple: it consists of a blue shirt, descending below the knees, the legs and feet being exposed, or the latter sometimes covered with the ancient cothrosmas or buskin. A cloak is worn of very coarse and heavy camel-hair cloth, almost universally decorated with black and white stripes passing vertically down the back: this is one square piece, with holes for the arms: it has a seam down the back. Upon their heads they wear a small turban, or dirty rag like a coarse handkerchief, bound across the temples, one corner of which generally hangs down, and this, by way of distinction, is generally fringed with strings in knots. The Arab women are not so often concealed from view as in other parts of the Turkish empire: they render their persons as disagreeable in appearance as any of the natives who inhabit the islands of the South Sea. Their bodies are covered with a long blue shift. Upon their heads they wear two handkerchiefs, one as a hood, and the other bound over it as a fillet across the temples. Just above the right nostril they place a small button, sometimes studded with pearl, a piece of glass, or any other glittering substance. Their faces, hands, and arms, are tattooed, and covered with hideous scars—their eyelashes and eyes being always painted, or rather dirtied with some dingy black or blue powder: their lips are dyed of a deep and dusky blue, as if they had been eating blackberries: their teeth are jet black: their nails and fingers brisk red: their ears are loaded with ponderous rings: and, altogether, it might appear as if some demon had employed his ingenuity to disfigure the loveliest work of the creation. The true Arab is always the inhabitant of the desert, a name given to any solitude, whether barren or fertile. Their usual weapons consist of a lance, a poniard, an iron mace, a battle-axe, and sometimes a matchlock gun. The moveables of a whole family seldom exceed a camel's load. They reside always in tents, on the open plain, or upon the mountains. The covering of their tents is made of goats' hair, woven by their women. Their mode of life very much resembles that of the gipsies in England—men, women, children, and cattle, all lodging together. In their disposition, though naturally grave and sedate, they are very amiable, considering hospitality as a religious duty, and always acting with kindness to their slaves or inferiors.

In our topographical description of Palestine, we shall commence with the capital,

JERUSALEM.

Few cities have been more frequently described than Jerusalem, and yet it is astonishing what diversity prevails in the accounts of it which we meet with in the more recent works upon Palestine. Sometimes the mantle of him who sung

"How Salem's shrine was won, and how adored,"

seems to have fallen upon the shoulders of the traveller, and tinctured his imagination with the hues of poetry, so that the holy city appeared to his eyes as rivalling, in the magnificence of its buildings, the most gorgeous edifices of modern times. Another, in traversing the desolate labyrinth called the valley of Jeremiah (a route usually followed in approaching the city), appears to have been inspired with the gloomy genius of the place; and, according to him, Jerusalem is a heap of filth and ruins, whose respectability is only here and there redeemed by a gaudy mosque or a glittering minaret. From these conflicting accounts we shall make as judicious a selection as possible, after giving a short

HISTORY OF THE CITY.

A contemporary of Abraham, Melchisedec, is called King of Salem, 2000 years before Christ. This Salem is supposed to be the city subsequently called Jerusalem. After this it came into the possession of the Jebusites; and when the Israelites conquered the land of promise, 1500 years before Christ, it was assigned in the division of the country to the tribe of Benjamin. The Jebusites, however, appear afterwards to have recovered possession of the place; for David conquered the city, called it after his name, and built the castle of Zion. His son Solomon greatly embellished it, and caused the temple to be built by the skilful artists of Tyre. Under his successors, Jerusalem was the capital of the kingdom of Judah. Five times it was taken and plundered: first by the Egyptians; then by the Arabians; by the Israelites; and again by the Egyptians, 611 years before Christ. Herodotus also mentions the last conquest of it, calling the city Kadytus, which resembles Kedushah the Holy; and the Mohammedans still call the city El Kods. At last, Nebuchadnezzar, during the reign of Zedekiah, conquered the kingdom, rased the city to the ground 586 years before Christ, and carried the Jews captive to Babylon. Seventy years after, Cyrus gave them permission to return and rebuild the city and temple. This was done under the direction of their high priests, Ezra and Nehemiah, whose successors governed them a long time. The story of Alexander's making a pacific visit to Jerusalem, after his conquest of Tyre, is considered a Jewish invention, as Josephus is the only author who mentions it. Alexander's successor, Ptolemy, captured Jerusalem, and carried a great number of the better sort of Jews to Alexandria. For a long time after it was taken by Antiochus the Great, it remained under the jurisdiction of the Syrian kings. Under the Maccabees, the Jews were again free for a considerable time, and chose their own rulers. One of the last of these, Aristobulus, invited Pompey the Great into the country, and thus Jerusalem came under the Roman dominion sixty-four years before Christ. But as it continued to have its own kings, at least in name, and also high priests, together with the Roman governors, this occasioned constant troubles, which were finally ended by the destruction of the city, and extermination of the inhabitants, by Vespasian and Titus, after a bloody siege, A. D. 70. Some buildings, however, were left among the ruins. The Jews again collected together, built on the place, and once more rebelled against the Romans, which so provoked the Emperor Adrian, that, in the year 118, he ordered all that Titus had spared to be destroyed. He commanded a new city to be built on its place, called Ælia Capitolina, in which no Jew was permitted to dwell. Constantine the Great, and his mother Helena, from pious motives, ordered all the Heathen monuments to be destroyed, and erected many new Christian edifices. Julian conceived the idea of rebuilding the old temple of the Jews, but is said to have been hindered from executing his plan by the eruption of subterranean fire. The city remained under the government of the eastern emperors, till Chosroes, King of Persia, conquered it in the year 614. It was recovered, however, by the Emperor Heraclius, in the peace of 628. This prince prohibited the Jews from dwelling there, and so alienated the patriarch of Jerusalem, Sophronius, by sectarian differences, that the Saracen Caliph Omar found little difficulty in making himself master of the city, A. D. 637. The Saracens, unwilling to forego the profits of pilgrimage, allowed the Christians to resort thither as formerly, upon the payment of a considerable tax, so that Jerusalem was nearly as much frequented as ever, till the inroads of the Turks in 1076. That barbarous people committed such outrages on the pilgrims, that they could no longer visit the holy sepulchre in safety; and this formed one of the moving causes of the crusades, in one of which Jerusalem was taken, and ruled, along with the surrounding territory, during upwards of sixty years, by five Latin kings, when it yielded to the arms of Saladin. After changing successively its Moslem masters, it was annexed, in 1517, to the Turkish empire, of which it has ever since formed a part.

GENERAL DESCRIPTION OF JERUSALEM.

This celebrated city of Palestine is situated at the distance of about forty-five miles east from the shores of the Mediterranean Sea, within the jurisdiction of the pacha of Damascus. Its environs are barren and mountainous. The city lies on the western declivity of a hill of basalt, surrounded with rocks and deep vallies, with a much colder climate than one would expect from its geographical situation. It is now only between two and three miles in circuit, and can be walked round in forty-five minutes. The town is built irregularly, somewhat in the form of a square, has pretty high walls, and six gates, which still bear Hebrew names. The houses are of sandstone, three stories high, and without windows in the lower story.

This lifeless uniformity is only diversified here and there by the spires of the mosques, the towers of the churches, and a few cypresses. The population has been variously estimated at from 20,000 to 25,000. "It can hardly," says Mr Carne, in his Letters from the East, "exceed twenty thousand; ten thousand of these are Jews, five thousand Christians, and the same number of Turks. The lower division of the city," he continues, "towards the east, is chiefly occupied by the Jews; it is the dirtiest and most offensive of all. Several of this people, however, are rather affluent, and live in a very comfortable style; both men and women are more attractive in their persons than those of their nation who reside in Europe, and their features are not so strongly marked with the indelible Hebrew characters, but much more mild and interesting. But few passengers in general are met with in the streets, which have the aspect, where the convents are situated, of fortresses, from the height and strength of the walls the monks have thought necessary for their defence. Handsomely dressed persons are seldom seen, as the Jews and Christians rather study to preserve an appearance of poverty, that they may not excite the jealousy of the Turks. The women, in their close veils and white dresses, look like walking corpses. The streets are unpaved, and filled either with heaps of dust or with mire. Nothing is to be seen but veiled figures in white, insolent Turks, and stupid or melancholy Christians." That Jerusalem is no place for the cultivation of the arts or sciences, one may easily conjecture from the malignant genius of Turkish despotism, and the forbidding aspect of Christian superstition. Weavers and slipper-makers are the only artisans. A multitude of relics, which are probably not all manufactured in the city, but are sent in also from the neighbourhood, are sold to the credulous pilgrims. Nevertheless, this city forms a central point of trade to the Arabians in Syria, Arabia, and Egypt. The people export oil, and import rice by the way of Acre. The necessaries of life are in profusion, and quite cheap, the game excellent, and the wine very good. The pilgrims are always a chief source of support to the inhabitants at Easter; they often amount to 5000. But few of them are Europeans. Jerusalem has a governor, a cadi or supreme judge, a commander of the citadel, and a mufti, to preside over religious matters. The citadel, which is pretended to have been the castle of David, is a Gothic building throughout. It is called the Pisan Tower, probably because it was built by the Pisans during the crusades. All the pilgrims go to the Franciscan monastery of the Holy Saviour, where they are maintained a month gratuitously. Besides this, there are sixty-one Christian convents in Jerusalem, of which the Armenian is the largest. They are supported by benevolent contributions, principally from Europe. The church of the Holy Sepulchre has been for 1500 years the most sacred place in Jerusalem. The temple of the Mohammedans, which is regarded as one of their greatest sanctuaries, is magnificent. No Jew or Christian is permitted to enter the inner sanctuary. Besides many old Jewish monuments, there are a great many Greek and Roman, several Christian, and especially Gothic monuments, which originated in the times of the crusades.

THE MOSQUE OF OMAR.

The most splendid edifice which Jerusalem, and indeed the Turkish empire, contains, is the Mosque of Omar, the St Peter's of Turkey. We have said that no Christian is allowed to enter it. Dr Richardson, however, succeeded in obtaining admission, and was conducted through the interior by the sacristan, who pointed, "in the pride of his heart, to the elegant marble walls, the beautifully gilded ceiling, the well where the true worshippers drink and wash (with which we also blessed our palates and moistened our beards), the paltry reading-desk with the ancient Koran, the handsome columns, and the green stone with the wonderful nails. As soon as we had completed this circuit, pulling a key from his girdle, he unlocked the door of the railing that separates the outer from the inner part of the mosque, which, with an elevation of two or three steps, led us into the sacred recess. Here he pointed out the patches of Mosaic in the floor, the round flat stone which the prophet carried on his arm in battle; directed us to introduce our hand through the hole in the wooden box, to feel the print of the prophet's foot, and through the posts of the wooden rail, to feel as well as to see the mark of the angel Gabriel's fingers, into which I carefully put my own, in the sacred stone that occupies the centre of the mosque, and from which it derives the name of Sakhara or Locked-up, and over which is suspended a fine cloth of green and red satin. It was so covered with dust, that, but for the information of my guide, I should not have been able to tell the composing colours. Finally, he pointed to the door that leads into the small cavern below, of which he had not the key. I looked up to the interior of the dome, but, there being few lamps burning, the light was not sufficient to show me any of its beauty farther than a general glance. The columns and curiosities were counted over again and again, the arches were specially examined and enumerated, to be sure that I had not missed nor forgotten any of them."

Dr Richardson having been permitted to visit this splendid edifice during the day, he found that the dimensions of the enclosure in which it stands are about fifteen hundred feet in length and a thousand in breadth. In this place the followers of the prophet delight to saunter or repose, as in the elysium of their devotions; and, arrayed in the gorgeous costume of the east, add much to the interest, the beauty, and solemn stillness of the scene. The Sakhara itself is a regular octagon of about sixty feet a side, and is entered by four spacious doors, each of which is adorned with a porch projecting from the line of the building, and rising considerably on the wall. All sides of it are panelled. The centre stone of one panel is square, of another it is octagonal, and thus they alternate all round, the sides of each running down the angles like a plain pilaster, and giving an appearance as if the whole were set in a frame. The marble is white, with a considerable tinge of blue; square pieces of the latter colour being introduced in different places, so as to confer upon the exterior a very pleasing effect. The upper story is faced with small tiles painted of different colours, and some of them are written over with sentences from the Koran. At this height there are seven elegant windows on each side, except where the porches interfere, when they diminish the general appearance of the edifice.

The interior fully corresponds to the magnificence and beauty just described. There are twenty-four marble columns, placed parallel to the eight sides of the building; three opposite to each side, so as still to preserve the octagonal form. Eight of them are large plain pillars belonging to no particular order of architecture, and all standing opposite to the eight entering angles of the edifice, and deeply indented on the inner side; so that they furnish an acute termination to the octagonal lines within. Between every two of the square columns there are two of a round figure, well proportioned, and resting on a base. They are from eighteen to twenty feet high, with a sort of Corinthian capital. A large square plinth of marble extends from the top of the one column to the other, and above it there is constructed a number of arches all round, which support the inner end of the roof or ceiling, the outer end resting upon the walls of the building. This is composed of wood or plaster, highly ornamented with a species of carving, and richly gilt.

This magnificent temple owes its origin to a large oblong shaped stone, which occupies the centre of the building. Like the Palladium of Troy, it is reported to have descended from heaven on the identical spot where it now stands; it happened when prophecy began at Jerusalem, and was used by those who were endowed with the gift of vaticination. Like the stone in the fairy tale which changed its hues with the fortunes of the possessor, this stone manifested sympathy in the fate of the prophets when they were compelled to evacuate Jerusalem, even so far as to give indications of a desire to accompany them in their flight. But, by the interposition of the angel Gabriel and Mahomet, it was found immediately in the place where it now stands, and around it the Caliph Omar reared his gorgeous temple.

In the interior of the rock whereon the Sakhara stands, there is a cave into which Dr Richardson could not obtain admittance. It is a room forming an irregular square of about eighteen feet surface, and eight feet high in the middle. The roof is that of a natural vault, quite irregular. In descending the staircase, there is upon the right hand, near the bottom, a little tablet of marble, bearing the name of El Makam Souleman, the Place of Solomon. A similar one upon the left is named El Makam Daoud, the Place of David. A cavity or niche on the south-west side of the rock is called El Makam Djibrila, the Place of Gabriel; and a sort of stone table at the north-east angle is denominated El Makam El Hoder, the Place of Elias. In the roof of the apartment, exactly in the middle, there is an aperture almost cylindrical through the whole thickness of the rock, about three feet in diameter. This is the Place of the Prophet.

Leaving the Mohammedan temple of worship, we shall now proceed to describe one of far more interest to the Christian reader, namely,

THE CHURCH OF THE HOLY SEPULCHRE.

Mount Calvary, the spot on which the crucifixion of Christ took place, was originally a rising ground without the walls, but was afterwards enclosed within the city, altered entirely in its outlines, and made the site of a church founded by the Empress Helena. This Church of the Holy Sepulchre, as it is called, is about one hundred paces in length, and sixty in width. It is in the form of a circle, having a heavy dome or cupola, the frame of which is made of the cedars of Lebanon, and covered with a kind of stucco. It has a spacious and magnificent appearance, the Corinthian order of architecture prevailing.* Mr Carne, in his "Letters from the East," describes it as follows:—

"There was a guard of Turks in a recess just within the door, to whom every pilgrim is obliged to pay a certain sum for admission; but we were exempted from this tax. In the middle of the first apartment is a large marble slab, raised above the floor, over which lamps are suspended; this is said to be the space where the body of the Redeemer was anointed and prepared for the sepulchre. You then turn to the left, and enter the large rotunda, which terminates in a dome at the top. In the centre of the floor stands the holy sepulchre; it is of an oblong form, and composed of a very fine reddish stone brought from the Red Sea, that has quite the appearance of marble. Ascending two or three low steps, and taking off your shoes, you enter the first small apartment, which is floored with marble, and the walls lined with the same. In the centre is a low shaft of white marble, being the spot to which the angel rolled the stone from the tomb, and sat on it. You now stoop low to enter the narrow door that conducts you to the side of the sepulchre. The tomb is of a light brown and white marble, about six feet long and three feet high, and the same number in breadth, being joined to the wall. Between the sepulchre and the opposite wall the space is very confined, and not more than four or five persons can remain in it at a time. The floor and the walls are of a beautiful marble; the apartment is a square of about seven feet, and a small dome rises over it, from which are suspended twenty-seven large silver lamps, richly chased and of elegant workmanship—presents from Rome, of the courts and religious orders of Europe; these are kept always burning, and cast a flood of light on the sacred tomb, and the paintings hung over it, one Romish and the other Greek, representing our Lord's ascension, and his appearance to Mary in the garden. A Greek or Romish priest always stands here with the silver vase of holy incense in his hand, which he sprinkles over the pilgrims.

Wishing to see the behaviour of these people, who come from all parts of the world, and undergo the severest difficulties to arrive at this holy spot, we remained for some time within it; and the scene was very interesting. They entered: Armenians, Greeks, and Catholics, of both sexes, with the deepest awe and veneration, and instantly fell on their knees; some, lifting their eyes to the paintings, burst into a flood of tears; others pressed their heads with fervour on the tomb, and sought to embrace it; while the sacred incense fell in showers, and was received with delight.

In an apartment a little on the left of the rotunda, and paved with marble, is shown the spot where Christ appeared to Mary in the garden. Near this begins the ascent to Calvary, which consists of eighteen very lofty steps; you then find yourself on a floor of beautifully variegated marble, in the midst of which are three or four slender white pillars of the same material, which support the roof, and separate the Greek division of the spot from that appropriated to the Catholics; these pillars are partly shrouded by rich silk hangings. At the end stand two small and elegant altars; over that of the Catholics is a painting of the crucifixion, and over the Greek is one of the taking down the body from the cross. A number of silver lamps are constantly burning, and throw a rich and softened light over the whole of this striking scene.

The street leading to Calvary has a long and gradual ascent; the elevation of the stone steps is above twenty feet; and if it is considered that the summit has been removed to make room for the sacred church, the ancient hill, though low, was sufficiently conspicuous. The very spot where the cross was fixed is shown; it is a hole in the rock, surrounded by a silver rim, and each pilgrim prostrates himself, and kisses it with the greatest devotion. Its identity is probably as strong as that of the cross and crown of thorns found a few feet below the surface; but where is the scene around or within the city that is not defaced by the sad inventions of the fathers?"

The priests connected with these sacred places keep up a system of religious ceremony, in some of which it would be impossible to say whether solemnity, fervour, superstition, ignorance, or sheer madness, most predominates. The ceremonies which take place during the season of Easter are ridiculous and absurd in the extreme. Upon Good Friday night the monks enact a sort of tragedy of the death of our Lord, in which they severally perform the various characters, such as Joseph of Arithmathea and Nicodemus. They have a figure of Christ as large as life nailed to a cross. This these solemn tragedians parade before them as they walk in procession, and go through a representation of the awful drama of his death, in which no circumstance of moment is omitted, from the singing of the hymn to the anointing of the body for burial, and its deposition in the sepulchre. The transactions of Easter day partake more of comedy than tragedy. It is a scene of superstitious riot and pitiful absurdity, which we think is unnecessary to describe. The reader may have some idea of it by imagining to himself what would be the consequences if bedlam were let loose upon the holy sepulchre. It is only doing justice, however, to those who have the keeping of the "place where our Lord lay," to observe, that some of the ceremonies are both solemn and impressive, without much admixture of absurdity. It is impossible, however, to read the exhibitions of Easter day and eve, without a painful misgiving as to every thing connected with the holy city. The reader will perhaps inquire, can we give any credit to the historical statements and local descriptions derived from individuals as ignorant, superstitious, and corrupt, as the priests and Christians of Jerusalem? Our religion can in no way be affected by the determinations of such questions as those, regarding the precise spot where our Saviour suffered, or where his body was laid. But still with such places there is a hallowed interest associated, and that any doubt should remain upon the subject, is a source of regret and disappointment. The obliteration which the surface of a conquered country generally suffers from its enslavers, must have ob-

* Represented in our view of Jerusalem, as the large edifice in the centre of the picture, within the outer wall.

erured many of the finer lines by which we might identify various localities; nevertheless, the great natural landmarks remain; and we may conclude with Chateaubriand, that although minute details are open to suspicion, the general outline is correct. With respect to the holy sepulchre, Dr Clarke, who throws doubt indiscriminately on all the traditions connected with the holy places, observes, "If Helena had reason to believe she could identify the spot where the sepulchre was, she took especial care to remove every trace of it, in order to introduce the fanciful and modern work which now remains." The place may be the same pointed out to her, but not a remnant of the original sepulchre can now be ascertained.

MOUNTS ZION AND MORIAH.

On crossing the small ravine which divides the modern city from Mount Zion, the attention is attracted to three ancient ruins, covered with buildings comparatively modern—the house of Caiaphas, the place where Christ held his last supper, and the tomb or palace of David. The first of these is now a church, the duty of which is performed by the Armenians: the second, consecrated by the affecting solemnity, with the memory of which it is still associated, presents a mosque and a Turkish hospital; while the third, a small vaulted apartment, contains only three sepulchres, formed of dark-coloured stone. This holy hill is equally celebrated in the Old Testament and in the New. Here the successor of Saul built a city and a royal dwelling; here he kept for three months the ark of the covenant; here the Redeemer instituted the sacrament, which commemorates his death; here he appeared to his disciples on the day of his resurrection. The place hallowed by the last supper, if we may believe the early fathers, was transformed into the first Christian temple the world ever saw, where St James the Less was consecrated the first bishop of Jerusalem, and where he presided in the first council of the church. Finally, it was from this spot that the Apostles, in compliance with the injunction given them, went forth to teach all nations.

A shallow vale, called the valley of Millo, separates Mount Zion from Mount Moriah, on which the temple stood; this was originally an irregular hill, separate from Mount Zion and Acra, as well as from Beretha. For the purpose of extending the appendages of the temple over an equal surface, and to increase the area of the summit, it became necessary to support the sides, which formed a square, by immense works. In order to connect it with Mount Zion, it was necessary to throw a bridge across the valley of Jehoshaphat. According to Josephus, the execrable but magnificent monarch, Herod, rebuilt the second temple; but there is reason to suppose that he only added considerably to its extent. Its fate is well known: the prediction of our Saviour, that one stone should not be left upon another, was literally fulfilled. After the Caliph Omar took Jerusalem, buildings were erected on the spot where Solomon's temple stood, the rock was enclosed with walls, and, by subsequent additions and embellishments, it became the splendid mosque which we have already described.

Leaving the city at the gate of St Stephen, the pilgrim is conducted to the spot nearly contiguous, where it is considered he suffered martyrdom. He is then shown the church of the sepulchre of the Virgin Mary, situated in the valley between the Mount of Olives and Jerusalem, founded by St Helena. This is a small square building, flat on the roof, with a door on the south side, by which there is a descent into the interior by steps, having on the right hand a small chapel, with the tomb of St Ann, the mother of Mary. On the left is another similar to the former, where Joseph, the husband of the latter, was interred. Although the authenticity of such assertions depends on the probabilities of tradition, yet the solemn stillness of the place, the sepulchral gloom, and, above all, the associations which are calculated to affect the mind in seeing every object about this city, combine to render a visit to this consecrated spot so deeply interesting, that a traveller of the least sensibility never can forget it.

MOUNT OF OLIVES, &c.

Passing along a small bridge thrown over the Kedron, the Mount of Olives next presents itself. About half way towards the summit, there are several grottos excavated labyrinthically in the rock. Higher up is another cavern, or subterraneous church, as it is now formed, consisting of several arched vaults, where the Apostles composed the creed bearing their name; but this is almost filled with rubbish. About fifty yards farther, the spot is pointed out where Christ looked down upon Jerusalem in grief, and pronounced that ever memorable prophecy which has been so awfully and strikingly fulfilled. On the top of the Mount are the remains of a small church or chapel, in the octagon form, with a cupola, denominated the Ascension. This was built by St Helena, who, through the means of her son Constantine, may be considered as possessed of the treasures of the Roman world, and has left behind her, not only in and about Jerusalem, but in other parts, innumerable monuments of "her faith and labours of love." Here there is shown the impression of the left foot or sandal of a man, which is ten inches in length and four in breadth, made on a rock or stone, said by the guides to be that of Christ, when his foot last touched the earth, though of course this is one of those modern inventions which prevail throughout the region.

GARDEN OF GETHSEMANE.

The garden of Gethsemane, of all the gardens in the world the most hallowed and interesting, is situated at the foot of the Mount, and near the Brook Kedron. It is a piece of ground surrounded by a coarse loose wall of a few feet in height, and about the third part of an acre in extent. There are seven olive trees of enormous magnitude remaining, and separate from each other, said to have been in existence since the time of our Lord; they are highly venerated by the Christians, who consider any attempt to cut or injure them as amounting to an act of profanation. Should a Catholic be known to pluck any of the leaves, it subjects him to a sentence of excommunication from church privileges. Beads are made of the stone of the olive, and a string of them is the most sacred object that can possibly be presented to a traveller.

It was to this garden that Christ had occasion to resort with his disciples, to engage in devotional meditation, and a view of it is well calculated to impress the Christian mind with the deepest religious awe. At the upper end is the place where the Apostles, Peter, James, and John, fell asleep during the passion of their divine Master, and, in the middle of the garden, the place where Judas betrayed him. Many other interesting places and grottos are here pointed out, and among them is one which is supposed to be the scene of the agony and the bloody sweat.

VALLEY OF JEHOSHAPHAT.

After leaving the garden of Gethsemane, the traveller enters the valley of Jehoshaphat towards the south, on the eastern side of it. Among the first objects which are pointed out is the pit of Nehemiah, where the avenger of Israel discovered the sacred fire which had been concealed there during the Babylonish captivity. There is also shown the spot where Isaiah is said to have been sawn asunder. A little farther from the scene of the martyrdom, and on the same side of the valley, is the pool of Siloam, so particularly alluded to in Scripture, the water of which is of a brackish disagreeable taste, and flows several miles distant under the city of Jerusalem, and is emptied here into a sort of a basin inclosed by a wall. At a short distance from, and over against the pool, is the "Mountain of Offence," as it is termed, where Solomon committed acts of idolatry, by offering sacrifices to the gods of the Moabites and other nations. Near the foot of it, the Field of Blood is shown, where Judas hanged himself; and beyond it two massy pieces of antiquity, one of which is named the Tomb of Zechariah, and the other that of Absalom, formed in an extraordinary manner out of the natural rock, about eighteen feet in height, and ornamented with some columns of architecture, after the Ionic order, hewn in the same entire stone, supporting a cornice over which rises a pyramidal roof. The latter, since Absalom was not supposed to be buried in the valley, is conjectured to have been formed during the life of that prince. Such is the antipathy of the Jews to this monument, that it is their practice in passing to throw stones against it, as a mark of their reprobation of the unnatural rebellion of Absalom against his father. Near it is the sepulchre of Jehoshaphat, which gives the name to the valley. It is a cavern which is more commonly called the Grotto of the Disciples, from an idea that they went frequently thither to be taught by their divine Master. The front of this excavation has two Doric pillars of small size, but of just proportions. In the interior are three chambers, all of them rude and irregular in their form; in one of which were several gravestones, removed, we may suppose, from the open ground for greater security. Like all the rest, they were flat slabs of a long shape, from three to six inches in thickness, and evidently a portion of the limestone-rock which composes the adjoining hills.

Chateaubriand is of opinion, that, except the pool of Bethesda at Jerusalem, we have no remains of the primitive architecture of its inhabitants. The tombs in the valley of Jehoshaphat display an alliance of Egyptian and Grecian taste, mixed with the peculiar style of the Hebrews. In the valley of Jehoshaphat the Jews have a place of sepulture, which contains a number of gravestones, where those who reside in Jerusalem are in the habit of going in procession at certain seasons, for the purpose of observing a religious festival in memory of the dead. There still exists a strong desire in this people to mingle their dust with the ashes of their fathers, and many of them, as well as Christians, entertain the fantastical belief that the valley of Jehoshaphat is to be the scene of the final resurrection. With respect to its present aspect, Chateaubriand beautifully observes, "What with the sadness of Jerusalem, from which there ascends no smoke nor issues any sound—the solitude of the mountains, in which we perceive no living being—and the confusion of the tombs, all broken, shattered, and half open—one could almost believe that the trump of doom had already sounded, and that the dead had begun to rise in the valley of Jehoshaphat."

Besides the places already described in and about the city which tradition has hallowed, are the following:—Beneath the gate of Bethlehem is the spot where Bethsheba was bathing when David beheld her from the roof of his palace, and the present tower of the king is built upon the site of the ancient palace. A small distance within the gate of St Stephen is the pool of Bethesda. It is one hundred and fifty feet long, and forty broad. The sides are walled with large stones joined together by iron cramps, and covered with flints embedded in a substance resembling plaster. Here the lambs destined for sacrifice were washed, and here the Saviour said to the paralytic man, "Take up thy bed and walk." It receives a melancholy interest from the consideration that it is the only remnant which remains of Jerusalem as it appeared in the days of Solomon. A wretched street leads from this to the governor's palace, a spacious and rather ruinous building of Roman architecture. It contains some good apartments, the windows of which command an excellent view of the Mosque of Omar and its large area. In this palace the monks point out the room where Christ was confined before his trial; and at a short distance is a dark and ruinous hall, shown as the judgment-hall of Pilate. You then proceed along the street where Christ bore his cross, in which, and in the streets leading up to Calvary, are the three places, where, staggering under the weight, he fell. These are marked by three small pillars laid flat on the ground. The very house of the rich man also is here, and the spot where Lazarus sat at his gate. A pilgrim who comes to the city must set no bounds to his faith, as he is shown the place where the head of Adam was found, the rock on which the martyr Stephen was stoned, and the place of the withered fig-tree, with the milk of the Virgin Mary, and some of the tears that St Peter wept on his bitter repentance.

BETHANY.

After leaving Jerusalem by the gate of St Stephen, crossing the valley of Jehoshaphat, and passing the garden of Gethsemane and the Mount of Olives, the pilgrim arrives at the village of Bethany, situated about two miles from the city, where Jesus once resided, and appeared to his disciples after his resurrection. On the road, we meet with the village of Bethpage, now a heap of ruins. Bethany is both small and poor: it is, however, beautifully situated, and the view just above it is very magnificent. The cultivation of the surrounding soil is much neglected. The object which first strikes the traveller, is a ruinous castellated pile, which it is said Lazarus occupied. This, however, is one of the oral legends which abound in this interesting country, and, notwithstanding the great and superior claims that all its hallowed spots have upon our most serious affections, weaken the impression of the best authenticated memorials, and effect the association of piety with incredulity and distrust. Not far distant are the ruins of a building, said to have been the house of St Mark. A little to the right are the vestiges of the habitation of Mary Magdalene. But by far the most interesting object is the tomb of Lazarus. The traveller first descends to a cave, probably from fifty to sixty feet under ground, and lands on a small quandrangular space, where there appears to have been a communication with a church adjoining, which is now built up and converted into a mosque. In the wall of this apartment, there is an aperture of about three feet in breadth, formed by the raising of a large stone, as if by some convulsion of nature, which conducts into an arched vault, said to be the spot where the body was laid. It measures about fourteen feet in length, ten in breadth, and eight in height. With respect to the identity of the tomb, Mr Carne observes, "Its identity cannot be doubted—the position of Bethany could never have been forgotten—and this is the only sepulchre in the whole neighbourhood."

BETHLEHEM.

Bethlehem, as being the birth-place of Christ, is one of the most interesting places in the Holy Land. The road leading to it is extremely rocky and barren, only diversified by some cultivated patches bearing a scanty crop of grain, and a profusion of wild flowers. On the way lies the ruined Tower of Simeon, who, upon beholding the infant Messiah, expressed his willingness to leave this world; the monastery of Elias, in which there is said to be a large stone, still retaining an impression of his body; and the tomb of Rachel, rising in a rounded top, like those erected to the memory of a Turkish sultan. Farther on is the well of which David longed to drink, and of which his mighty men, at the imminent risk of their lives, procured a supply. To distinguish this town from another of the same name of the tribe of Zebulun, the Bethlehem we now approach is usually distinguished by the addition of Ephrata, or by a reference to the district in which it is situated. It is a fine village, situated upon a mountain, and surrounded with gardens of fig-trees and olives. The houses are very humble, and flat on the roof, with stairs on the outside.

THE CONVENT OF FRANCISCANS.

The convent of Franciscans stands to the east, and is separated from the town; it is contiguous to the church of St Mary, which was built by Constantine and the Empress Helena, over the place of their nativity, and forms, with the adjacent monasteries, a vast pile, in the shape of a cross. The church is of considerable magnitude, and was considered at one period to be unrivalled in point of beauty and magnificence. The roof is constructed of the cedar of Lebanon, and supported by four rows of lofty marble columns, being about fifty in number. The interior of the walls was encrusted with marble, but robbed of it to adorn the palace of the pacha at Grand Cairo. The choir is spacious, and terminates in a semicircle, in which the principal altar is placed. This part of the edifice is covered with a cupola, adorned with figures in Mosaic. A small staircase conducts to the chapel of the Nativity, which is under ground. Before the altar several massy silver lamps are kept constantly burning; and the spot where it is said Christ was born, is marked with a star, formed of white marble, inlaid with jasper, and surrounded with a radiance or glory. On this there is encircled the following inscription:—

Hic de Virgine Jesus Christus natus est.
Here Jesus Christ was born of the Virgin Mary.

To the right of this is shown the place where stood the manger in which he was laid. It appears to be cut out of the natural rock, and lined with marble. Lamps of silver are always kept burning before it. A narrow passage leads from this chapel into that of the innocents who were slain by the command of Herod, where is a cell, in which, say the monks, St Jerome made a translation of the Bible. A short distance from the convent is a grotto, where, according to tradition, the mother of Jesus concealed herself and child, whilst Joseph was making arrangements for their flight.

Four miles to the south of Bethlehem, in a most secluded situation in the middle of mountains, are situated the celebrated pools or fountains of Solomon. These are three in number, of a quadrangular form, cut out of the living rock. About half a mile below there is a deep valley, embosomed in high hills, where it is said the gardens of Solomon were laid out.

From the top of the church at Bethlehem there is a fine prospect of the surrounding country, extending to Tekoa on the south, and En-gedi on the east. In the latter place is the grotto where David, a native of Bethlehem, cut off the skirt of Saul's garment. Between this point and Jerusalem are several small detached towers, of a square form, built in the midst of vine-lands. These are for the accommodation of watchmen appointed to guard the produce from thieves and wild beasts, as alluded to by the evangelist St Mark. With regard to the tradition respecting the cave of the Nativity, even Dr Clarke admits the indubitable authenticity. This has been established by an unbroken chain of evidence, which extends from the first ages of Christianity to the present time. With respect to the number of inhabitants which it contains, much diversity of opinion prevails. Mr Buckingham says they amount to above 1000; Dr Richardson sets down the number at 300; and Mr Carne at 700, adding at the same time "that they appear to live very meanly." This appears to be the nearest approximation to the truth.

Near to Bethlehem are the ruins of a church and convent, which were erected by the pious empress over the place where the angels appeared to the shepherds. Hardly any part of it has survived the desolation to which every edifice in Palestine has been repeatedly subjected.

CONVENT OF ST JOHN.

On the way back to Jerusalem, the traveller alights on the convent of St John, in the desert. This monastery is built over the dwelling where the Baptist is supposed to have been born. The spot on which he was brought forth is marked with a star of marble, bearing this inscription:—

Hic precursor Domini Christi natus est.
Here the forerunner of Christ the Lord was born.

The church belonging to this establishment has been described as one of the best in the Holy Land. It has an elegant cupola, and a pavement of Mosaic, with some paintings; but the appearance, notwithstanding, is mean and indifferent, as if its votaries were few, and but little concerned in preserving its ancient grandeur. The cave which the second Elias is said to have inhabited, is situated on the brow of a steep mountain, in a most dreary and desolate spot. The grotto, which would seem to be cut out of the rock, is twenty-four feet in length by twelve in breadth, and in front of it flows a spring of water. To the south, and at some distance from the desert, is pointed out the well where Philip baptised the eunuch, as recorded in the Acts of the Apostles.

Quitting these places, the traveller turns his face southward to Tekoa and Hebron. The former, which was built by Rehoboam, and is distinguished as the birth-place of Amos the prophet, presents some considerable ruins, and even a few remains of architecture. It appears to have stood upon a hill, which is described as being about half a mile in length, and a furlong broad. On the north-eastern corner there are fragments of an antique building, supposed to have been a fortress; while about half way up the ascent there are similar indications of a church, now in a ruinous condition. Towards the south, various manifestations of ancient civilization present themselves. Pococke mentions a ruined castle called Creightoun, situated on the side of a steep hill, and a church dedicated to St Pantaleone. At a short distance there is a grotto, which on one occasion is said to have contained 30,000 men; and hence it is supposed to be one of those retreats in the fastnesses of En-gedi, to which David fled from the pursuit of Saul. About two miles to the south-east is the Mount of Bethulia, near a village of the same name, a position which is thought to agree with that of Beth-haccerem, mentioned by Jeremiah as a proper place for a beacon where the children of Benjamin were to sound the trumpet in Tekoa. This strong post is said to have been held by the Knights of Jerusalem forty years after the capital had fallen; but on what authority, we know not.

HEBRON.

Hebron is considerably removed from the common track of pilgrims and tourists; it is a large town, and contains a monument, dedicated to the memory of Abraham, and his immediate descendants. M. Burckhardt, who saw it in 1807, bears testimony to the fact that the sepulchre, once a Greek church, is now appropriated to the worship of Mohammed. The ascent to it is by a large staircase that leads to a long gallery, the entrance to which is by a small court. Towards the left is a portico resting upon pillars. The vestibule of the temple contains two rooms; the one being the tomb of Abraham, the other that of Sarah. In the body of the church is the sepulchre of Isaac; and in a similar one upon the left is that of his wife. On the opposite side of the court is another vestibule, which has also two rooms, being respectively the dormitory of Jacob and of his spouse. At the extremity of the portico, upon the right hand, is a door which leads to a sort of long gallery that still serves for a mosque; and passing from thence, is observed another room, containing the ashes of Joseph, which are said to have been carried thither by the people of Israel. All the sepulchres of the patriarchs are covered with rich carpets of green silk, magnificently embroidered with gold; those of their wives are red, embroidered in the same way.

Hebron is said to contain about four hundred families, of which about a fourth part are Jews. It is situated on the slope of a mountain; has a strong castle; can boast abundance of provisions, a considerable number of shops, and some neat houses. The whole of the country between Tekoa and Hebron is finer and better cultivated than in the neighbourhood of Jerusalem.

We shall now, with Chateaubriand for our guide, proceed to

THE DEAD SEA.

On leaving Bethlehem for the Dead Sea, the traveller goes eastward, through a vale where it is said Abraham was wont to feed his flocks. This pastoral plain is succeeded by a range of mountainous and barren ground. Descending from this, two lofty towers rise from a deep valley, marking the site of the convent of Santa Saba, a very ancient church. Its situation is very dreary, being built amidst precipices on the brink of a deep and gloomy dell, where the brook Kedron flows.

In advancing, the country still presents a desolate aspect. The road at length seeks a lower level, and approaches the rocky border which bounds the valley of the Jordan; when, after a toilsome journey of ten or twelve hours, the traveller at last beholds the Dead Sea, and the line of the river; the landscape, however, is by no means grand or prepossessing. Two long chains of mountains run in a parallel direction from north to south, without breaks, and without undulations. The eastern or Arabian chain is the highest; and when seen at the distance of eight or ten leagues, it resembles a prodigious perpendicular wall. Not one summit, not the smallest peak is distinguishable; only slight inflections are here and there observed, as if the hand of the painter who drew this horizontal line along the sky had trembled in some places. The mountains of Judæa form the range on which the observer stands as he looks down on the lake Asphaltites; it is less lofty and more unequal than the eastern chain, and also differs from it in its nature; exhibiting heaps of chalk and sand, which assume various bizarre forms. The Arabian side, on the contrary, presents nothing but bleak precipitous rocks, which throw their long and gloomy shadows over the water of the Dead Sea. Not a single blade of grass is to be found among these crags; every thing announces the country of a reprobate people, and well fitted to perpetuate the doom pronounced on Ammon and Moab. The valley embosomed in these two chains of mountains displays a soil similar to the bottom of a sea which has long retired from its bed—a beach covered with salt, dry mud, and moving sands, furrowed as it were by the waves. Vegetation is here in a deplorable state; there are a few dreary shrubs which perpetuate a sort of inanimate existence; their leaves are covered with salt, and their bark has a smoky smell and taste. Instead of villages, you perceive the ruins of a few towers. In the middle of this valley flows a discoloured river, which reluctantly throws itself into the pestilential lake by which it is engulfed. Its course amid the sand can be distinguished only by the willows and the reeds that border it; among which the Arab lies in ambush to attack the traveller, and to murder the pilgrim.

We now arrive at the celebrated lake which in Scripture is called the Dead Sea; among the Greeks and Latins, Asphaltites; and among the Arabs, Bahna Looh, or the Sea of Lot. Considerable diversity of opinion has prevailed, both among the ancients and moderns, regarding the exact dimensions of this lake, which as yet are probably not accurately ascertained. Mr Carne says, its length may probably be about sixty miles, and its average breadth eight. Mr Banks, however, who took observations from several neighbouring heights, says that its utmost extent does not exceed thirty miles. This discrepancy places the inaccuracy of travellers, with regard to their topographical descriptions of Palestine, in a very strong point of view. It is surrounded on the east by lofty hills, exhibiting rugged and frightful precipices; on the north it is bounded by the plain of Jericho, through which it receives the river Jordan. Other streams are discharged into it; and there being no visible outlet, while the banks are not overflowed, some have thought there is a subterraneous channel communicating with the Mediterranean; others readily account for the phenomenon, in the evaporation which necessarily takes place in a hot climate. This lake is clear and limpid, resembling the colour of the sea. Its waters are of greater specific gravity than any hitherto discovered; they are in general fatal to animal life, nor do vegetables flourish in their immediate vicinity. The fishes carried hither by the river Jordan, according to the concurring testimony of travellers, speedily perish; but the latest observers affirm that there are some small ones in the lake peculiar to itself, as also that a few inferior vegetables may be seen in it. The water of the Dead Sea holds the following substances in solution:—Muriate of lime, 3.920; Magnesia, 10.246; Soda, 10.360; Sulphate of lime, .054.

Pococke, after bathing here, found his face covered by a thin crust of salt, and the stones which it occasionally overflows are encrusted with the same substance. Mines of fossil salt are found in the neighbourhood. Many absurd fables were formerly circulated respecting the Dead Sea. It was affirmed that the pestiferous vapours hovering over it were fatal to the birds attempting to fly across; but recent travellers affirm that numerous swallows skim the surface, and from thence imbibe the water necessary in the construction of their nests. We would have passed over in silence the fact, that bodies are better buoyed up in this lake than in fresh water or in the ocean, did not travellers dwell upon the circumstance as something marvellous, and look upon the settling of the point, by their swimming upon its waters, as a feat equal to that of Byron's crossing the Hellespont. A glance at the analysis given above will show that it is denser than sea water, and, hence, will bear up substances which there would sink.

Great quantities of asphaltum, or mineral pitch, are always seen floating on the surface of the Dead Sea, and it is driven by the winds to the banks on the east and west; but the statement that a pestilential effluvium hovers over it, is rather apocryphal. Mr Carne informs us that there is nothing of the kind. The neighbourhood of the lake abounds with volcanic products; and although eruptions have ceased for many centuries, earthquakes are still common in Syria and Palestine.

The Dead Sea is always associated with that dreadful catastrophe recorded in Scripture, the destruction of Sodom and Gomorrah. With respect to the agents employed for executing the purpose of divine vengeance, various conjectures have been stated—some suppose that the great cities were swallowed up by a volcano. The opinion of Chateaubriand, who had carefully examined several volcanos, is decidedly opposed to this view of the subject. The learned Frenchman inclines to the opinion of Michaelis and Busching, that Sodom and Gomorrah were built upon a bituminous mine; that lightning kindled this combustible mass; and that the cities were engulfed in this subterraneous conflagration. Malte Brun ingeniously supposes that the stones of which the towns themselves were built might be bituminous, and thus have been kindled by the fire of heaven. These views appear very plausible, when taken in connection with the Mosaic account of the place, that the vale of Siddim, which is now occupied by the Dead Sea, was full of "slime pits," or pits of bitumen. There can be no doubt, however, that combustible matter descended from heaven upon the devoted cities of the plain, for the language of the Scriptural account is precise and explicit: "The Lord rained upon Sodom and Gomorrah, brimstone and fire from heaven." According to Strabo, there were thirteen towns swallowed up in the lake Asphaltites; Stephen of Byzantium reckons eight; the book of Genesis, although it names five as situated in the vale of Siddim, relates the destruction of two only; four are mentioned in Deuteronomy; and five are noticed by the author of Ecclesiasticus. Several modern travellers assure us that they observed fragments of walls and palaces in the Dead Sea, and the ancients speak positively upon the point. Josephus, who employs figurative language, says, that he perceived on the shores of the Dead Sea "the shades of the overwhelmed cities." Strabo gives a circumference of sixty stadia to the ruins of Sodom, which are likewise mentioned by Tacitus. Recent travellers have done nothing to throw light upon this interesting subject; and until something is ascertained with regard to the fact, we are forced to the alternative of looking upon it as apocryphal.

THE RIVER JORDAN.

The river Jordan rises at the foot of the Antilibanus; forms the lake Genesereth; traverses Palestine, of which it is the only important river, from north to south; receives the Kedron; and, after a course of 150 miles, disembogues its waters into the Dead Sea. Hasselquist informs us that the plain, which extends from this to Jericho, a distance of more than three leagues, is, generally speaking, level, but barren and uncultivated. The soil is a grayish sandy clay, and so loose, that horses often sink up to the knees in it. The surface of the earth is covered with salt, in the same manner as on the banks of the Nile, and would prove no less fruitful, were it irrigated with equal sure. The stones on the beach are all various-coloured quartz. Much difference of opinion prevails amongst authors with respect to the width of the Jordan. The Swede above mentioned says, that, at Jericho, it is eight paces over, the banks six feet in height, and perpendicular, the water deep, muddy, and warm rather than cold. Chateaubriand measured it in several places, and found it fifty feet in breadth, and six feet deep, down to the shore. This discrepancy must arise from the different seasons of the year at which the measurements were made. Mr Carne observes, that, when he saw it, it was about twenty yards across, and appeared to be very deep.

JERICHO.

Jericho, which was at one period denominated the City of Palm-trees, was anciently considered only inferior in point of consequence, wealth, and magnificence, to Jerusalem, and was enclosed by walls three miles in circumference. Of its splendid buildings, there remains only the part of one tower, which is supposed to have been the dwelling of Zaccheus the publican. A heap of rubbish marks the line of its ancient walls. It appears, indeed, either as if some cause, fatal to population, were still emanating from the pestiferous vicinity of the Dead Sea, and destined to extirpate the very energies of life, or that the judgments anciently denounced against it by the Almighty were still in full force. It was the first city which the Israelites reduced upon entering the Holy Land. Five hundred and thirty years afterwards, it was rebuilt by Hielel of Bethel, who restored its population and splendour, in which flourishing condition it appears to have continued for several centuries. Mark Antony presented to Cleopatra the whole territory of Jericho. Its walls were sacked by Vespasian during the war which he carried on in the country. It was afterwards more than once restored; but in the twelfth century it was overthrown by the infidels, and has not since emerged from its ruins. It is the opinion of Mr Buckingham, that the true site of Jericho, as described by Flavius Josephus, the Jewish historian, was at a greater distance from the river than the village of Rahab, commonly supposed to represent the city. In descending the mountains which bound the valley on the western side, he saw the ruins of a large settlement, covering at least a square mile, whence, as well as from other remains, he concluded that it must have been a place of some consequence. The distance of Jericho from Jerusalem, as fixed by Josephus at one hundred and fifty furlongs, and, from the river Jordan, at sixty, together with his description of the country, answers exactly to the situation of the ruins just mentioned. The spot lies at the very foot of the sterile mountains of Judea; and these are still as barren, rugged, and destitute of inhabitants, as formerly, throughout their whole extent, from the Lake of Tiberias to the Dead Sea. The distance, by the computation in time, amounted to six hours, or nearly twenty miles, from Jerusalem—the space between the supposed city and the river being little more than one-third of that amount, precisely the proportion indicated by the Jewish historian. Formerly, the soil around Jericho was celebrated for a precious balsam, but in the present day not a tree is found to vegetate on this desolate spot of Judea.

Rahab stands about four miles nearer the river. It consists of about fifty very mean dwellings, every one having in front a fence of thorns, as a protection from the attacks of the Bedouins, whose horses will not approach these formidable thickets. The inhabitants are all Mohammedans; they are shepherds rather than cultivators of the soil—this last duty, indeed, when performed at all, being done principally by the women and children, as the men roam the plain on horseback, and derive their principal means of subsistence from robbery and plunder. They are governed by a sheik, whose influence among them is more of a parental than a magisterial description. It may be observed, as a remarkable coincidence, that the name of this village corresponds to Rahab, the name of the hostess who received into her house the Hebrew spies, and signifies odour or perfume—the slight change on the form of the Arabic term implying no difference in the import of the root whence they are both originally derived.

The traveller whose journey lies between Jerusalem and Jericho still runs the risk of falling among thieves; the journey is most perilous, and seldom undertaken. Sir F. Henniker, however, accomplished it a few years ago, and accordingly suffered for his temerity. We meet with many interesting localities in this line of road. Among the mountains on the eastern side of the Jordan is Pisgah, a towering peak which the travellers delight to recognise. From its summit Moses was permitted to behold the promised inheritance, stretching towards the west, south, and north. When entering the mountains which protect the western side of the plain, the attention of the traveller is invited to the Fountain of Elisha, the waters of which were sweetened by the power of the prophet. They are now received in a basin, whence they issue in a copious stream, which splits into several rills, irrigating the land as far as Jericho.

MOUNTAIN OF QUARANTINA.

The tourist in his progress to the capital soon finds himself at the foot of the mountain called Quarantina, from being the supposed scene of the temptation and fast of our Saviour; the neighbourhood of the lofty eminence is a barren place. Leaving the mountain, the pilgrim returning from the Jordan finds himself on a beaten path, which, since the days of the Jewish legislator, it is probable has connected the rocks of Salem with the banks of the sacred river. Chateaubriand says that it is broad, and in some parts paved, having undergone, as he conjectures, several improvements while the country was under the Roman yoke. On the top of a mountain there is the appearance of a castle, which commands, and may be supposed to have protected the road; and at a little distance, in the bottom of a valley, is the Place of Blood, called in Hebrew, Abdomim, where formerly stood a small town belonging to the tribe of Judah, and where the good Samaritan is imagined to have succoured the wounded traveller who had fallen among thieves. That deep and gloomy dell is still the scene of robbery and murder, and possesses unquestionable right to the horrible distinction which it has so long enjoyed.

Having traversed the country south and east of the capital, we shall now proceed in our account of that which lies to the northward of it.

CAVE OF JEREMIAH AND SEPULCHRES OF THE KINGS.

Leaving Jerusalem by the northern gate, we proceed on the road which leads to Damascus. Near the entrance to the holy city there is a grotto, said to have been for some time the residence of Jeremiah the Prophet. The bed of the holy man is shown in the form of a rocky shelf, about eight feet from the ground; and the spot is likewise pointed out on which he is understood to have written his book of Lamentations. At a little distance from the city stand the sepulchres of the kings, connected with which there still prevails some obscurity. But whoever was buried here, the place discovers so great an expense, both of labour and treasure, that we may well suppose it to have been the work of kings. It is approached on the east side by an entrance cut out of the rock, which opens into a court of about forty paces square. On the south side is a portico nine paces long and four broad, likewise hewn out of the living rock, and having an architrave running along its front adorned with sculpture. The passage into the sepulchre is now so greatly obstructed with stones and rubbish that it is no easy matter to creep through; but, having overcome this difficulty, you arrive at a large room seven or eight yards square, excavated in the solid body of the hill. Its sides and ceiling are so exactly square, and its angles so just, that no architect could form a more regular apartment. From this room you pass into six others, all of the same construction. In every one of these, except the first, are coffins of stone placed in niches. They are of the size of those used in Europe, and have the form of a parallelogram. They had at first been covered with handsome lids, but the most of them have been destroyed. One of white marble was observed by Dr Clarke, adorned all over with the richest and most beautiful carving. There is much taste and skill displayed in the execution of these subterraneans, as well as in the ornaments with which they are embellished. But the most surprising thing connected with them is their doors, which consist of one entire piece of stone, handsomely carved.

BEER, LEBONAH, AND THE MOUNT OF GERIZIM.

The next object of importance which we meet with is a village supposed to be the Mickmash alluded to in Scripture. It is at present distinguished by the name of Beer, signifying a well, and adopted, most likely, from a delicious spring of water flowing through it; near to which are the ruins of a church, built in commemoration of the parents lamenting the loss of our Saviour, who, not being found by them there, was afterwards discovered with the expounders of the law in the temple. It was to this place, also, that Jotham had recourse in order to escape the fury of his brother. Beyond this hamlet, at the distance of about four hours' walk, is Leban, called Lebonah in the Bible, a village situated on the eastern side of a delicious vale. The road between these two places is carried through a wild and very hilly country, destitute of trees or other marks of cultivation, and rendered almost totally unproductive by the barbarism of the government. In a narrow dell, formed by two lofty precipices, are the ruins of a monastery, being in the neighbourhood of that mystic Bethel where Jacob enjoyed his celestial vision. We next arrive at the well of that patriarch, the scene of the conference between our Saviour and the woman of Samaria. Over this fountain Helena erected a large edifice, of which, however, almost nothing now remains. Near this is the narrow valley of Shechem, the Sychar of Scripture, overhung on either side by the two mountains Gerizim and Ebal, memorable as being the theatre on which was pronounced the sanction of the divine law. The Samaritans have, as is well known, a place of worship on Mount Garizim, where at certain seasons they perform the rites of their religion. According to their version of the Pentateuch, it was here that the Almighty commanded the children of Israel to set up great stones covered with plaster, on which to inscribe the body of their law; to erect an altar to offer peace-offerings; and to rejoice before the Lord their God. In the Hebrew edition, Mount Ebal is said to have been the scene of these pious services—a variation which the Samaritans ascribe to the malice of the Jews. In the vicinity of the town is a small mosque, which is said to cover the sepulchre of Joseph, and to be situated in the field bought by Jacob from Hamor, the father of Shechem, as is related in the book of Genesis.

NABLOUS, OR SHECHEM.

The road from Leban to Nablous, or Shechem, is mountainous and rugged. It presents, however, a remarkable picture of industry and cultivation, and, in abundance and wealth, may be styled the Eden of the East. The ancient Shechem is the metropolis of a rich and extensive country, abounding in agricultural wealth, and is one of the most flourishing towns in the Holy Land. It has a very imposing appearance when viewed from the surrounding heights, and looks as if it were embosomed in a delicious paradise. The population, who are principally Mohammedans, have been estimated at 10,000; but this Mr Buckingham thinks an exaggeration.

The Samaritans do not exceed forty in number. They have a synagogue, where divine service is performed every Saturday. Four times a-year they go in solemn procession to the old temple on Mount Gerisim, on which occasion they assemble before sunrise, and read the law till noon. They have but one school in Nablous where their language is taught, though they take much pride in preserving ancient manuscripts of their Pentateuch in the original character. Mr Connor saw a copy, which is reported to be three thousand five hundred years old, but he was not allowed to examine nor even to touch it. The events transacted in the field of Shechem render the localities contiguous to this city peculiarly interesting. Here stands the well of Jacob, and here the sons of the patriarch "drove their flocks a-field," and here they sold to the Ishmaelites their brother Joseph, the future all but potentate of the greatest kingdom then upon the face of the earth. Here, as of old, the shepherds graze their flocks upon the hills of Samaria, and the Ishmaelites come from Gilead, "bearing spices and balm and myrrh"—so imperishable are the customs and manners of the east.

SAMARIA.

Samaria is now called Sebaste, or the Venerable, an appellation conferred on it by Herod. It is computed by modern tourists to be more than forty miles distant from Jerusalem. The situation is extremely beautiful, and naturally strong, occupying the summit of a hill, encompassed all around by a deep valley. But the city which Herod adorned with princely buildings is now a mere village, small and poor, exhibiting only the miserable wreck of former greatness. Here John the Baptist was decapitated, and the Empress Helena erected a church over the place where he pined and suffered; but it has shared the fate of the rest of the city, being now a mere ruin. The prison where the holy blood of the desert-bred was spilled, is, however, pointed out by the Turks, who hold it in high veneration.

We shall now cross the Jordan, and enter the land of Gilead.

GERASA.

In this section of Palestine, the inheritance of Reuben and Gad, several very important discoveries were made by Dr Seetzen in 1806, among which were the ruins of the ancient city of Gerasa, or, as it now is called by the Arabs, Djerash. Approached from the south, the city is entered by a triumphal gateway, nearly entire. The workmanship is remarkably fine, and bears a striking resemblance to the remains of Antinoe, in Upper Egypt. It appears to have been a detached triumphal arch, erected for the entrance of some victorious hero. Within this gateway is an extensive theatre, for the exhibition of sea-fights, and, a little onward, there is seen a second gateway, similar in design to the other. To the left is a large and beautiful colonnade, arranged in a circular form, all of the Ionic order, and surmounted by an architrave. Next succeed a long avenue of columns, in a straight line, supposed to mark the direction of some principal street that apparently extended the whole length of the town. These columns are all of the Corinthian order, and the range on each side is ascended by a flight of steps. The attention of the traveller is now attracted by four magnificent pillars, of considerable dimensions, which probably adorned the front of some principal edifice now destroyed. After passing a square, and various masses of buildings, the tourist comes to the ruins of a temple of a semicircular form, with four columns in front, and facing the principal street in a right line. The spring of its half dome is still remaining, as well as several columns of yellow marble and of red granite. The whole seems to have been executed with peculiar care, especially the sculpture of the friezes, cornices, pediments, and capitals, which are all of the Corinthian order, and considered not less rich and chaste than the works of the best ages. On a broken altar near this ruin is observed an inscription having the name of Marcus Aurelius. Beyond this are temples, colonnades, theatres, arched buildings with domes, detached groups of Ionic and Corinthian columns, bridges, aqueducts, and portions of large buildings scattered here and there. The ground occupied by this city, which was nearly in the form of a square, might have been four miles in circumference. But so complete is now the desolation of this once magnificent place, that Bedouin Arabs encamp among its ruins, for the sake of the rivulet by which they are washed. With respect to the ancient history of this city, so much diversity of opinion prevails, that it were idle to enter into any investigation of the subject.

We now arrive at the hills of Gilead, the rich pasture-lands of the tribe of Reuben, and formerly the kingdom of the gigantic Og, the monarch of Bashan.

seven or eight hundred feet above the level of the Jordan is a district of extraordinary fertility, abounding with the most beautiful prospects, which yield in nothing to the finest parts of Galilee and Samaria. This scenery continues till the traveller reaches the Nahr el Zerkah, or river Jabbok, the ancient boundary between the Amorites and the children of Ammon. On the north begins the kingdom of Bashan, once celebrated for its oaks, its cattle, and the bodily strength of its inhabitants.

LAKE OF GENESARETH.

We come now to the lake, which has passed under different appellations from the sacred writers: such as the "Sea of Galilee," from being enclosed by Galilee; the "Lake of Genesareth, or Gnesar;" to these were added, the "Sea of Cinnereth and Tiberias." This picturesque sheet of water, an object of such high veneration, which, with that of the Dead Sea, may be considered as the two principal lakes in the Holy Land, appears to owe its origin to the waters of Jordan, which flow from Lebanon. The river Jordan enters at the northern, and flows out at the southern extremity, and its course is visibly seen all the way through. The range of mountains, forming its eastern shore, is very lofty, and their steep and rocky sides are barren; the western shore where the town stands is lower; the hills are more picturesque, and divided by sweet vallies clothed with verdure, but destitute of trees. With respect to the size of the lake, we must choose again amongst conflicting statements. It seems to be about fifteen miles in length and five in breadth. The waters are perfectly sweet and clear, and the fish are said to be of a delicious flavour.

It is almost unnecessary to remind the reader that this lake and neighbourhood were places where many important events occurred, mentioned in the New Testament. Here, it will be remembered, Christ embarked in a ship, to go to different places about its borders in the prosecution of his errands of mercy, and from which he instructed the multitude who had assembled on the shore.

Capernaum lies at the upper end of the lake, and is now called Talhewm, or Tel Hoom. It is nothing more than a station of Bedouins, but there are traces of its former importance. The foundations of a magnificent, but now much dilapidated edifice, can still be traced.

Tiberias, which makes a conspicuous figure in the Jewish annals, is the only place on the sea of Galilee retaining any marks of its ancient importance. It is understood to cover the ground formerly occupied by a town of a much remoter age, and of which some traces can still be distinguished. Taberia, as it is now denominated, has the form of an irregular crescent, and is enclosed towards the land by a wall, flanked with circular towers. It lies nearly north and south, along the edge of the lake, and has its eastern front so close to the water on the brink of which it stands, that some of the houses are washed by the sea. The whole does not appear more than a mile in circuit, and cannot, from the manner in which they are placed, contain above 500 separate dwellings. Here there are a mosque and two Jewish synagogues, also a Christian place of worship, called the House of Peter, which is thought by some to be the oldest building used for that purpose in any part of Palestine. The structure is of very ordinary description; but it derives no small interest from the popular belief that it is the very house which Peter inhabited at the time of his being called from his boat to follow the Messias. The population of the town does not now exceed 2000. Of these, about one-half are Jews, the rest are Mohammedans, with the exception of a few of the Christian creed. The warm baths, which have given celebrity to that neighbourhood, are still found at the distance of between two and three miles southward from the town. "Tiberias," says Carne, "is a scene where nature still seems to wear as sublime and lovely an aspect as in the day when it drew the visitations of our Lord. No curse rests on its shores, as on those of the Dead Sea, but a hallowed calm and a majestic beauty, that are irresistibly delightful."

MOUNT TABOR.

An almost uninterrupted ascent conducts from Tiberias to Nazareth. On this route, we have Mount Tor, or Tabor. This mount, which is classed in Scripture with Hermon, and something in the resemblance of a sugar loaf, is insulated on all sides, independent of the mountains around it, and stands with inexpressible dignity at one end of the great plain of Esdraelon, which may be ascended on all points, excepting towards the north, where it is rugged. There is not, perhaps, to be found, in the whole compass of the globe, one spot, from which a believer in the gospel can possibly enjoy a more sublime or glorious prospect, than from the summit of Mount Tabor, which has been so celebrated in the sacred volume, and held during all ages in such high veneration by Christians. In the first place, there is presented to view an extensive plain. On one side of it, on the left hand, are the mountains of Samaria, towards Jerusalem; on the other, to the right, those about Nazareth, especially the memorable hill from which the Jews attempted to precipitate Christ; with the top of Mount Carmel, washed by the ocean, at an opposite extremity of this plain. In another, Hermon, in its lofty dignity; Endor, and Nain, with the mountains of Gilboa. Next, the valley of Jordan, the spacious plains of Galilee, with its sea of Genesareth, and its enclosure of mountains; Dothan, where Joseph was sold, with its rivers, vallies, and little hill, and the village of Saphet, anciently called Bethulia, on an eminence, and presumed to have been the point of elevation alluded to by Christ in his sermon on the mount, from which it is also remarkably conspicuous, and not at a great distance. Again, the sublime height on which he delivered this memorable oration; the route to Damascus. Lastly, Mount Lebanon, towering with prodigious alpine dignity in the background.

Different opinions have been entertained by writers with regard to the extent of ground on the summit, and the cultivation of it. Taking the whole into calculation, it may be nearly two miles in diameter. To the west, there are masses of scattered ruins. At one period, a governor of Galilee surrounded the top of it with walls, which is confirmed by the scattered fragments still to be seen. St Helena, also, in prosecution of her zeal in the cause of Christianity, founded two monasteries, one to the memory of Moses, and the other of Elias. Various historical incidents are connected with this mountain. Here it was that Barak, descending with his ten thousand men from Tabor, discomfited Sisera and all his chariots. In the same neighbourhood, Josiah king of Judah fought in disguise against Necho king of Egypt, and fell by the arrows of his antagonist, deeply lamented. Vespasian reviewed his army in the same great plain. It has been a chosen place for encampments in every contest carried on in the country, from the days of Nebuchednezzar king of the Assyrians, down to the disastrous invasion of Napoleon Bonaparte.

NAZARETH.

Among the places which were honoured with the presence of Christ, and consecrated as the scenes of his benevolence and good-will towards men, Nazareth of Zebulun, and its neighbourhood, present strong claims to our attention. It is about one hundred miles distant from Jerusalem, and is romantically situated upon the bottom and sides of a hill which overlooks it.

It would be tedious to enumerate all that are shown to a traveller, but the following appear most deserving of notice:—The church belonging to the convent, which is rather elegant, and is erected over the grotto or cave where Mary took up her abode. It has no other roof than that which is formed of the natural rock, and is in the shape of a cross.

Among many pictures which adorn this church, there is a pretended likeness of Christ.

The second object shown is the shop where Joseph worked; it is now used as a place of worship. Over the altar, he is represented with the implements of his trade, holding our Lord by the hand, as if in the act of imparting the knowledge of his vocation.

Thirdly, a chapel, in the centre of which is an enormous stone, about nine feet in length, and six in breadth, on which it is affirmed that Christ sat and sat with his chosen few.

Fourthly, the synagogue where Christ, agreeably to his practice, read to the Jews, from the sacred volumes, on the Sabbath.

Fifthly, near the town is pointed out a hill, from which, disregarding the sanctity of that day, they threatened to throw him, in consequence of the dissatisfaction which his addresses had given.

And, lastly, a well of the Virgin, which supplies the inhabitants of Nazareth with water. Mr Carne says, the population may amount to about twelve hundred, and are mostly Christians.

After crossing the plain of Esdraelon, we come to Mount Hermon, the dew of which is so beautifully alluded to by the Psalmist. Near this place stands Nain, which is so called from its pleasant situation, where the widow's son was restored to life by the Saviour. About two miles from Nain, is seen Endor, where the sorceress resided who was consulted by Saul, and in the vicinity are the mountains of Gilboa, where the forces of Israel were collected.

CANA OF GALILEE.

Kaffer, Kenna, or Cana of Galilee, falls next under notice. This village is pleasantly situated on a small eminence in a valley, and contains two or three hundred inhabitants. Many pots, answering to the description given by the Evangelist, are found lying about amongst the ruins; from which it would appear evident, that the practice of keeping water in large stone pots, each holding from eighteen to twenty-seven gallons, was once common in the country. Near the bottom of a field, which is said to be that in which Christ plucked the ears of corn upon the Sabbath, stands the Holy Mount, which has been so eminently distinguished as the spot from whence the multitudes were addressed. It has an elevation of from two to three hundred feet.

The landscape which stretches from the lake of Tiberias to the sources of the Jordan, is in many parts uncommonly fine, presenting luxuriant crops, thriving villages, and other tokens of security and comfort. The mountains that terminate the prospect are magnificent, some of them being covered with perpetual snow.

SAPHET, SEPHOURI, AND ZEBULUN.

The only town of consequence between the ruins of Capernaum and the alpine range of Hermon and Djibbel el Sheik, is Saphet, being one of the four cities consecrated by the religious veneration of the Hebrews. According to Burckhardt, it stands upon several low hills that divide it into quarters, the largest of which is occupied by Jews. The whole may contain six hundred houses, of which one hundred and fifty belong to the people just named, and nearly as many to the Christians. The summit of the principal eminence is crowned with an ancient castle, part of which is regarded by the descendants of Israel as being contemporary with their ancient kings. The Jews have here seven synagogues, and a sort of university for the education of their rabbis. Their attachment to this place arises especially from the traditionary belief that the Messias is here to reign forty years before he assumes the government at Jerusalem. From Nazareth to Acre we proceed over a barren rocky tract of country; on the way we meet with Sephouri or Sepphoris, the Zippor of the Hebrews, and the Diocesarea of the Romans, once the chief town and bulwark of Galilee. The remains of its fortifications exhibit one of the works of Herod, who, after its destruction by Varus, not only rebuilt and fortified it, but made it the principal city of his tetrarchy.

Its chief celebrity is connected with the tradition that it was the residence of Joachim and Anna, the parents of the Virgin Mary. Constantine built a magnificent church over the spot where the devout couple lived, the ruins of which will be found minutely described in Dr Clarke's travels. The vale of Zebulun divides the above village from the ridge of hills which look down on Acre and the shores of the Great Sea. This plain every where presents the most beautiful scenery. On the road, various ruins occur which exercise the ingenuity of the antiquarian traveller. All remains of the strong city of Zebulun have disappeared, and its admirable beauty, rivalling that of Tyre, Sidon, and Berytus, is now sought for in vain among Arab huts and heaps of rubbish. We shall now enter upon that part of Palestine which lies upon the shores of the Mediterranean.

ACRE.

Acre stands close to the sea at the end of a bay extending in the form of a bow, about twelve miles to the point of Mount Carmel at the opposite part, and has a population of ten thousand people. It was originally called Accha, and is alluded to in sacred writ; of this name Acre is evidently a corruption. It is preceded by the words "St Jean," in consequence of the place having been given by Richard of England to the Knights of St John of Jerusalem; at one time it received the name of Ptolemais. This place was visited by the Apostles, but particularly by St Paul. It has been the scene of a variety of bloody contests, especially during the period of the crusades, and was the last place from which the Christians were driven. The Turks ultimately laid hold of it with a numerous army, after a furious siege, when terrible outrages were committed. They have been in possession of it since the year 1291. As Acre is the key not only of all Galilee, but, in general, of the Holy Land, having the best port, it may account for the violent efforts made by the French to grasp it; they were however, as is well known, successfully repelled by British gallantry and perseverance. The most distressing sight in the town is the number of deplorable objects to be met with, whose faces have been dreadfully disfigured by that implacable Herod or tyrant of the day, who struck such dread and terror over this country—namely, Achmet, the former pacha, or Djezzar. This latter appellation is synonymous with cutter or butcher, which he justly merited, from the frightful catalogue of atrocities of which he was the author.

St Jean d'Acre is very strongly fortified, being newly enclosed with high walls, and is considered the strongest place in Syria. The memorable siege which occurred in March 1799, since it gave a blow so fatal to Bonaparte, was a remarkable event, and will be a brilliant page of our national history. The houses are of stone, with roofs like terraces, the entrances to which are narrow, and many appear to communicate with each other. The streets are dirty, and the air impure, from their being contracted, where a loaded camel, in going along, may be considered as occupying the breadth of it. The bazaars are mean, and the inhabitants miserable.

MOUNT CARMEL.

Mount Carmel forms a promontory or majestic headland. It runs from east to west, and is about 2000 feet from the level of the sea, by which its base is washed. Near it runs Kishon, one of the rivers which is particularly alluded to in the sacred writings. Carmel is the most beautiful mountain in Palestine; is of great length, and in many parts covered with trees; and a part of its summit is pointed out as the plane where Elijah prayed for rain, and saw the humid cloud rise out of the sea. On the 20th of July, the Christians proceed to perform acts of devotion in memory of the prophet. There was formerly a monastery here, but it is now abandoned.

Between this point and Jaffa we meet with the ruins of several ancient villages and towns, amongst which is Cesarea. "Perhaps there has not been," says Dr Clarke, "in the history of the world, an example of any city that in so short a space of time rose to such an extraordinary height of splendour as did this of Cesarea, or that exhibits a more awful contrast to its former magnificence, by the present desolate appearance of its ruins." In fact, not a solitary inhabitant remains where once stood the proud city of Herod. Its theatre, its palaces and temples, form a marble desert—

"Whose echoes, and whose empty tread,
Sound like the voices of the dead."

The other places are not of sufficient importance to detain us from entering upon a description of

JAFFA, OR YAFFA, THE ANCIENT JOPPA.

This is one of the most ancient sea-ports in the world. Pliny assigns it a date which stretches far back into the twilight of time, anterior to the deluge itself. Tradition has even assigned this as the place where Noah built his ark! It was here, however, in the most authentic of all records informs us, that Solomon ordered the materials of his temple to be brought by sea from Lebanon; here the prophet Jonah embarked for Tarshish; and here, in apostolic times, St Peter restored Tabitha to life. During the warlike era of the crusades, Jaffa made a conspicuous appearance; and latterly it has been dragged into a sort of disgraceful notoriety, from the well-known circumstance of Napoleon having massacred some prisoners there. The town occupies an eminence in the form of a sugar loaf, with a citadel on the summit. The bottom of the hill is surrounded with a wall twelve or fourteen feet high, and two or three feet thick. The environs are occupied by extensive gardens, the soil being very favourable for the production of fruit. According to Dr Clarke, the harbour is one of the worst upon the Mediterranean, and unfit for shipping. The road is protected by a castle, and there are some store-houses and magazines on the sea-side. The coast is low, and but little elevated above the level of the sea. There are no antiquities in Jaffa. The inhabitants amount to between four and five thousand, who are mostly Turks and Arabs.

Between Jaffa and El Arisch, the extreme point of the Holy Land in this direction, lie the towns of

ASHDOD, GATH, ASKELON, AND GAZA.

It is perhaps unnecessary to inform the reader that these were once famous cities of the Philistines, and repeatedly brought before our notice in the Old Testament. The pathetic exclamation, "Tell it not in Gath, publish it not in Askelon!" must be familiar to every one. Ashdod is situated on the summit of a grassy hill, and, if we are to believe historians, was anciently as strong as it was beautiful. It now, however, can lay claim to neither adjective, except perhaps the latter. Gath, a place of strength in the time of the prophets Amos and Mica, is now similarly circumstanced with Ashdod. Askelon, once one of the proudest satrapies of the Philistine lords, still, to external appearance, maintains something of its ancient character. Its position is strong, and its walls, which are of great thickness and considerable height, are built on the top of a ridge of rock, winding round the town in a semicircular direction, and terminating at each end in the sea. But, alas! they enclose not a living being. How truly has been fulfilled the prophecy of Zechariah, "The king shall perish from Gaza, and Askelon shall not be inhabited." Gaza is truly without a king. It is now only a large village, with narrow streets and houses, which in general are destitute of windows. There is some trade, however, carried on in Gaza, particularly in cotton, and the inhabitants, according to Mr Buckingham, exceed two thousand. This place was formerly of great magnificence and strength; for two months it baffled all the efforts of Alexander to take it. El Arisch, the natural frontier of Palestine on this side, is situated upon a slightly elevated rock in the midst of drifting sands. It has a substantial fortress, and contains about two thousand inhabitants. According to Ali Bey (Burckhardt) almost the whole country of the Philistines is beautiful. It is for the most part composed of undulating hills, of a rich soil, and clothed with exuberant vegetation. There is not, however, either a river or a spring in the whole district; so that the wells and water collected during the periodical rains are the only means of irrigation within the reach of the inhabitants.

It will be necessary to return to Jaffa, in order to take a view of the road which lies between that town and Jerusalem. About nine miles from Jaffa stands Ramla, or Ramali, the ancient Rama of Ephraim, and very probably the Arimathea of the New Testament. It is situated in a rich plain, and contains about 2000 families. Here there are several convents and mosques; and, on a hill to the west of the town, stands a venerable ruin, called the Tower of the Martyrs, a name probably derived from the martyrs of Sebastia, in Armenia, whose bodies have been here deposited. About a league from this is Lydda, still called Loudd, where St Peter cured Æneas of the palsy. This place is now a poor village, with few inhabitants. The country which surrounds it, however, is of a rich and fruitful soil. Farther on is the Arab village of Bethoor, supposed with much probability by Dr Clarke to be the Bethoron of Scripture. We enter now into the country of Judæa. It is very mountainous; "and its scenery," says Dr Richardson, "brought strongly to my recollection the ride from Sanquhar to Leadhills, in Scotland; and to those," he continues, "who have visited this interesting part of my native country, I can assure them the comparison gives a favourable representation of the hills of Judæa." He goes on to say, that the great difference lies in the contrast which the countries present in the character of their roads and inhabitants, those of Palestine being of the very worst description. Among the places of note which lie in the route to Jerusalem, is Modin, well known as the site of the city and tombs of the illustrious and patriotic Maccabees. It is still a place of strength, and goes by the same name. Between this and Jerusalem we meet with nothing of importance, except what has been already described.

TYRE.

Returning to the sea-shore, we have the ancient Tyre, once the mart of nations and the glory of the earth. In the early ages, Tyre, in Phœnicia, is described in Scripture as a renowned city and a stronghold, encompassed with walls and towers; it was allotted to the tribe of Asher; it is now frequently called Sur, and perhaps, of all other maritime cities in the globe, was more highly renowned for riches and commerce, since her very merchants were declared to be as princes, and "every deck a throne;" and a most interesting description of the trades carried on within its walls, has been transmitted to us in the 27th chapter of Ezekiel. It was not, however, merely in a commercial point of view that it was represented to the world at large as an object of wonder and admiration. Among the variety of trades exercised in this city, that of dyeing was most distinguished, on account of the beautiful purple tint, which poets have celebrated as a chief ingredient in the magnificence of the vestments worn by the principal inhabitants. During the time of our Saviour, considerable importance must have been attached to the city, as it is frequently alluded to, with its neighbourhood. Tyre was besieged and taken by Alexander the Great, after whose death it began to recover, and maintain a commercial character. It afterwards submitted, first, to the Roman, and afterwards to the Mohammedan yoke, under the power of which it now remains. It was enclosed with walls, which originally must have been of great strength, furnished with towers, having holes or apertures for making observations, part of which still remains. This town does not appear to be so desolate a place as has been sometimes represented. It contains a few good houses, and nearly 2000 inhabitants. The island upon which the city anciently stood, has of course long disappeared. With Tyre is always associated Sidon, probably from the expression of our Lord, "It shall be more profitable for Tyre and Sidon," &c.

SIDON.

Zidon, or Sidon, owes it name to the eldest of the sons of Canaan, and was comprehended under the "lot," or possessions formally assigned to the tribe of Asher. It appears to have been higher in point of antiquity than Tyre, although both have been classed in the character of sisters, arising, most likely, from their contiguity, and publicly considered as a city of large extent and importance, since it has been distinguished in Scripture by the title of "Zidon the Great." Among various arts and sciences, the invention of the alphabet and arithmetic, making of glass, and skill in casting and sculpture, have been celebrated; and an unrivalled dexterity in hewing of wood will hand down the Sidonian name in the page of history to the latest period of time. The commercial pursuits of this people were also as lucrative as they were extensive; and it was likewise celebrated for its maritime enterprise.

Sidon is now a small town, rising gradually from the sea-shore, very pleasantly situated, and surrounded with rich gardens. The climate is peculiarly mild: the streets are excessively narrow, many of them under archways, as at Jerusalem: the inhabitants are estimated at about seven thousand, of whom two thousand are Christians, who have places of worship; the Jews, also, who may be calculated at two hundred, have a synagogue. Considering its small extent, the trade of this place is pretty considerable, particularly in silk.

The next object of importance is

MOUNT LEBANON,

"Whose head in wintry grandeur towers,
Whitens with eternal sleet;
While summer in a vale of flowers,
Is sleeping rosy at his feet."

This mountain has received the appellation of Lebanon, from the word Leban, signifying white, and, in all probability, from the snow which remains on its heights during the whole year. It has been peculiarly marked in Scripture as affording many glowing images and beautiful metaphors to the sacred writers. The cedars of it have in all ages been celebrated as objects of grandeur, and touched upon as images in ancient prophecy. It may be further added, that the cedars of this mountain, uniting so many qualities for building, afforded ample materials, and were sent by King Hiram to Solomon for the erection of his splendid temple; with respect to which, it has been beautifully said—

"Like some tall palm the noiseless fabric grew."

The highest elevation of Lebanon is 9600 feet. The summits are still shaded with cedars, and beautified with thousands of rare plants.

THE DRUSES AND MARONITES.

The mountains of Lebanon and neighbourhood are inhabited by two races, differing in religion and manners, but similar in their love of independence, the Maronites and the Druses. The country of the former is called Kesraoun, the Castravan of the historians of the crusades. It reaches from the river Kebir to the Kelb. The Maronites, amounting to 120,000, dwell in villages and hamlets. The fervour and devotion which pervade this people recall to us the ideas of the primitive church. An imposing superstition has consecrated a cedar forest which is said to have furnished the timber of Solomon's temple. Only twenty large cedars remain, and this old vegetable race verges fast to its extinction. Every year, on transfiguration day, the Greeks, the Armenians, and the Maronites, celebrate a mass on an altar of rough stones raised at the roots of these venerable trees.

The Druses, also 120,000 in number, live to the south of the Maronites. Their country has several subdivisions, differing from one another in their soil and productions. It is by religious peculiarities that this people is separated from the other inhabitants of Syria. They believe in one God, who, for the last time, showed himself in human form in the person of Hakem, caliph of Egypt, in 1030. Persuaded that all other systems of belief will finally be united in that which they profess, they regard them all with equal indifference, although the Christians have considered them as entertaining a marked contempt for the Mohammedan religion. On the eastern base of Lebanus is the fertile plain, watered by numerous streams, where the ancient city of Damascus stands, the Demeshk, or Sham-el-Demeshy of the Orientalists.

DAMASCUS.

This city was once famous for the manufacture of sabres, which appear to have been made of thin laminae of steel and iron welded together, so as to unite great flexibility with a keen edge. The art of making them is lost, since Tamerlane carried off the artisans to Persia. Sabres are still made here, but of inferior quality. It has a manufacture of excellent soap, and of stuffs made of a mixture of cotton and silk. The cabinet work of fine wood, adorned with ivory and mother-of-pearl, has excited the admiration of the Europeans. This city is enlivened by the bustle of commerce, and the passage of the caravans to Mecca. The great street which crosses it presents two rows of shops, in which the riches of India glitter along with those of Europe. Damascus is seven miles in circumference, and at present the population may amount to 100,000. The private houses in Damascus, simple in external appearance, exhibit in the interior all the splendour and elegance of a refined luxury; great magnificence is also displayed in the mosques, the churches, and the coffee-houses. The large mosque is a fine and spacious building, but no traveller is permitted to enter. The Chan Verdy, or Coffee-House of Roses, is considered as one of the curiosities of the Levant. Various places associated with events mentioned in Scripture are pointed out in the city and neighbourhood. The street still called Straight is that where St Paul is, with reason, said to have lived. It is as straight as an arrow, a mile in length, broad and well paved. A lofty window, in one of the towers to the east, is shown as the place where the Apostle was let down in a basket; and in the way to Jerusalem is the spot where his course was arrested by the light from heaven. There is a tradition that men was made in a meadow to the west of the city; to the east of it is pointed out the place where the host of Neaman the Syrian stood.

At the commencement, we gave a view of the present state of the country. Change and mutability are leading characteristics of all other countries but those in the east. There they remain the same, century after century; and the descriptions of them by travellers, of two hundred years' standing, exactly correspond with those given by travellers of yesterday. It was anticipated by some that Palestine would have been materially affected by the operations of the Pacha of Egypt. Nothing, however, has yet occurred which would justify us in drawing any conclusion as to a change in its civil administration. It would be unpardonable in any account of the Holy Land, to omit mentioning the present state of the Jews, its ancient and highly-favoured inhabitants. We learn, from a statement lately published in Germany, that their numbers amount to between three and four millions, scattered over the face of the whole earth, but still maintaining the same laws which their ancestors received from their inspired legislator more than three thousand years ago. In Europe, there are nearly two millions enjoying different degrees of political privilege, according to the spirit of the several governments; in Asia, the estimate exceeds several hundred thousand; in Africa, more than half a million; and in America, about two thousand. It is supposed, however, on good grounds, that the Jewish population on both sides of Mount Taurus is considerably greater than is here given, and that their given number does not fall short of five millions. In Palestine, of late years, they have greatly increased. It is said that not fewer than ten thousand inhabit Saphet and Jerusalem, and that in their worship they still sing those pathetic hymns which their manifold tribulations have inspired; bewailing, amid the ruins of their ancient capital, the fallen city and the desolate tribes.

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HISTORY OF THE ISLAND OF GREAT BRITAIN,

From the Commencement of the Civil War, till the Rebellion of 1745.

AT the close of a former sheet bearing the present title, Charles the First and his Parliament were represented as about to commence a civil war. It is now our duty to continue the narrative formerly commenced, so as to afford to the large class who are unable to obtain larger and more expensive works, a brief, but, it is hoped, intelligible and correct view of the progress of British history.

THE REMONSTRANCE.

It was generally allowed by moderate people, that, in the autumn of 1641, by which time the labours of the Parliament had continued one year, the King had granted redress of all the abuses for which the earlier part of his reign, and the British constitution in general, were blameable. If he could have given a guarantee that he never would seek to restore any of these abuses, or attempt to revenge himself upon the men who had been chiefly concerned in causing him to give them up, there would have been no further contention. Unfortunately, the leaders in the House of Commons felt that, if they once permitted the King to resume his authority, there would be no longer any safety for them; and it was deemed necessary by this body of men, that things should be prevented from falling into their usual current. They therefore prepared a paper called the Remonstrance, containing an elaborate view of all the grievances that had ever existed or could now be supposed to exist, and this they not only presented to the King, but disseminated widely among the people, with whom it served to increase the prevailing disaffection.

COMMENCEMENT OF THE WAR.

From this time it was seen that the sword could alone decide the quarrel between the King and the Parliament. Charles made an unsuccessful attempt (January 4, 1642) to seize six of the most refractory members, for the purpose of striking terror into the rest. The effort only served to widen the breach. In the early part of the year just named, the two parties severally employed themselves in preparing for war. Yet, even now, the King granted some additional concessions to his opponents. It was at last, upon a demand of theirs for the command of the army—a privilege always before and since resting with the crown—that he finally broke off all amicable intercourse. He retired with his family to York.

The Parliament found its chief support in the mercantile classes of London and of the eastern coast of England (which was then more devoted to trade than the west), and in the Puritan party generally, who were allied intimately with the Presbyterians of Scotland, if not rapidly becoming assimilated with them. Charles, on the other hand, looked for aid to the nobility and gentry, who were able to bring a considerable number of dependents into the field. The one party was by the other styled *Roundheads*, in consequence of their wearing short hair; while the friends of the Parliament bestowed upon their opponents the epithet of *Malignants*. The Royalists were also, in the field, termed Cavaliers, from so many of them being horsemen.

On the 25th of August, the King erected his standard at Nottingham, and soon found himself at the head of an army of ten thousand men. The Parliament had superior forces, and a better supply of arms; but both parties were very ignorant of the art of war. The King commanded his own army in person, and the Parliamentary forces were put under the charge of the Earl of Essex.

The first battle took place, October 23, at Edgehill in Warwickshire, where the King had rather the advantage, though at the expense of a great number of men. He gained some further triumphs before the end of the campaign, but still could not muster so large an army as the Parliament. During the winter, the parties opened a negociation at Oxford; but, the demands of the Parliament being still deemed too great by the King, it came to no successful issue.

CAMPAIGN OF 1643.

Early in the ensuing season, the King gained some considerable advantages: among the rest he defeated a Parliamentary army under Sir William Waller at Stratton, and soon after took the city of Bristol. It only remained for him to take Gloucester, in order to confine the insurrection entirely to the eastern provinces. It was even thought at this time that he might have easily taken possession of London, and thereby put an end to the war. Instead of making such an attempt, he caused siege to be laid to Gloucester, which the army of Essex relieved, when just on the point of capitulating. As the Parliamentary army was returning to London, it was attacked by the royal forces at Newbury, and all but defeated. Another royal army in the north, under the Marquis of Newcastle, gained some advantages; and, upon the whole, at the close of the campaign of 1643, the Parliamentary cause was not in a flourishing condition.

MILITARY CHARACTER OF THE PARTIES.

In this war, there was hardly any respectable military quality exhibited, besides courage. The Royalists used to rush upon the enemy opposed to them, without any other design than to cut down as many as possible, and, where any part of the army was successful, it never returned to the field while a single enemy remained to be pursued; the consequence of which was, that one wing was sometimes victorious, while the remainder was completely beaten. The Parliamentary troops, though animated by an enthusiastic system of religion, were somewhat steadier, but nevertheless had no extensive or combined plan of military operations. The first appearance of a superior kind of discipline was exhibited in a regiment of horse commanded by Oliver Cromwell; a gentleman of small fortune, who had been a brewer, but was destined, by great talent and address, joined to an unrelenting disposition, to rise to supreme authority over these kingdoms. Cromwell was one of nature's captains; though himself inexperienced in military affairs, he showed from the very first a power of drilling and using troops, which no other man in either army seemed to have. Hence his regiment soon became famous for its exploits.

SOLEMN LEAGUE AND COVENANT.

The English Parliament and the Scottish nation were alike distressed by the royal successes in 1643, which threatened both with the loss of all the political ameliorations they had wrested from the King. They therefore entered, in July, into a *Solemn League and Covenant*, for prosecuting the war in concert, with the view of ultimately settling both church and state in a manner consistent with the liberties of the people. In terms of this bond, the Scots raised an army of 21,000 men, who entered England, in January 1644, and, on the 1st of July, in company with a large body of English forces, overthrew the King's northern army on Long Marston Moor. The conduct of the Scottish nation in this transaction was not so unexceptionable as might be wished. They had been gratified in 1641 with a redress of every grievance they could name; since which time the King had not given them the least cause of complaint. In now raising war against him, they had no excuse but the very equivocal one that it was necessary to guard against the possibility of his ever being able to injure them. They were also acting on English pay, which was unworthy of a nation, which, on many occasions, made very clamorous assertions of its being independent. The mainspring of their proceedings was a hope of being able to establish the Presbyterian religion in England. The Episcopal church being now abolished, divines were nominated by both nations to meet at Westminster, in order to settle upon a new form of worship and church government; and after a long course of deliberation, it was agreed that the Presbyterian system should be adopted, though in England it was provided that the new church should have no connection with or influence over the state.

NEW-MODELLING OF THE PARLIAMENTARY ARMY.

The defeat at Long Marston was severely felt by the King, who gained a victory over Waller at Copredy Bridge, and caused Essex's army to capitulate in Cornwall (September 1); but in consequence of a second fight at Newbury (October 27), in which he suffered a defeat, he was left at the end of the campaign with greatly diminished resources. A new negociation was commenced at Uxbridge; but the terms asked by the Parliament were so exorbitant, as to show no sincere desire of ending the war. In truth, though the Presbyterian party were perhaps anxious for peace, there was another party, now fast rising into importance, who had no such wishes. These were the Independents, a body of men who wished to see a republic established in the state, and all formalities whatsoever removed from the national religion. Among the leaders of the party was Cromwell, whose mind seems to have already become inspired with lofty views of personal aggrandisement. This extraordinary man had the address to carry a famous act called the Self-Denying Ordinance, which ostensibly aimed at depriving all members of the legislature of commands in the army, but was intended solely to displace a few noblemen who were obnoxious to his designs—and also an act for modelling the army anew, in which process he took care that all who might be expected to oppose his views should be excluded. It was this party that prevented any accommodation taking place between the King and his subjects.

MONTROSE'S CAREER IN SCOTLAND.

While the negociation was pending, the Marquis (formerly Earl) of Montrose produced a diversion in Scotland in favour of the King. Having got fifteen hundred foot from Ireland, to which he added a few Perthshire Highlanders, he fell down upon the Lowlands, and on the 1st of September (1644) gained a complete victory over a larger and better-armed force at Tippermuir. At Aberdeen, whither he went for the purpose of increasing his army, he gained another victory over a superior body of Covenanters. He was then pursued by a third army, under the Marquis of Argyle, and, after some rapid movements, seemed to dissolve his forces in the Highlands. Ere his enemies were aware, he burst in the middle of winter into the country of his grand enemy Argyle, which he did not leave till he had made it a desert. Finding himself timidly followed by Argyle, at the head of a large body of Campbells, he turned suddenly, and falling upon them at Inverlochy (February 2, 1645), gained a complete victory. He then moved along the eastern frontier of the Highlands, where he found himself opposed by a fourth army under General Baillie. After sacking Dundee, and eluding Baillie's troops, he encountered a greatly superior force at Auldearn, in Nairnshire (May 4), whom he also overthrew. Then turning upon Baillie, whom he met at Alford, in Aberdeenshire (July 2), he gained a fifth victory, almost as complete as any of the rest. In all these battles he carried every thing before him by the spirit of his first onset, and the slaughter was in general very great. He now descended to the Lowlands, and at Kilsyth, near Glasgow, was opposed by an army of 6000 men, whom the insurgent government at Edinburgh had hastily assembled from Fife and Perthshire. These, with a much smaller force, he also defeated (August 15), killing immense numbers in the pursuit. The Committees of Church and State then broke up and left the kingdom, leaving him in appearance its sole master. His successes had in the mean time given the King hopes of carrying on the war with success; but Montrose had in reality gained no sure advantages. Besides his small army of mingled Irish and Highlanders, there was hardly any portion of the nation who did not regard him as the greatest of traitors. While lying with a diminished force at Philiphaugh, near Selkirk, he was surprised (September 11), by a detachment of the regular Scottish army, under General David Leslie, who completely defeated his troops, and obliged him to leave the kingdom. His having gained six victories in succession, over larger bodies of men, has procured for him a distinguished name; but his cruelty, and the ambition to which his motives were confined, detract greatly from his character.

CONCLUSION OF THE CIVIL WAR.

The English campaign of 1645 ended in the complete overthrow of the King. Throughout the war, his enemies had been continually improving in discipline, in conduct, and in that enthusiasm which animated them so largely; while the Royalists had become, out of a mere principle of opposition, so extremely licentious, as to be rather a terror to their friends than to their enemies. The new-modelling of the Parliamentary army, which took place early in 1645, had also added much to the effectiveness of the troops, who were now nominally commanded by Sir Thomas Fairfax, but in reality by Oliver Cromwell, who bore the rank of Lieutenant-General. The consequence was, that, in a pitched battle at Naseby (June 14), the King was so completely beaten, that he and his party could no longer keep the field. He had no resource but to retire into Oxford, a town zealously affected to his cause, and well fortified.

THE KING TAKES REFUGE WITH THE SCOTTISH ARMY.

He endeavoured, from this forlorn position, to renew the negociations for a peace, but every attempt of that kind was frustrated by the Independents, who, though a minority in the House of Commons, possessed great power through the army, and, as already mentioned, were desirous of effecting greater changes in church and state than those for which the war was originally undertaken. Dreading the influence of this body, Charles retired privately from Oxford (May 1646), on the approach of the Parliamentary forces, and put himself under the protection of the Scottish army at Newark.

It was now the policy of Charles to set himself up, as it were, to auction between the Presbyterian and Independent parties, and put himself at the head of that which should offer him the best terms. The Presbyterian party, including all the Scotch and a vast proportion of the English public, would have reinstated him in power, if he would have sanctioned that religion which, as already mentioned, was now declared to be the established worship of England. On the other hand, if he would have consented to abolish all established forms of worship, and permit every congregation to elect and pay for its own clergyman, the Independents would have perhaps accepted him as the president of their republic, though it is more likely that the leaders of this faction would have been as well pleased to see him sink into ruin through the crooked policy he was now pursuing.

As the views of the Scots throughout the war had been steadily confined to the security of the Presbyterian religion, along with the safety of the King's person and the establishment of a limited monarchy, they received him with great respect at their camp, and entered into negociations for effecting their grand object. If Charles would have acceded to their views, he might have immediately resumed a great part of his former power, and the agitations of many subsequent years, as well as his own life, might have been spared. But it was the misfortune of this monarch to entertain a bigoted favour for the Episcopal forms of worship, and an obstinate conviction of the impossibility of carrying on a monarchy without bishops. He therefore split with the Presbyterians on the very point which they considered the most important.

THE KING DELIVERED UP BY THE SCOTS.

From the time when he first threw himself into the Scottish camp, the English Parliament had made repeated and strenuous demands for the surrender of his person into their hands. The Scots, however, though acting partly as a mercenary army, asserted their right, as an independent nation under the authority of the King, to retain him in their own hands. They had a large claim against the English Parliament for arrears of pay; and it was not till that was compounded for at L.400,000, that they consented to deliver up their monarch. Partly through this consideration, and partly through despair of inducing him to enter into their religious views, they at length gave him up to their brethren of England, though certainly not to the party which afterwards brought him to the block, or with any apprehension that such would be his fate. It must also be stated in favour of the Scots—who have suffered much obloquy on this account, even from a nation whose Parliament would not discharge a just debt without an inducement—that they could not have retained possession of the King any longer without a war with the English, which would have involved a breach of the Solemn League and Covenant, and a desertion of all their religious objects, in favour of an Episcopal and hostile monarch. After surrendering the King, the Scottish army retired (January 1647) to their native country, and was dismissed.

ASCENDANCY OF THE ARMY.

The King was now placed in Holdenby Castle, and negociations were opened for restoring him to power. While these were pending, the Parliament deemed it unnecessary to keep up the army, more especially as its spirit was plainly observed to be of a dangerous character. On the first proposal, however, to dismiss this servant, it rose upon its master, and, inspired and led by Cromwell, put the Parliament completely under restraint. It also contrived to take possession of the King's person, which gave it a great advantage over its opponents.

TRIAL AND EXECUTION OF THE KING.

Charles subsequently escaped to the Isle of Wight, where he was taken under the protection of a kind of neutral power, the governor of Carisbrook Castle. Here he renewed his negociations with both parties, hoping to turn their mutual dread of each other to his own advantage. But he only, by this means, wrought his own ruin. Upon a promise to give Presbytery a trial of three years, he engaged the Scots, or at least a moderate party of them, to take arms in his behalf, and invade the kingdom of England. In July 1648, Cromwell defeated this army, taking its leader the Duke of Hamilton prisoner; and as there was then no Presbyterian force, and no Cavalier or moderate party of any kind, able to meet his army, he might be considered as the military dictator of his country. He immediately proceeded, by violence, to exclude the Presbyterians from the House of Commons, and to obtain from the remainder, who were his own creatures, the appointment of what was called a High Court of Justice, in order to try the King on a charge of having levied war against his subjects, which had recently been pronounced treason by Parliament. This extraordinary trial commenced on the 20th January 1649, in Westminster Hall. Charles from first to last protested against the right of the court to judge of him; but he was, nevertheless, condemned to lose his head. Cromwell, who was the sole mover in this singular and most decisive measure, was no doubt animated by the consideration, that to go back after having advanced so far, was only to ensure his own destruction. He therefore determined to listen to no plea of mercy. On the 30th of January, the King was beheaded in front of his palace of Whitehall, to the horror of his subjects in general, who, however, were unable to interpose in his favour. An army of about eight thousand men in London, and some smaller parties scattered in the provinces, were at this particular crisis sufficient to bring the sovereign to the block, against the inclinations of his people. Charles the First was altogether a martyr to the Episcopal form of church-government, previously and since established in England. He was allowed, even by his enemies, to be a virtuous prince. If he was too strongly prepossessed in favour of particular systems in civil and ecclesiastical government, he only partook of the character of the age in which he lived—an age distinguished by the wildest extremes in all kinds of doctrines. But it is in a great measure absurd to refer the fate of this monarch to his own particular character. It is evident, from the current of popular feeling, that about this time a struggle was to take place in England between the kingly power and the popular privileges, and it appears to us to have signified very little who was to conduct the contest on the former side. In the more important order of events, men are of no more avail to control them, than are vessels able to check the tide by which they are borne along in their course.

ESTABLISHMENT OF A REPUBLIC.

The small remaining part of the House of Commons, which gained the ridiculous epithet of the Rump, now established a republic, under the title of the Commonwealth, the executive being trusted, under great limitations, to a council of forty-one members, while in reality Cromwell possessed the chief influence. The House of Peers was voted a grievance, and abolished, and the people were declared to be the legitimate source of all power—a proposition which fewer might have denied, if the Rump had been itself a fair and free representation of the popular will.

SUBJUGATION OF IRELAND AND SCOTLAND.

The Scots, on the other hand, heard of the execution of the King with great indignation, and immediately proclaimed his eldest son as Charles the Second. In Ireland, moreover, a rebellion of Royalists, and another of the native Catholics, took place at the same time. Cromwell immediately conducted an army into the latter country, and, by dint of monstrous cruelties, had almost reduced it, when he was obliged to turn his attention to Scotland. Early in 1650, the young monarch, who had taken refuge in Holland, sent Montrose with a small force to attempt a Cavalier insurrection in Scotland; but, he being taken and put to death, Charles found it necessary to accede to the views of the Scotch respecting the Presbyterian religion, and he was accordingly brought over and put at the head of a considerable army, though under great restrictions. Cromwell immediately invaded Scotland, for the purpose of putting down this hostile movement. He crossed the Tweed on the 19th of July, and advanced through a deserted country to Edinburgh, where the Scottish army lay in a fortified camp. Sickness in his army, and the want of provisions, soon after compelled him to retreat, and the Scottish army, following upon his rear, brought him into a straitened position near Dunbar, where he would soon have been under the necessity of surrendering. In the midst of his perplexities (September 3), he beheld the Scots advancing from the neighbouring heights to give him battle, and, in a transport of joy, exclaimed, "The Lord hath delivered them into our hands." The movement was solely the result of interference on the part of the clergy who followed the Scottish camp: the better sense of General Leslie would have waited for the voluntary surrender of his enemy. In the fight which ensued, the veteran troops of Cromwell soon proved victorious. The Scots fled in a panic, and were cut down in thousands by their pursuers. This gained for Cromwell the possession of the capital and of all the south-east provinces; but the Covenanters still made a strong appearance at Stirling. Cromwell spent a whole year in the country, vainly endeavouring to bring on another action. During the interval (January 1, 1651), the Scots crowned the young King at Scone, part of the ceremony consisting in his acceptance of the solemn league and covenant. In the ensuing summer, Cromwell at length contrived to outflank the position of the Scottish army; but the result was, that Charles led his troops into England without opposition, and made a very threatening advance upon the capital. Ere the royalists had time to rally around him, Cromwell overtook his forces at Worcester, where, after a stoutly contested fight (September 3, 1651), he proved completely victorious. Charles, with great difficulty, escaped abroad, and Scotland, no longer possessed of a military force to defend herself, submitted to the conqueror. All the courts of the Scottish church were suppressed, and ministers were left no privilege but that of preaching to their flocks. The country was kept in check by a small army under General Monk, and in a short time was declared by proclamation to be united with England. Thus was the independent party, or rather Cromwell, left without a single armed enemy. All the efforts of the people, during twelve years, to obtain limitations upon the monarchy, had ended in a military despotism.

THE PROTECTORATE.

In April 1653, Cromwell, being quite tired of even the slight control imposed upon him by the Rump, entered the house with a party of soldiers, and, turning the whole of the members out of doors, locked the door and took away the key in his pocket. This concluded the Long Parliament, as it was called, which had sat down in November 1640, and at an early stage of its proceedings obtained the King's consent to an act declaring the impossibility of dissolving it without its own consent. Cromwell called a mock Parliament of one hundred and thirty-nine persons, who got the nickname of Barebone's Parliament, in reference to one of the members, a leather-seller, who bore that name. As this assembly obtained no public respect, Cromwell soon dissolved it, and his officers then proclaimed him Protector of the Commonwealth of Great Britain and Ireland. He had now gained the supreme and almost uncontrolled authority of the empire, and his administration, though despotic, and involving many breaches of the most sacred principles of liberty, was not without some popular features. He was successful in a war with Holland, and caused the British name to be more respected in the most of neighbouring countries than it had ever been before, or has almost ever been since. He also, by abolishing preferences of one religion over another, produced a perfect contentment among the professors of all, except perhaps the members of the disestablished church. His government, however, was from first to last the child of mere force, and solely kept up by such means. It had no solid grounds in the affections of the people. It is a remarkable proof of this, that the Parliaments which he from time to time summoned, and which consisted of persons selected chiefly under the authority of his own officers, always troubled him so much with the freedom of their views as to oblige him to dissolve them. The same fact is proved by the difficulty he had in raising money. Thus, though Cromwell had become the greatest man in the empire, he was beset with so many difficulties that he could not be said to have increased his own happiness. He had sufficient clearness of understanding to know that the means by which he arrived at so much power were not honourable, and that his authority was not compatible with the real good of his country. He was also liable to a constant dread of assassination—for men in no rank of life had as yet seen the monstrous wickedness and danger of that expedient. The last Parliament he called was in January 1656; besides the Commons, he summoned the few remaining peers, and endeavoured, by ennobling some of his officers, to make up a kind of Upper House. This assembly proved as intractable as its predecessors, and he contracted such a disgust at the very nature of a representative legislature, as to resolve, like the late King, never to call another. His health finally sunk under the effects of his ill-gotten power, and he died on the 3d September 1658, a day which was thought to be propitious to him, as it was the anniversary of several of his victories. His eldest son Richard, a mild and inenergetic person, succeeded him as Protector, but could not long maintain a rule, which even his father had found the greatest difficulty in managing. He quietly slunk out of public view, leaving the supreme authority in the hands of the Rump, which had taken the opportunity to re-assemble.

THE RESTORATION.

This remnant of an old Parliament continued in power till the autumn of 1659, when it sunk beneath a council of the Cromwellian officers. This latter government, in its turn, gave way to the Rump, which sat down once more in December. The people beheld themselves made the sport of a few ambitious adventurers, and began to long for some more fixed and respectable kind of government. Their efforts for liberty, conducted from the first by armed violence, had ended in a government of which violence was the only principle; and they contracted an unjust disrespect for freedom, and every thing relating thereto, from the effects of their own imprudent ways of seeking it.

At this crisis, General Monk, commander of the forces in Scotland, conceived the design of settling the nation. He left Scotland (January 2, 1660) with a considerable army; and though he kept his thoughts scrupulously to himself, all men bent their eyes upon him, as a person destined to realise their hopes. He reached London (February 3), and was received with assumed respect by the Rump. Some resistance was attempted by Lambert, one of Cromwell's officers, but in vain. Ere long, Monk was able to procure the restoration of the members who had been secluded from Parliament by Cromwell; who, being a majority, gave an immediate ascendancy to anti-republican views. As soon as this was effected, an act was passed for calling a new and freely elected Parliament; after which, the present assembly immediately dissolved itself.

The new Parliament proved to be chiefly composed of Cavaliers and Presbyterians, men alike favourable to monarchy, though differing in many other views. At the first they proceeded with great caution, for such terror had been inspired by the late military tyrannies, that, even when the breathings of almost all men were evidently in favour of a restoration of the monarchy, they could hardly trust themselves to take any steps towards that purpose. At length General Monk informed them that a messenger was in waiting with dispatches from the King, and it was instantly resolved to receive him. The dispatches were found to contain a proposal for the King's restoration to power, with an offer of indemnity for all past offences which the Parliament itself might not think fit for punishment, and a toleration for all tender consciences in the matter of religion. The documents were read with shouts of applause, and money immediately voted for the purpose of bringing over the royal family. They were so glad to escape from the severe and lawless oppressions of the last few years, that they never thought of making any definite arrangement with the King as to the extent of his prerogative. They, and the nation in general, seemed to think there could be no safety except in that almost absolute rule, which they had begun to dispute twenty years before. Charles the Second arrived in London on the 29th of May, his thirtieth birth-day, and was received with such a phrenzy of joy by all ranks of people, that he could not help thinking it his own fault, he said, that he had been so long separated from them.

REACTION OF PUBLIC FEELING.

Excepting in the execution of ten persons, who had been concerned in the death of the late king, and of three popular leaders in Scotland,* the restored monarch showed no desire of revenging the misfortunes of his father, or his own exclusion from the throne. The Parliament which called him home was constituted a legal one by his own ratification of an act for that purpose. In the settlement of other matters, it seemed the prevailing wish that all the institutions of the country should be made as nearly what they were before the civil war as possible. Thus, the Episcopal church was established both in England and in Scotland, though not without causing about a third of the clergy in both countries to resign their charges. The Parliament of the latter country exceeded that of England in loyalty. It declared the power of the King to be hereditary, divine, and indefeasible, and asserted his uncontrolled right to the lives and possessions of his subjects. The change of political feeling was not more remarkable than what took place in religion. The stern and enthusiastic piety which prevailed during the civil war, was now treated with ridicule, and the most of the people vied with each other in that licentious riot and drunkenness which is condemned by all systems of faith. The nation, in fact, seemed intoxicated with the safety which they supposed themselves to have at length gained, in a restoration to the imperfect freedom they enjoyed before the civil war.

DUTCH WAR.

If Charles could have managed these favourable circumstances with common discretion, he might have been the most prosperous of sovereigns. It was not long, however, before his mal-administration revived a great deal of the old feeling against him. With more than ordinary abilities, he was indolent and self-indulgent, and had no conscientious feelings as the director of the destinies of a great nation. His extravagant expenditure soon cooled the affections of his Parliament, and he began to find considerable difficulties in obtaining money. To relieve himself from this embarrassment, he sold Dunkirk, a French port which had been acquired by Cromwell, to the French king for L.40,000. For the same purpose, he married a Portuguese princess, who was not likely to have any children, but who possessed a dowry of half a million. He also commenced (1664) a war against Holland (a country that had afforded him shelter during his exile, and had many claims upon the sympathy of the English), merely that, in applying the Parliamentary subsidies necessary for keeping up hostilities, he might have an opportunity of converting part of the money to his own personal use.

This Dutch war was chiefly conducted by sea. On the 3d of June 1665, an English fleet of 114 sail met a Dutch one which numbered just one ship less, near Lowestoffe, and after an obstinate fight, gained a complete victory, depriving the enemy of eighteen vessels, and compelling the rest to take refuge on their own coast. The commander on this occasion was the Duke of York, the King's younger brother—a man of greater application and more steady principles, but who soon after became unpopular, in consequence of his avowing himself a Catholic.

Some other well-contested actions took place at sea, and the English, upon the whole, had the advantage. Owing, however, to a failure of the supplies, the King was obliged to lay up his best vessels in ordinary, and to send only an inferior force to sea. The Dutch took advantage of this misfortune, to send a fleet up the Thames (June 10, 1667), which, meeting with no adequate resistance, threatened to lay the capital in ruins and destroy its shipping. Fortunately, the Dutch admiral did not think it expedient to make this attempt, but retired with the ebb of tide, after having sunk and burnt nearly twenty vessels, and done much other damage. The King, finding himself rather impoverished than enriched by the war, soon after concluded a peace.

PLAGUE AND FIRE OF LONDON.

In the meantime, two extraordinary calamities had befallen the metropolis. In the summer of 1665, London was visited by a plague, which swept off about 100,000 people, and did not experience any abatement till the approach of cold weather. On this occasion, the city presented a wide and heart-rending scene of misery and desolation. Rows of houses stood tenantless, and open to the winds; the chief thoroughfares were overgrown with grass. The few individuals who ventured abroad, walked in the middle, and, when they met, declined on opposite sides, to avoid the contact of each other. At one moment were heard the ravings of delirium or the wail of sorrow from the infected dwelling; at another, the merry song or careless laugh from the tavern, where men were seeking to drown, in debauchery, all sense of their awful situation. The second calamity was a conflagration (vulgarly believed to have been caused by the Catholics), which commenced on the night of Sunday the 2d of September (1666), in the eastern and more crowded part of the city. The direction and violence of the wind, the combustible nature of the houses, and the defective arrangements of that age for extinguishing fires, combined to favour the progress of the flames, which raged during the whole of the week, and burnt all that part of the city which lies between the Tower and the Temple. By this calamity, 13,200 houses and 89 churches, covering in all 430 acres of ground, were destroyed. The flame at one time formed a column a mile in diameter, and seemed to mingle with the clouds. It rendered the night as clear as day for ten miles around the city, and is said to have produced an effect upon the sky which was observed on the borders of Scotland. It had one good effect, in causing the streets to be formed much wider than before, by which the city was rendered more healthy.

THE PERSECUTION IN SCOTLAND.

Meanwhile, in Scotland, great dissatisfaction had been occasioned by the imposition of Episcopacy upon the church, and advantage had been taken of various acts of resistance on the part of the clergy and people, to visit both with measures of considerable severity. Heavy fines were imposed upon such as failed to attend the ministrations of the established clergy, on the suspicion that, when not at church, they were hearing the ejected clergymen in some private place. A small standing army was kept up to enforce the fines, and, till these were paid, free quarters were exacted. Tired of suffering, a few of the peasantry in Galloway rose in rebellion (November 1666), and, advancing through the disaffected districts of Ayrshire and Lanarkshire, gradually assumed a threatening appearance. An unfortunate movement towards Edinburgh, where they expected accessions, thinned their numbers, and they were overpowered by General Dalyell at the Pentland Hills. Thirty-four of the prisoners were executed as rebels, chiefly at the instigation of Archbishop Sharpe, who, with the other prelates, was peculiarly zealous in behalf of the government. Besides these sufferers, fifty persons were forfeited, including fifteen clergymen. Some attempts were made, at the desire of the King, to induce the ejected clergy to come into the church; but very few took advantage of a leniency which the sovereign would have extended also to Catholics, and which involved their acknowledgment of his supremacy in spiritual affairs. About the year 1670, these divines began to hold conventicles in secluded parts of the country, to which the country people used to come with arms. At these places, a far warmer kind of devotion was felt than could be experienced under tamer circumstances; and, as may be supposed, such meetings were not calculated to diffuse or foster a sentiment of loyalty. Sensible of this, the government obtained an act, imposing very severe fines on all who should preach or listen at conventicles; but without producing any effect. The penalties with which they were threatened, seemed only to make the people more attached to their peculiar modes of worship and church government.

THE TRIPLE ALLIANCE—THE FRENCH ALLIANCE.

The kingdom of France was at this period rising into a degree of power and wealth, under its monarch Louis the Fourteenth, which it had never before known. Louis had some claims through his wife upon the Netherlands (since called Belgium), which was then part of the Spanish dominions. He accordingly endeavoured to possess himself of that country by force of arms. A jealousy of his increasing power, and of the Catholic religion professed by his people, induced the English to wish that his aggressions should be restrained. To gratify them, Charles entered into an alliance with Holland and Sweden, for the purpose of checking the progress of the French king. In this object he was completely successful, and consequently he became very popular. The Parliament, however, having disappointed him of supplies, he soon after entirely changed his policy, and, with the assistance of five abandoned ministers, Clifford, Ashley, Buckingham, Arlington, and Lauderdale, who were called the Cabal, from the initials of their names forming that word, resolved to render himself, if possible, independent of Parliament; in other words, an absolute prince. In consideration of a large bribe from Louis the Fourteenth, he agreed to join France in a war against Holland, with the view of utterly exterminating that example of a Protestant republic. War was accordingly declared in May 1672, and the naval force of England was employed in meeting that of the Dutch by sea; while Louis led a powerful army across the Rhine, and in a very short time had nearly reduced the whole of the Seven Provinces. In this emergency, the Dutch could only save themselves from absolute ruin, by laying a great part of their country under water. The English, who had not entered heartily into this war, soon began to be alarmed for the fate of Holland, which was almost their only support against the dread of Popery, and, though forbidden, under severe penalties, to censure the government measures, they soon contrived to exhibit so much dissatisfaction, as to render a change of policy unavoidable. The King found it necessary to assemble his Parliament (February 1673), and it was no sooner met, than it passed some acts highly unfavourable to his designs (among which was the Test Act, for excluding Catholics from office), and, above all things, declared it would grant no more supplies for the Dutch war. The King resolved to prorogue the assembly; but before he could do so, they voted the alliance with France, and several of his ministers, to be *grievances*. Charles, who, in wishing to be absolute, had been inspired by no other motive than a desire of ease, now saw there was a better chance of his favourite indulgence in giving way to his subjects, than in any other course; and he at once abandoned all his former measures, and concluded a separate peace with Holland. This country was now beginning, under the conduct of the Prince of Orange, to make a good defence against the French; which it was the better enabled to do, by obtaining the friendship of Germany and Spain. In the year 1678, after a war, which, without any decisive victories, will ever reflect lustre upon Holland, a peace was concluded. The Prince of Orange, in the previous year, had married the Princess Mary, daughter of the Duke of York, and educated in the reformed faith—an alliance which pleased the English, from its strengthening the Protestant interest, and which was destined, some years after, to bring about wonderful effects.

THE POPISH PLOT.

Throughout the whole of British history for a century past, one of the grand moving-springs was an intense detestation and fear of the Catholics, though these religionists were not only of limited number, but cannot be observed during the whole time to have ever combined for any purpose against their Protestant brethren. This sentiment was now inflamed by the avowed Catholicism of the Duke of York, the heir-presumptive of the crown, and by the late intrigues of the King with France. It raged, in short, to such an extent as to give the whole community the appearance of suffering under a fit of lunacy. In 1678, an account of a plot, supposed to have been formed by the Papists for burning London, massacring the Protestants, and destroying the King and the Protestant religion, was circulated by one Kirby, a chemist; Tong, a weak, credulous person; and Titus Oates, one of the most abandoned miscreants that ever appeared in history. The circumstances

* The Marquis of Argyle, Johnston of Warriston, and Mr Guthry, a clergyman.

attending this pretended discovery were so perfectly incredible and monstrous, that, if the nation had not been in a state of hallucination at the time, they never could have been for a moment listened to. However, the plot was not only generally believed by the people, but also by the Parliament and the court; and such was the extent of the excitement, that a general massacre of the Catholics was apprehended. Even the King, though incredulous, was obliged to give way to the prevailing delusion. Meanwhile letters were seized, which discovered the Duke of York's correspondence with France, in opposition to the religion and interests of his country; the correspondence of the King's minister Danby, which involved the King in the disgrace of similar machinations, was detected; and, to crown the whole, Sir Edmondsbury Godfrey, the magistrate, who first gave publicity to the plot, was found in the fields dead, with his own sword stuck through his body. For two years this horrible delusion reigned over the public mind, and under its influence many innocent Catholics were judicially murdered. At length the execution of a venerable nobleman, the Viscount Stafford, excited a general sensation of pity, and the people gradually saw and repented of the excesses which they had committed.

THE EXCLUSION BILL.

The Parliament having impeached Danby, the King resolved to dissolve it, and call another. The new assembly, however, proved as incontrollable as its predecessor. It carried, by a majority of 79, a bill excluding the Duke of York from the succession; declared the King's guards and standing army illegal; and passed the *Habeas Corpus* act, which has ever since been considered as so effectual a protection of the personal freedom of the subject. The House of Commons now for the first time began to assume the forms and character it has since generally retained. The court party were called Tories, from the word *tore* (give me), used by the Irish banditti, who were Cavaliers; and the party who opposed the court in favour of the people, acquired the name of Whigs, from the sour milk so called, which formed a chief part of the food of the proscribed Presbyterians in Scotland. The latter party always greatly predominated in the Parliaments of Charles the Second, and their measures were of so liberal a cast, that Mr Fox considered this tyrannical reign as in one respect, the brightest era of British freedom. Though the bill for excluding the Duke of York was thrown out by the Upper House, that prince found it necessary to retire from popular odium, first to Brussels, and afterwards to Scotland, while the Duke of Monmouth, eldest natural son of the King, and believed by many to be legitimate, began to be looked to by the Presbyterians and liberal party in general as a preferable heir to the crown. In these agitations, the populace of London was particularly active; and it was at this period that the term *mob* was first used. The word was an abbreviation of *mobile vulgus*, a phrase signifying "the unsteady vulgar," which the court contemptuously applied to the crowds which daily assembled.

PERSECUTION IN SCOTLAND.

The persecution in Scotland for field-meetings was so severe, that, before the year 1678, it was supposed that seventeen thousand persons had suffered by it, many of them very severely. A bond was attempted to be imposed upon the people, in which conventicles were renounced; and to enforce it in the west country, an army of ten thousand Highlanders was permitted to range there at free quarters. Nothing, it was found, could break the resolution of the people to adhere to their favourite modes of worship; on the contrary, all these severe measures inspired a deep resentment against the government, as well as the prelates. On the 2d of May 1679, as Archbishop Sharpe was going in his coach to St Andrew's, he was beset by a body of desperate men, who cruelly slew him. An insurrection of the west country conventiclers immediately followed, and a party of dragoons, sent against them under Captain Graham of Claverhouse, was gallantly repulsed. In a brief space, about five thousand men were found in arms against the state, among whom were many of the minor gentry. The rebellion was considered so formidable, that the Duke of Monmouth was sent down to head the troops for its suppression. He found them posted advantageously at Bothwell Bridge (June 22); but divisions on certain religious and political points unfitted them for making a good resistance. After defending the bridge for a while, they turned in a panic, and fled. Three hundred were killed in the pursuit, and twelve hundred taken prisoners. This unfortunate insurrection, being followed up by fresh severities, effectually subdued all disposition to resistance, except in a small party of the non-conformists, whose principles were of an unusually enthusiastic kind. Twenty armed men, professing these principles, were assailed by a detachment of dragoons, in Airsmoss (1680), when their leader Cameron, a clergyman, and several others, were killed, after a desperate resistance. Cargill, another preacher of that extreme sect, soon after held a conventicle at Torwood, near Stirling, where he formally excommunicated the King, his brother, and ministers. These proceedings had a highly injurious effect, in so far as they gave occasion for fresh severities against the whole party; but they were inspired by such pure and pious motives, and brought down such calamities upon the unshrinking heads of those concerned in them, that they have ever since been regarded in Scotland with great respect. The more uncompromising party soon after arranged themselves into what they called a Secret Society, and (January 12, 1682) openly appeared at Lanark, and published a declaration of their principles, among which a renunciation of all allegiance to Charles the Second was the most remarkable. The dispute between the government and its subjects had now arrived at such an extremity, that individuals were shot in the fields by military law, if they merely refused to acknowledge the royal authority. The most of the people, unable or unwilling to resist, were therefore obliged to give an external reverence to the prelatical church imposed upon them, or at least to the irregular clergy who had received an indulgence. A great disposition prevailed to emigrate to the American colonies, as the only means of escaping the oppressive restraints under which they laboured at home.

THE KING BECOMES ABSOLUTE—THE RYE-HOUSE PLOT.

In the meantime, an extraordinary revolution took place in England. About the time that popular feeling was recovering from the Popish Plot mania, the House of Commons had shown stronger symptoms than ever of a determination to seek the exclusion of the Duke of York from the throne. The time was unfortunate, for men were beginning to suspect that they had been deceived in many of their surmises about danger from the Catholics. The object, moreover, however necessary it might be to freedom, was one which touched upon a principle which many men in that age deemed sacred—that of hereditary succession; nor was it possible to blame the King for opposing a measure so unfavourable to the interests of his nearest blood relation. In fact, the liberal party of the House of Commons pushed their favourite measure to such a point as to cause a kind of reaction against them.

The King called a new Parliament to meet at Oxford, resolved, in the event of its not proving more tractable, to dissolve it, and call no other such assembly. It met on the 21st of March 1681, and the Whigs soon showed that the Exclusion Bill was still paramount in their minds. The King permitted one of his Ministers to propose, that, at his death, the Princess of Orange should reign as regent, and the new King be for ever banished five hundred miles from his dominions. But they would not listen to this concession. Charles then dissolved them, as utterly intractable, and, strange to say, was generally applauded for the act. Popular feeling had now taken a decided turn in favour of royalty; and the representative branch of the legislature, long regarded with veneration by the English, was permitted to go down without a struggle. The King henceforth ruled entirely without control, being secretly supplied with money by France, in consideration of his non-interference with the conquests of that country. The liberal party was completely baffled and broken, and all its power as a check upon the royal measures lost, through an unfortunate inadvertency to the state of public feeling.

A fit of slavishness now befell the English nation, as remarkable in its extent as the late fury against the court and the Catholics. Supported by this mood of the people, Charles caused all the corporations in the kingdom to give up their old charters, and accept of new ones, by which he became all-powerful over the elections of magistrates, and, consequently, over those of Parliamentary representatives, should ever another election of that kind take place. The leaders of the late majority in Parliament, comprising the Duke of Monmouth, Lord Russell (son of the Earl of Bedford), the Earl of Essex, Lord Howard, the famous Algernon Sydney, and John Hampden, grandson of the patriot who first resisted Charles the First, being reduced to absolute despair, formed a project for raising an insurrection in London, to be supported by one in the west of England, and another under the Earl of Argyle in Scotland, and the object of which should be confined to an amelioration of the government. They were betrayed by an associate Rumsay, and implicated, by a train of unfortunate circumstances, in a plot for assassinating the King (styled the Rye-house Plot), of which they were perfectly innocent. Russell and Sydney perished on the scaffold for this ill-starred movement, and the triumph of the King was rendered the more complete. After a despotic reign of nearly four years, he died (February 6, 1685), professing himself a Catholic, and was succeeded by the Duke of York.

ACCESSION OF JAMES THE SECOND.

Charles the Second, with all his faults, had conducted himself towards his subjects with so much pleasantness, and had so well calculated his ground before making any aggression upon popular liberty, that he might probably have pursued his arbitrary career for many years longer. But his brother James, though much more respectable as a man, more industrious and more sincere, wanted entirely that easiness of carriage and that penetration which were the grounds of the late King's popularity and success. He was, moreover, a declared Catholic, and inspired by an ardent desire of reforming the nation back into that faith. These circumstances, though they at first seemed to threaten very bad consequences, will soon be found to have proved the means of saving these nations from the complete establishment of a despotic government.

He began his reign by declaring before the Privy Council his intention of governing solely by the laws, and to maintain the existing church; and such was the confidence in his sincerity, that he soon became very popular. Addresses poured in upon him from all quarters, professing the most abject devotion to his person. He called a Parliament in order to obtain money, and, by reason of the control which the crown had acquired over the boroughs, he was not disappointed in his wishes. The House of Commons voted him an ample revenue, and expressed the greatest servility towards him in all things. The doctrines of passive obedience, and the divine right of the sovereign, were now openly preached. The Scottish Parliament declared the King's *sacred, supreme, and absolute authority*, which they offered to support with their lives and fortunes. In fact, it seemed as if the civil liberties of the British people were now to be surrendered to the crown, as a possession which it was no longer safe or expedient to retain.

EXPEDITIONS OF MONMOUTH AND ARGYLE.

The remains of the Whig party still existed, though in exile, and there were some districts of the country where they thought they had considerable influence. The Duke of Monmouth and the Earl of Argyle (the latter of whom had been condemned to death in Scotland for garbling the test oath, but had escaped), met in Holland, and projected two separate invasions, for the purpose of expelling the Catholic James. The former soon after landed in the west of England with a small retinue, and quickly found himself at the head of five thousand persons, though irregularly armed. At several places, he caused himself to be proclaimed King, which offended many of his principal adherents, as inconsistent with his previous engagements. Upon the whole, his conduct was not energetic enough for the management of such an enterprise. Being attacked by the King's troops near Bridgewater, his infantry fought with some spirit, but, being deserted by the cavalry, and by the duke himself, were obliged to give way. Monmouth himself was taken, and executed. His followers were many of them hanged without form of trial by the royal troops, and others were afterwards put to death with hardly any more formality, by the celebrated Chief Justice Jefferies, whom the King sent down with a commission to try the offenders. The butchery of several hundred men of low condition, who were unable to do any harm to the government, was looked upon as a most unjustifiable piece of cruelty, not to speak of the illegal way in which it was done; and the King was greatly blamed for it.

The Earl of Argyle sailed in May with a corresponding expedition, and landed in his own district in the West Highlands. Unfortunately, the government had received warning, and seized all the gentlemen of his clan, upon whom he had chiefly depended. He nevertheless raised between two and three thousand men, and made a timid advance to Glasgow, in the expectation of being joined by the persecuted Presbyterians of that part of the country. Being surrounded on the march by various parties of troops, he dispersed his army, and sought to escape in disguise, but was taken, brought to Edinburgh, and executed. Thus terminated the last effort made by the Whig party to ameliorate the iron sway of the Stuarts.

ARBITRARY MEASURES OF THE KING.

Encouraged by his successes, James conceived that he might safely begin the process of changing the established religion of the country. On the plea of his supremacy over the church, he took the liberty of dispensing with the test oath in favour of some Catholic officers, and thus laid low an act which was looked upon, under existing circumstances, as the chief safeguard of the Protestant faith. His Parliament, servile as it was in temporal matters, took the alarm at this spiritual danger, and gave the King so effectual a resistance, that he resorted to a dissolution. The same phenomenon was acted in Scotland.

Heedless of these symptoms, he proclaimed an universal toleration, for the purpose of embracing the Catholics, and thus assumed the highly unconstitutional right of dispensing with acts of Parliament. The nation was thrown by this measure, and by the numerous promotions of Roman Catholics, into a state of great alarm; and even the clergy, who had been formerly so eager to preach passive obedience to the regal will, began to see that there might be a danger in that doctrine. James having commanded that his proclamation of toleration should be read in every pulpit in the country, only two hundred of the clergy obeyed. Six of the bishops joined in a respectful petition against the order; but the King declared that document to be a seditious libel, and threw the petitioners into the Tower. In June 1688, they were tried in Westminster Hall, and, to the infinite joy of the nation, acquitted.

Blinded by religious zeal, the King proceeded on his fatal course. In defiance of the law, he held open intercourse with the Pope, for the restoration of Britain to the bosom of the Romish church. He called Catholic lords to the privy council, and even placed some in the cabinet. Chapels, by his instigation, were every where built, and monks and priests went openly about his palace. A court of high commission—the most flagitious instrument of tyranny under

Charles the First—was erected, and before this every clerical person who gave any offence to the King, was summoned. He also excited great indignation by violently thrusting a Catholic upon Magdalen College, at Oxford, as its head, and expelling the members for their resistance to his will. To crown the general feeling, a son was born to the King (June 10, 1688), who promised to perpetuate the Catholic religion in the country, and whom many suspected to be a supposititious child, brought forward for that purpose only.

GENERAL DISAFFECTION.

The disaffection produced by these circumstances extended to every class of the King's subjects, except the small body of Roman Catholics, many of whom, even, regarded the royal measures as in the highest degree imprudent. The Tories were enraged at the ruin threatened to the Church of England, which they regarded as the grand support of conservative principles in the empire. The Whigs, who had already made many strenuous efforts to exclude or expel the King, were now more inflamed against him than ever. The clergy, at this time a popular and influential body, were indignant at the injuries inflicted upon their church; and even the dissenters, though comprehended in the general toleration, saw too clearly through its motive, and were too well convinced of the illegality of its manner, and of the danger of its object, as affecting the Protestant faith, to be exempted from the general sentiment. But for the birth of the Prince of Wales (whose birth they suspected erroneously), the people at large might have been contented to wait for the relief which was to be expected, after the death of the King, from the Princess of Orange, who was a Protestant, and united to the chief military defender of that interest in Europe. But this hope was now shut out, and it was necessary to resolve upon some decisive measures for the salvation of the national religion.

PRINCE OF ORANGE CALLED OVER.

In this crisis, some of the principal nobility and gentry, with a few clergymen, united in a secret address to the Prince of Orange, calling upon him to come over with an armed force and aid them in protecting their faith and liberties. This prince, who dreaded that England would soon be joined to France against the few remaining Protestant powers, and also that his prospects of the succession in that country (for he was nephew of the King) were endangered, listened readily to this call, and immediately collected a large fleet and army, comprising many British refugees. His preparations were conducted with great secrecy, and James was partly blinded to them by a rumour that the only object was to frighten him into a closer connection with France, in order to make him odious to his subjects. When he was at length assured by his minister in Holland that he might immediately expect a formidable invasion, he grew pale, and dropped the letter from his hands. His delirium of power vanished, and he found himself on the brink of a dreadful precipice, which had hitherto been concealed from his view by the illusions of religious zeal. He now saw the necessity of providing for his own safety, as well as of endeavouring to conciliate the affections of his people. He immediately ordered his fleet to be assembled, and his army to be recruited with new levies. He sent for troops from Scotland and Ireland; and to his no small satisfaction, found his land forces amount to forty thousand men.*

Nor was the King less liberal of his civil concessions than vigorous in his military preparations. He had already issued writs for the meeting of Parliament on the 27th of the ensuing November. He followed these with a declaration, that it was his fixed purpose to endeavour to establish a legal settlement of an universal liberty of conscience for all his subjects; that he had resolved to preserve inviolate the church of England; and he protested that it was his intention Roman Catholics should remain incapable of sitting in the House of Commons. He gave orders to the Lord Chancellor, and the Lord Lieutenants of the several counties, to replace all the Deputy Lieutenants and Justices who had been deprived of their commissions for their adherence to the Test and the Penal Laws against non-conformists; he restored the charter of London, and the charters of all the corporations in the kingdom; he annulled the court of ecclesiastical commission; he reinstated the expelled president and fellows of Magdalen College; and he invited again to his councils all the bishops whom he had so lately persecuted and insulted, assuring them that he was ready to do whatever they should think necessary for the security of the Protestant religion and the civil rights of his subjects.

But these concessions, though important in themselves, were made too late to be allowed much merit; and being generally supposed to be extorted by fear, they were coldly received by the nation. Nor was the conduct of the King, in other respects, answerable to such conciliating measures. He recalled the writs for the meeting of Parliament, without issuing any new ones; a step which created universal suspicion of his sincerity, and begot a belief that all his concessions were no more than temporary expedients. He shewed, however, a laudable zeal for his own honour, in obtaining a legal proof of the birth of the Prince of Wales; but by an imprudence approaching to insanity, the heir of the crown was baptized in the Romish communion, and the Pope, represented by his nuncio, stood godfather to the boy.

Meanwhile, the Prince of Orange continued his preparations. A powerful fleet was ready to put to sea; the troops fell down the Maese from Nimeguen; the transports, which had been hired at different ports, were speedily assembled; the artillery, arms, ammunition, provisions, horses, and men, were embarked; and William, after taking formal leave of the states, and calling God to witness that he had not the least intention to invade, subdue, or make himself master of the kingdom of England, went himself on board. His whole armament, which sailed from the Brille and Helvoetsluys, on the 19th of October, consisted of fifty stout ships of war, twenty-five frigates, and an equal number of fire-ships; with five hundred transports, carrying about fifteen thousand land forces, including five hundred and fifty-six officers. Admiral Herbert, who had left the service of James, led the van; the Zealand squadron, under Vice-Admiral Evertsen, brought up the rear; and the Prince of Orange in person commanded in the centre, carrying a flag with English colours, and his own arms surrounded with these popular words—"THE PROTESTANT RELIGION AND THE LIBERTIES OF ENGLAND." Under this inscription was placed the appósite motto of the house of Nassau:—*Je maintiendrai*, "I will maintain!"

This great embarkation, the most important which had for some ages been undertaken in Europe, was scarce completed, when a dreadful tempest arose at south-west, and drove the Dutch fleet to the northward. The storm raged for twelve hours, and the prince was obliged to return to Helvoetsluys. But he soon repaired his damages, and again put to sea. An east wind carried him down the Channel, where he was seen from both shores, between Dover and Calais, by vast multitudes of anxious spectators, who felt alternately the extremes of hope and fear, mingled with admiration, at such a magnificent spectacle. After a prosperous voyage, he landed his army in Torbay (November 5), without the smallest opposition either by sea or land.

The same wind which favoured the enterprise of the Prince of Orange, confined the English fleet to its own coast. Lord Dartmouth, who was inviolably attached to James, lay near Harwich with thirty-eight ships of the line, and twenty-three frigates; a force sufficient to have disconcerted the designs of William, if it could possibly have put to sea; so that the success of the revolution may be said to have depended upon the winds! The destruction of the Dutch fleet, even after the landing of the Prince, would have discouraged his adherents, and proved fatal to his undertaking. Sensible of this, Dartmouth came before Torbay, with a fixed resolution to attack the Hollanders as they lay at anchor. But his fleet was dispersed by a violent storm, and forced to return to Spithead, in such a shattered condition as to be no more fit for service that season.

The Prince of Orange, immediately on his landing, dispersed a printed declaration, which had been already published in Holland, and contributed not a little to his future success. In that elaborate performance, written originally in French by the pensionary Fagel, and translated into English by Dr Burnet, the principal grievances of the three British kingdoms were enumerated; namely, the exercise of a dispensing and suspending power; the revival of the court of ecclesiastical commission; the filling of all offices with Catholics; the open encouragement given to popery, by building every where places of worship, colleges, and seminaries for that sect; the displacing of judges, if they gave sentence contrary to the orders or the inclinations of the court; the annulling the charters of all the corporations, and thereby subjecting elections to arbitrary will and pleasure; the treating of petitions to the throne, even the most modest, and from persons of the highest rank, as criminal and seditious; the committing of the whole authority in Ireland, civil and military, into the hands of Papists; the assuming of an absolute power over the religion and laws of Scotland, and openly exacting in that kingdom an obedience without reserve. He concluded with protesting that the sole object of his expedition was to procure a redress of these grievances; to get a legal and free Parliament summoned, that might provide for the liberty and security of the nation, and examine the proofs of the legitimacy of the Prince of Wales, in regard to which he expressed the most violent suspicions.

Though this declaration was received with ardour by the nation, the prince for some time after his landing could not boast of his good fortune. A great deal of rain having fallen, the roads were rendered almost impassable, and he possessed neither cattle nor carriages sufficient to convey the baggage of his army. He proceeded, however, to Exeter; but without being joined by any person of eminence, either on his way or for eight days after his arrival at that place. His troops were discouraged, he himself began to think of abandoning his enterprise, and actually held a council of his principal officers, to deliberate whether he should not re-embark. Impatient of disappointment, he is said even to have publicly declared his resolution to permit the English nation to settle their own differences with their King, and to direct his father-in-law where to punish, by transmitting to him the secret correspondence of his subjects.

The friends of the court exulted mightily at the coldness of William's reception, but their joy was of short duration. One Burrington having shewn the example, the prince was speedily joined by the gentry of the counties of Devon and Somerset, and an association was signed for his support. The Earl of Abingdon, Mr Russell, son of the Earl of Bedford, Lord Wharton, Mr Godfrey, Mr Howe, and a number of other persons of distinction, repaired to Exeter. All England was seen in commotion. Lord Delamere took arms in Cheshire; the city of York was seized by the Earl of Danby; the Earl of Bath, governor of Plymouth, declared for the prince; and the Earl of Devonshire made a like declaration in Derby. Every day discovered some new instance of that general confederacy into which the nation had entered against the measures of the King. But the most dangerous symptom, and that which rendered his affairs desperate, was the defection of the army. Many of the principal officers were inspired with the prevailing spirit of the nation, and disposed to prefer the interests of their country to their duty to their sovereign. Though they might love James, and have a due sense of the favours he had conferred upon them, they were startled at the thought of rendering him absolute master, not only of the liberties, but even of the lives and properties of his subjects; and yet this, they saw, must be the consequence of suppressing the numerous insurrections, and obliging the Prince of Orange to quit the kingdom. They therefore determined rather to bear the reproach of infidelity, than to run the hazard of becoming the instruments of despotism.

The example of desertion among the officers was set by Lord Colchester, son of the Earl of Rivers, and by Lord Cornbury, son of the Earl of Clarendon. The King had arrived at Salisbury, the head-quarters of his army, when he received this alarming intelligence; but as the soldiers in general seemed firm in their allegiance, and the officers in a body expressed their abhorrence of such treachery, he resolved to advance upon the invaders. Unfortunately, however, for his affairs, the Dutch had already taken possession of Axminster. A sudden bleeding at the nose, with which he was seized, occasioned a delay of some days; and farther symptoms of defection appearing among the officers, he judged it prudent to retire toward London. Lord Churchill, afterwards the great Duke of Marlborough, and the Duke of Grafton, natural son of Charles the Second, who had given their opinion for remaining at Salisbury, fled under cover of the night to the Prince of Orange. Successive misfortunes poured in on the unfortunate monarch. Trelawney, who occupied an advanced post at Warminster, deserted with all his captains, except one. Prince George of Denmark, the King's son-in-law, and the young Duke of Ormond, left him at Andover. Every day diminished the number of his officers; and to increase his accumulated misfortunes, he found, on his arrival in London, that his favourite daughter, Anne, Princess of Denmark, had secretly withdrawn herself the night before, in company with Lady Churchill. All his firmness of mind left him; tears started from his eyes; and he broke out into sorrowful exclamations, expressive of his deep sense of his new lost condition. "God help me!" cried he, in the agony of his heart; "my own children have forsaken me!"*

Henceforth, the conduct of the infatuated James is so much marked with folly and pusillanimity, as to divest his character of all respect, and almost his sufferings of compassion. Having assembled, as a last resource, a council of the peers then in London, he issued, by their advice, writs for a new Parliament, and appointed the Marquis of Halifax, the Earl of Nottingham, and Lord Godolphin, his commissioners to treat with the Prince of Orange. Thinking the season for negociation past, William continued to advance with his army, at the same time that he amused the commissioners. Though he knew they were all devoted to his cause, he long denied them an audience. Meanwhile, James, distracted by his own fears, and alarmed by the real or pretended apprehensions of others, sent the Queen and the Prince of Wales privately into France, and embraced the extraordinary resolution of following them in person. He accordingly left his palace at midnight, attended only by Sir Edward Hales; and in order to complete his imprudence and despair, he commanded the Earl of Feversham to disband the army, recalled the writs for the meeting of the Parliament, and threw the great seal into the Thames.

If James had deliberately resolved to place the Prince of Orange on the throne of England, he could not have pursued a line of conduct more effectual for that purpose. Besides the odious circumstances of seeking refuge with the heir of the crown in a country distinguished for popery and arbitrary power, and recalling the writs for a free Parliament, the anarchy and disorder which ensued on the sudden dissolution of government, made all men look up to William as

* The following account of the Revolution is from Russell's History of Modern Europe. The rest of the sheet is carefully condensed from the larger histories of England and Scotland—a process of no small degree of difficulty.

* A less melancholy anecdote than this is related. Prince George of Denmark, husband of the King's second daughter, and who was a man of weak character, used to express himself to his Majesty as very much surprised at the defections which every night took place, always saying, when any lord or officer was mentioned as having retired, "Est il possible?" At length Prince George himself followed the general example; which being told to the King, he cried, with a sneer, "What, *est il possible* gone too!"

the saviour of the nation. The populace rose in London, and not only destroyed all the Popish chapels, but even rifled the houses of the ambassadors of Catholic princes and states, where many of the Papists had lodged their most valuable effects. Riot and devastation every where prevailed. The whole body of the people, released from the restraints of law, felt one general movement; and new violences were apprehended from the licentious soldiers, whom Feversham had disbanded without either disarming or paying them.

In order to remedy these evils, and restore public tranquillity, an office which seemed now beyond the power of the civil magistrate, such of the bishops and peers as were in London assembled in Guildhall, and, erecting themselves into a supreme council, executed all the functions of royalty. They gave directions to the mayor and aldermen for keeping the peace of the city; they issued their commands, which were readily obeyed, to the fleet, to the neglected army of James, and to all the garrisons in England. They ordered the militia to be raised; and they published a declaration, by which they unanimously resolved to apply to the Prince of Orange to settle the affairs of the nation, deserted by the King, through the influence of evil counsellors.

William was not backward in assuming that authority which the imprudence of James had devolved upon him. He exercised, in his person, many acts of sovereignty; and in order to make his presence more welcome in London, he is said to have propagated a report that the disbanded Irish had taken arms, and begun a general massacre of the Protestants. Such a rumour at least was spread all over the kingdom, and begot universal consternation. The alarm bells were rung, the beacons fired; and men fancied they saw at a distance the smoke of the burning cities, and heard the dying groans of those who were slaughtered by the enemies of their religion! Nothing less than the approach of the Prince of Orange and his Protestant army, it was thought, could save the capital from ruin.

William had advanced to Windsor, when he received the unwelcome news that the King had been seized in disguise, by some fishermen, near Feversham in Kent, on supposition that he was some Popish priest, or other delinquent, who wanted to make his escape. This intelligence threw all parties into confusion. The Prince of Orange sent orders to James not to approach nearer to London than Rochester. But the messenger missed him on the way, and he once more entered his capital amid the loudest acclamations of joy. The people forgot his misconduct in his misfortunes, and all orders of men seemed to welcome his return.

This, however, was only a transient gleam before a new storm. Scarce had the King retired to his bedchamber, when he received a message from the prince, desiring him to remove to Ham, a house belonging to the Duchess of Lauderdale; and the following night, as he was going to rest, the Dutch guards, without further notice, took possession of his palace, and displaced the English, to the great disgust of the army, and no inconsiderable part of the nation. James set out next morning, by permission, for Rochester, in preference to Ham, under a Dutch guard.

Afraid of being taken off either by poison or assassination, and mortified at his present abject condition, he continued to meditate his escape; and as the backdoor of the house in which he lodged was intentionally left without any guard, he found no difficulty in accomplishing his design. He privately withdrew at midnight, accompanied by his natural son, the Duke of Berwick, and went on board a large sloop, which waited for him in the river Medway. After some obstructions, he safely arrived at Ambleteuse, in Picardy; whence he hastened to St Germain's, where the Queen and the Prince of Wales had arrived the day before.

The same day that James left Whitehall, William arrived at St James's. It happened to rain very heavily, and yet great numbers came to see him; but, after they had staid long in the wet, he disappointed them. Being an enemy to show and parade, perhaps from a consciousness of his ungraceful figure, he went through the park to the palace. Even this trifling incident helped to alter the sentiments of the people; and being now cool, they judged more impartially. They considered it as an unnatural thing for the Prince of Orange to waken his father-in-law out of his sleep, and force him from his own palace, when he was ready to submit to every thing; they began even to suspect that this *specious undertaking* would prove to be only a *disguised* and *designed usurpation*. The public bodies, however, waited upon the Prince, and expressed their zeal for his cause; and, among others, the gentlemen of the law, with old Sergeant Maynard at their head, who, when William took notice of his great age, and said he must have outlived all the lawyers of his time, wittily replied, "I should have outlived the law itself, if your highness had not come over!"

THE REVOLUTION SETTLEMENT.

William was now requested by such of the members of the late Parliaments as happened to be in town, to issue writs for a convention, in order to settle the nation. He was in the same manner requested to call a convention in Scotland, and both assemblages, which were elected by poll, met early in 1689. By the English convention, after a great deal of discussion, it was determined "that, King James the Second having endeavoured to subvert the constitution by breaking the *original contract* between the King and people, and having violated the fundamental law, and withdrawn himself from the kingdom, has *abdicated* the government; and that the throne is thereby become *vacant*." There were some proposals for making the Prince only a regent, while his consort should be declared Queen; but it was eventually found that his powerful aid could not be secured in the present crisis, for a less price than a full participation of the throne along with Mary. They were therefore proclaimed as William and Mary, King and Queen of Great Britain and Ireland. In Scotland, where the Presbyterians had resumed an ascendancy, the convention came to a less timid decision. It declared that James, by the abuse of his power, had *forfeited* all right to the crown—a decision also affecting his posterity—and William and Mary were immediately after proclaimed. By a bill passed in the English Parliament, called the Instrument of Settlement, the succession, failing Mary, was to go to William, then to Anne, the late King's second daughter; and the prerogative of the crown was settled within the limits which it has had ever since. The grand point gained by the Revolution—as the transaction is called—was, that the King, by misgovernment, might as effectually forfeit his right to *allegiance*, as the subject, by misconduct, his title to *protection*. The power of the King was recognised as expressly emanating from the people, and existing solely by their general consent. The security of the Protestant religion, and the exclusion of Catholics from office, were other triumphs, then and long after much appreciated by the English; while in Scotland, the establishment of the Presbyterian church upon a fixed basis gave satisfaction to all except a very small party.

RESISTANCE IN SCOTLAND AND IRELAND.

The leader of this party was the Viscount Dundee, formerly known, under the name of Graham of Claverhouse, for his severities against the recusant Presbyterians. This nobleman retired with a troop of dragoons to the Highlands, where he was quickly joined by the clans. At the same time, the Duke of Gordon held out Edinburgh Castle in behalf of King James. It was with no small difficulty that the new government could obtain the means of reducing these opponents. The castle, after a protracted siege, was given up in June (1689). General Mackay was dispatched by William, with a few troops, to join with such forces as he could obtain in Scotland, and endeavour to suppress the insurrection in the Highlands. He encountered Dundee at Killiecrankie (July 27), and, though his troops were greatly superior in number and discipline, experienced a complete defeat. Dundee, however, fell by a musket-shot in the moment of victory, and his army was unable to follow up its advantage. In a short time the Highland clans were induced to yield a nominal obedience to William and Mary.

In Ireland, a far more formidable resistance was offered to the revolution settlement. The people of this country, being chiefly Catholics, and greatly incensed against their Protestant masters, regarded the cause of King James as their own. He landed in Ireland early in spring, and was soon at the head of a large, though ill-disciplined army. To gratify his Catholic subjects, he passed an act in the Irish Parliament, annulling what was called the Act of Settlement, by which the Protestants had been placed in land originally belonging to persons of the opposite faith. The Protestants, finding themselves thus dispossessed of what they considered their property, and exposed to the vengeance of a majority over whom they had long triumphed, fled to Londonderry, Inniskilling, and other fortified towns, where they made a desperate resistance, in the hope of being speedily succoured by King William. That sovereign now led over a gallant army to Ireland, and (July 1) attacked the native forces under his father-in-law at the fords of the Boyne, near the village of Dunore, where he gained a complete victory. James was needlessly dispirited by this disaster, and lost no time in sailing again to France. In reality, the Irish made a better appearance, and fought more vigorously, after the battle of the Boyne, than before it. The Duke of Berwick and the Earl of Tyrconnel still kept the field with a large body of cavalry, and the infantry were in the meantime effectually protected in the town of Limerick. William invested this town, and, in one assault upon it, lost two thousand men, which so dispirited him, that he went back to England, leaving his officers to prosecute the war. The Irish army afterwards fought a regular battle at Aghrim, but, partly owing to the loss of their brave leader, St Ruth, were totally routed. The remains of the Catholic forces then took refuge in Limerick, where they finally submitted upon very advantageous terms, not only to themselves, but to all their countrymen of the same persuasion. It was agreed that they should receive a general pardon; that their estates should be restored, their attainders annulled, and their outlawries reversed; that Roman Catholics should enjoy the same toleration as in the days of Charles the Second; that they should be restored to all the privileges of subjects on merely taking the oaths of allegiance; and that such as chose to follow the fortunes of James (of which there was a vast number) should be conveyed to the Continent at the expense of government.

TROUBLES OF THE NEW GOVERNMENT.

Though all military opposition was thus overcome, William soon found difficulties of another kind in the management of the state. The Tories, though glad to save their religion by calling in his interference, had submitted with no good grace to the necessity of making him King, and no sooner was the danger past, than their usual principles of hereditary right were in a great measure revived. James's hopes of a restoration were thus for a long time kept alive, and the peace of William's mind was so much embittered as to make his sovereignty appear a dear purchase. Nothing, indeed, could so fully testify that the hope of gratitude for public services is fallacious, than the jealous and illiberal spirit with which a great part of the English nation treated this great benefactor of their country. Perhaps the only circumstance which reconciled the King to his situation, was the great additional force he could now bring against the ambitious designs of Louis the Fourteenth. Almost from his accession he entered heartily into the combination of European powers for checking this warlike prince, and conducted military operations against him every summer in person. The necessity of having supplies for that purpose, rendered him unfit, even if he had been willing, to resist any liberal measures proposed to him in Parliament, and hence his passing of the famous Triennial Act in 1694, by which it was appointed that a new Parliament should be called every third year—a point in the claims of freedom which had been gained from Charles the First, but abandoned in compliment to his son, and which was afterwards lost once more. In this year died Queen Mary, without offspring; after which, William reigned as sole monarch.

GLENCOE MASSACRE—DARIEN EXPEDITION.

While William was treated in England with less than justice, he deservedly lost all his popularity in Scotland, in consequence of two separate acts, which must now be related. An order had been issued, commanding all the Highland chiefs, under pain of fire and sword, to give in their submission before the final day of the year 1691. One individual—Macdonald of Glencoe—was prevented by accident from observing the day, and letters of fire and sword, signed by the King, were accordingly issued against him. The military party entrusted with this duty, instead of boldly advancing to the task, came among the clan as friends, partook of their hospitality and amusements, and never indicated their intentions till the morning of February 13, when they attacked the unsuspecting people in their beds, and mercilessly slew all that came in their way. Thirty-eight persons, including the chief and his wife, were slaughtered, and many others died in the snow, as they vainly tried to escape. A more atrocious action does not stain modern history. Two or three years after, the Scottish people began to turn their attention to commerce, by which they saw such advantages gained by neighbouring states, and they planned a colony on the Isthmus of Darien, which they thought might become an emporium for American and Indian produce. They subscribed among themselves, for this purpose, no less than L.400,000; to which was added more than as much again by the merchants of London and Holland. The jealousy of other trading companies, and the remonstrances of the Spaniards, who apprehended some interference with their colonies, induced the King to withdraw his countenance from the scheme, after he had sanctioned it by act of Parliament; but nevertheless (1698), a gallant expedition was sent out by the Scots, who founded a town called New Edinburgh, about midway between Portobello and Carthagena, and under the ninth degree of latitude. During the winter months, every thing seemed likely to answer the expectations of the colonists; but summer brought disease, and, on their provisions running low, they found, to their infinite consternation, that they could get no supplies, the Spanish and British colonists of the neighbouring countries being alike forbidden to deal with them. In May and September 1699, ere intelligence of these circumstances could reach home, two other expeditions had sailed, containing eighteen hundred men, who were involved on their arrival in the same disasters. After disease had swept off many hundreds, the remainder were attacked by the Spaniards, who pretended a right to the country; and to these haughty enemies, who were countenanced in their proceedings by the British sovereign, the unfortunate colony was obliged to surrender. Very few ever regained their native country, and the large sums vested in the undertaking were irrecoverably lost. The massacre of Glencoe, and the Darien expedition, were thenceforward words to call up the most infuriated feelings against the King, in the breasts of the Scottish nation; among whom the Jacobite party, or friends of the exiled James, thenceforward began to assume a formidable appearance.

END OF THE REIGN OF WILLIAM THE THIRD.

The peace of Ryswick, concluded in 1697, by which the French power was confined to due limits, permitted William to spend the concluding years of his reign in peace. In 1700, in consideration of the childlessness of William and his sister-in-law Anne, the famous Act of Succession was passed, by which the crown, failing these two individuals, was settled upon the next Protestant heir, Sophia, Duchess of Hanover, daughter of Elizabeth, the eldest daughter of James the First. The wars carried on by William having been so expensive as to outrun the resources of the nation, it was in his time that a public debt first began to be contracted.

About this time, the causes of a new war took their rise in certain disputes respecting the succession to the crown of Spain. The title to that sovereignty, in the event of the death of the existing King without heirs, was claimed by the King of France, the Elector of Bavaria, and the Emperor of Germany, through various female lines of descent. A treaty, to which England was a party, was entered into for preventing the whole from falling into the hands of Louis, whose empire would then have been so great as to be inconsistent, it was thought, with the independence and safety of the neighbouring states. When the King died, Louis, without regard to the treaty, established one of his grandsons as King of Spain, and other important dominions belonging to it, among which was the kingdom of Naples. About the same time, in defiance of the treaty of Ryswick, he acknowledged the son of James the Second [this exiled prince died in September 1701] as King of Great Britain. The British monarch was indignant at both events, and the nation at the latter; and war was accordingly in preparation, when King William died (March 2, 1702), in consequence of a fall from his horse.

MARLBOROUGH'S WARS.

The movement against Louis had not been confined to Great Britain: it was a combination of that power with the Emperor of Germany and the states of Holland. Anne, the successor of William, found it necessary to maintain her place in the Grand Alliance, as it was termed; and the Duke of Marlborough was sent over to the Continent with a gallant army, to prosecute the war in conjunction with the allies. Now commenced that career of glory which has rendered the reign of Anne and the name of Marlborough so famous. In Germany and Flanders, under this commander, the British army gained some signal successes, particularly those of Blenheim and Ramillies: in Spain, a smaller army, under the chivalrously brave Earl of Peterborough, performed other services of an important kind. The war, however, was one in which Britain had no interest—for it has been seen that Spain has continued under a branch of the House of Bourbon, without greatly endangering other states. A party, consisting chiefly of Tories, endeavoured, in 1706, to put an end to the war; and France was so much reduced in strength as to concede all the objects for which the contest had been commenced. The people, however, were so strongly inspired with a desire of humiliating France, which in trade and religion they considered their natural enemy, that some ambitious statesmen of a contrary line of politics were enabled to set the treaty adrift. Among these was the Duke of Marlborough himself, who, being permitted to profit, not only by his pay, but by perquisites attached to his command, wished the war to be protracted, merely that he might make his enormous wealth a little greater. It was by these unnecessary interferences with continental politics, which yet were urged only by the people, and by a popular class of statesmen, that the foundation was laid for the existing national debt.

UNION OF ENGLAND AND SCOTLAND.

Since their religious enthusiasm had been laid at rest by the Revolution Settlement, the Scots had been chiefly animated by a desire of participating in the commerce of England. The shameful treatment of their expedition to Darien had now inspired them with a bitter feeling against their southern neighbours, and they resolved to show their power of counter-annoyance, by holding up threats of dissenting from England in the matter of the succession. In 1703, their Parliament passed the Act of Security, by which it was ordained that the successor of her Majesty should not be the same person with the individual adopted by the English Parliament, unless there should be a free communication of trade between the countries, and the affairs of Scotland thoroughly secured from English influence. Another act was at the same time passed, for putting the nation under arms. The English ministers then saw that an incorporating union would be necessary, to prevent the Pretender from gaining the Scottish crown, and to protect England from the attacks of a hostile nation. For this purpose, they exerted themselves so effectually in the Scottish Parliament, as to obtain an act, enabling the Queen to nominate commissioners for the arrangement of an union. The men appointed, thirty on each side, were, with hardly an exception, the friends of the Court and of the Revolution Settlement; and the treaty accordingly was framed without difficulty. In October 1706, it was submitted to the Scottish Parliament, and was found to contain the following principal points—that the two nations were to be indissolubly united under one government and legislature, each, however, retaining its own civil and criminal law; the crown to be in the house of Hanover; the Scottish Presbyterian church to be guaranteed; forty-five members to be sent by the Scottish counties and burghs to the House of Commons, and sixteen elective peers to be sent to the Upper House by the nobles; the taxes to be equalised, but, in consideration of the elevation of the Scotch imposts to the level of the English (for the latter people already owed sixteen millions), an equivalent to be given to Scotland, amounting to nearly four hundred thousand pounds, which was to aid in renewing the coin and other objects. These terms were regarded in Scotland as miserably inadequate; and the very idea of the loss of an independent legislature and status among governments, raised their utmost indignation. Nevertheless, by dint of sheer bribery, the union was carried through Parliament; and, from the 1st of May 1707, the two countries formed one state, under the title of the Kingdom of Great Britain.

HIGH CHURCH MANIA.

Soon after this period, there occurred one of those changes in the current of popular sentiment, which have already been alluded to as characterising our history. For some years, Whig ascendancy, the exclusion of the Pretender, the humiliation of France, and the military glory of Great Britain, had been the grand objects of the people. Tired now of these, they gradually began to cry up Toryism, hereditary succession, and the Church of England, and thought more of the expenses of the war and its empty objects, than its glory. What tended greatly to bring about this change, was the prosecution, by the ministry, of a divine named Henry Sacheverell, for a violently enthusiastic sermon which he had preached before the Lord Mayor and Aldermen of London, and in which he seemed to call upon the people to take up arms in defence of their endangered church. The ministers were so weak as to give this absurd man a solemn trial, which only inflamed the people in favour of him and the church—the latter being an institution then invested with much public respect on account of its independent conduct in resisting James the Second. The people rose so tumultuously for Sacheverell, that the ministry, after procuring a condemnation, could inflict only an appearance of punishment. After the trial, he received more marks of public reverence and honour than were ever bestowed on the greatest national benefactor; and the Tory and High Church party gained so much strength in a new Parliament then elected, as to expel the Whigs. A Tory ministry—the famous Tory ministry of Queen Anne—then came into power (1710), being headed by Harley Earl of Oxford, and the celebrated Viscount Bolingbroke.

PEACE OF UTRECHT.

The members of this new cabinet immediately applied themselves, though very secretly, to the business of bringing about a peace. When their plans were matured, the consent of the House of Commons was easily gained, seeing that that assembly contained a majority of Tories; but the Lords having shown some reluctance, it was found necessary to create twelve new peers, in order to overpower the sense of that part of the legislature. After a tedious course of negociation, Britain and Holland concluded a peace at Utrecht (1713), leaving the Emperor of Germany still at war. By this arrangement, Philip the Fifth was permitted to retain Spain and the Indies, but no other part of the dominions which his ambitious grandfather had endeavoured to secure for him; and it was provided that he and his descendants should never inherit the kingdom of France, nor any future king of France accede to the crown of Spain. Britain obtained nothing tangible by all her exertions, except the enviable privilege of being exclusively employed to carry slaves to the Spanish American colonies! In fact, the wars of William and Anne had no object but that of preventing certain continental territories from being amassed by certain sovereigns—an evil which, in hardly any extent, could have ever done serious injury to Britain; while it is evident that the people supported these contests through the influence of the most besotted sentiments, nor saw their inutility till they felt the increase of taxes which they occasioned. There was then, it must be observed, little principle among statesmen, and little information among the people. The Tory ministry obtained the peace only for party ends; and though it really was beneficial, as the termination of a course of error, it was not received very generally in that light; for, after all, the news of a victory in Flanders had a great charm for the public ear; and the army is not a thing that the populace are ever seen to dislike, either in reference to its expense or its liability to become an instrument of oppression.

ACCESSION OF GEORGE THE FIRST.

Queen Anne, who was a good but weak-minded woman, had for some years entertained a wish that the act of settlement should be set aside, and the crown restored, on her death, to the main line of her family, in the person of her brother James, now styled the Pretender. Toryism was hardly so popular as to make it possible to avow this purpose boldly; and accordingly the greatest caution was observed by herself and her ministers in their intrigues for bringing in the Pretender. Before their plans were matured, the Queen took suddenly ill, and died (Aug. 1, 1714); and the Tory ministers, finding themselves under the necessity of acting according to the existing law, proclaimed the Elector of Hanover, son of the late Princess Sophia, under the title of George the First. The new sovereign lost no time in coming over to Britain, and fixing himself in that heritage which his family has ever since retained. He was fifty-four years of age, of a good though not brilliant understanding, and very firm in his principles. Knowing very well that the Whigs were his only true friends, he at once called them into the administration: the Tories he treated with contempt, if not absolute rudeness, being of opinion that it is needless to seek to conciliate enemies. The former party continued in power during the whole of this and the subsequent reign.

REBELLION OF 1715.

During the first year of George the First, the Tories kept up very threatening High Church riots; but the Whigs, gaining a majority in the new House of Commons, were able to check this a little by the celebrated enactment called the Riot Act, which permits military force to be used in dispersing a crowd, after a certain space of time has been allowed. Being completely disappointed in their hopes of office and power, and treated with unnecessary insult by the King, the party resolved to attempt bringing in the Pretender by force of arms. For this end their means were totally inadequate; but it is the characteristic of this party, that they always think their cause so very good in itself, that it cannot fail of success. They believed that all England and Scotland were ready to take arms for the Pretender, when in reality there was but a limited portion of the people so inclined, and that portion unwilling to move, if they saw the least risk. Blind to these circumstances, and without design or concert, they opened the unfortunate civil war of 1715. The Earl of Mar, a member of the late administration, raised his standard at Castleton, in Braemar, without any commission from the Pretender, and was soon joined by Highland clans to the amount of ten thousand men, who rendered him master of all Scotland north of the Forth. There, however, he weakly permitted himself to be cooped up by the Duke of Argyle, who, with a far less numerous force, had posted himself at Stirling. Mar expected a co-operative invasion of England by the Duke of Ormond, and a rise of the people of that country. But the duke completely failed in his design, and no rise took place, except in Northumberland. There Mr Forster, M.P., and the Earl of Derwentwater, with some other noblemen, appeared in arms, but unsupported by any considerable portion of the people. Mar detached a party of eighteen hundred foot, under MacIntosh of Borlum, to join the Northumbrian insurgents, who complained that they had no infantry. The junction was managed with great address, and at the same time some noblemen and gentlemen of the south of Scotland attached themselves to the southern army. The government was singularly ill provided with troops; but it nevertheless sent such a force against Mr Forster as obliged him to retire with his men into the town of Preston, in Lancashire, where, after an obstinate defence, the whole party (November 13) surrendered themselves prisoners at the King's mercy. On the same day, the Earl of Mar met the Duke of Argyle at Sherriffmuir, near Dunblane, where a battle was fought, in which, after the manner of the battles in the civil war, the right wing of each army was successful, but neither altogether victorious. The duke withdrew in the face of his enemy to Stirling, and the earl retired to Perth, resolved to wait for the news of an invasion from France, and for the arrival of the Pretender, whom he had invited to Scotland. He did not for some time become aware of the hopelessness of the former object. Louis the Fourteenth, upon whom the hopes of the party greatly rested, had died in September, leaving the government to the Regent Orleans, who had strong personal reasons for wishing to cultivate the good-will of the British monarch, and of course declined to assist in the present enterprise. The Pretender, nevertheless, sailed for Scotland, and on the 22d of December, arrived incognito at Peterhead, bringing nothing but his own person to aid his adherents. The Earl of Mar, who had already attempted to negociate a submission to the government, brought him forward to Perth, where he was amused for some time with preparations for his coronation. But before he had been many days there, the Duke of Argyle found himself in a condition to advance against the insurgent force; and on the 30th of January 1716, this unfortunate prince commenced a retreat to the north, along with his dispirited army. On the 4th of February, he and the Earl of Mar provided for their own safety by going on board a vessel at Montrose, and setting sail for France: the army dispersed itself into the Highlands. For this unhappy appearance in arms, the Earl of Derwentwater, Viscount Kenmure, and about twenty inferior persons, were executed; forty Scottish families of the first rank lost their estates, and many excellent members of society were exiled for ever.

ADMINISTRATION OF WALPOLE.

The Whig government of George the First derived great additional power and stability from the suppression of this insurrection, and, to secure itself against the inconvenience of consulting the people too often, soon after carried a bill for extending the duration of Parliaments to seven years—a blow against liberty which the Tories in vain endeavoured to ward off. In 1720, the financial schemes of Law, the comptroller-general of France, inspired the British public with similar visionary projects, one of which, entitled the South Sea Company, ended by producing a wide-spread scene of ruin. Peace was slightly disturbed about this time by an attempt of Spain to regain her Italian territories, which was, however, speedily suppressed, and by some schemes of the Jacobites, or friends of the Pretender, which were still more promptly defeated. During the twenty ensuing years, the country was managed chiefly by Sir Robert Walpole, without the occurrence of any event of importance, except the death of George the First, and the accession of George the Second, in 1727. This minister has the merit of having preserved peace during that long period, but will ever be infamous for the system of corruption by which he maintained his ascendancy in the House of Commons. His grand principle was, that every man had his price, and, when that was ascertained, that there remained no difficulty but to raise the necessary sum, or confer the requisite favour. He acted so regularly upon this principle, and with so little decency, that the British Parliament became a mere mockery of a representative or deliberative body. Not that there was wanting a minority who, calling themselves patriots, declaimed loudly against the base practices of the ministry, and affected to stand up for the country. Sir Robert, however, looked upon these persons—and he perhaps was not far wrong—as only individuals whose price he had not been able to compass, or had not thought it worth while to disburse.

WAR WITH SPAIN, 1739.

After twenty years of peace, Walpole was urged, much against his will, into a contest with Spain, on account of some efforts made by that country to check an illicit trade carried on by British merchants in its American colonies. In searching vessels for the prevention of this traffic, the Spaniards had made some trifling aggressions; and British spirit took fire at the indignity of being liable to a search by any power on earth, even for the prevention of a notorious breach of treaty. The community therefore demanded a war, and the minister, with great reluctance, was obliged to comply. One fleet, under Admiral Haddock, was sent to cruise off the coast of Spain, and another, under Admiral Vernon, was sent against the American colonies. The latter gained lustre by taking the important town of Portobello. Another and larger expedition, with ten thousand soldiers, was then sent to reinforce Vernon; but, owing to disputes between him and the commander of the troops, no further triumphs were gained. A timid, ill-concerted, and ill-conducted attack upon the fortifications of Carthagena, lost Britain about twenty thousand men. Meantime, a third fleet, under Anson, sailed to the eastern coast of Spanish America, in order to co-operate with Vernon; but only one of the vessels reached its destination. Anson, thus reduced in naval force, took several prizes off Chili, and plundered the town of Paita, but could venture upon no more hazardous enterprise. He cruised across the Pacific, in the hope of meeting one of the Spanish galleons, which usually contained great quantities of bullion; but did not succeed, till, on his return from refitting at Canton, he took the Manilla transport, with treasure to the amount of three hundred thousand pounds. Though he had failed in all the proper objects of the expedition, the money he brought to the public treasury caused him to be very well received by the people; while the flagrant mismanagement at Carthagena was the subject of general execration.

WAR WITH FRANCE.

The Spanish war now languished for some time, while the attention of Britain was attracted to the proceedings of France. After the death of the Emperor Charles the Sixth of Germany, his dominions fell by inheritance to his daughter, the celebrated Maria Theresa, Queen of Hungary. She was opposed, however, in this succession by the sovereigns of France, Saxony, and Bavaria, who all pretended to have some claims on her dominions. A war was commenced against her; the Elector of Bavaria was crowned Emperor; and such was the success of the French arms, that she was soon reduced to the greatest distress. With this quarrel Britain had no shadow of excuse for interfering; but the King thought his dominions in Germany endangered, and the people had all their usual taste for fighting with the French. War was therefore entered into, Walpole sinking conscientiously beneath the prejudices of his two masters. The phenomenon was then observed of Great Britain paying an army of 16,000 Hanoverians, besides many of her own native troops, to fight the battles of that people. During the progress of the contest, an unusual bitterness animated the opposing parties in the House of Commons. The Ministry had been recruited by the most popular men of the late minority—among whom the most conspicuous were Lord Carteret and the Earl of Bath. It was of course expected that these men would lose no time, after they were in power, to effect some of those improvements in the constitution which they had formerly clamoured for. Indeed, nothing less than a total renovation of the constitution was expected. A number of motions to this purport were accordingly made in both Houses of Parliament; but, to the astonishment of the nation, they were all violently opposed and quashed, by the very men who had lately maintained the principles on which they were founded, and whose former speeches had suggested many of them. The most important of these motions were the following three:—One for appointing a committee to "inquire into the conduct of affairs during the last twenty years;" one for bringing in a bill to "repeal the act for septennial Parliaments;" and one "for excluding pensioners from the House of Lords." Though German subsidies, standing armies, and continental connections, had been the constant objects of the indignation of these men while out of place, and had furnished them with the occasion of some of the finest strokes of their popular eloquence, they extended their complaisance to the King in all these particulars, much farther than their execrated predecessors. Besides providing for subsidies to Denmark and Hesse-Cassel, they procured a vote of half a million to the Queen of Hungary; they augmented the land forces to 62,500; they transported to the Low Countries 16,000 British troops under the Earl of Stair, to make a diversion in favour of Maria Theresa; and they ordered these troops to be joined by 6000 Hessians, and the above-mentioned 16,000 Hanoverians in British pay. The community of the present day, whatever they may occasionally think of those at the head of affairs, have certainly reason to congratulate themselves on the great increase of both moral and political principle which has taken place in that exalted class of men since the days of the Walpoles and the Baths.

BATTLE OF DETTINGEN.

About the time when Great Britain entered into this struggle, the affairs of the Hungarian queen took a surprising turn, and her armies, under her husband the Grand Duke of Tuscany, Prince Charles of Lorraine, and other eminent commanders, began to drive all her enemies forth from her dominions. France, having lost 100,000 men in the contest, sued for peace; but this the queen haughtily refused, in the hope of gaining still greater triumphs by means of Britain. The aid of that power, as it turned out, was of little service to the queen. The Earl of Stair had permitted his army to get into a position of great difficulty at Aschaffenburg, on the Upper Maine, and, but for a blunder of the French, it would probably have been starved into a surrender, along with the King and prime minister (Carteret), both of whom had recently joined it. The blunder consisted in an attack made by the Duke of Grammont, with 30,000 troops, upon the British and Hanoverian infantry, upon a plain near the village of Dettingen. The infantry, cheered by the presence of the King, who rode between the lines with his sword drawn, received the charge of the French cavalry with great firmness, and compelled them to retreat—a movement which communicated a panic to the whole French army, and might have been attended with the most disastrous consequences, if the British monarch would have permitted his advantage to be followed up.

BATTLE OF FONTENOY.

The death of the Emperor Charles the Seventh, for whom this great European contest appeared to have taken its rise, might have now given an opportunity for the cessation of hostilities; but the French thought the war still necessary, in order to prevent the husband of Maria Theresa from being elected emperor, and the British were still animated by their usual antipathy to that people. A campaign was therefore opened in Flanders, the troops of the former nation being commanded by Count Saxe, distinguished for military genius and experience; while the British and Hanoverian army was under the charge of the young Duke of Cumberland, second son to the King. To animate the French troops, the King (Louis the Fifteenth) and the Dauphin attended the camp. The French having invested Tournay, it was resolved by the English to hazard a battle, in order to save that strong city. The rencounter took place (May 1745) at Fontenoy, near the bridge of Colome. The British infantry advanced under Cumberland, and, notwithstanding a tremendous fire, which swept them off in whole ranks, attacked the centre of the position of the French army, which they beat back in so furious a style, that Saxe advised the King to retire for the safety of his person. Louis bravely refused to stir, being apprehensive that a retrograde motion on his part would decide the day against his army. Ashamed to desert their sovereign, the French returned to the charge; the cavalry renewed their efforts; and other circumstances conspired to give a turn to the battle. The British cavalry were prevented by a mistake from giving their support to the infantry; and the Dutch and Austrian part of the army was found totally ineffective. Assailed on all sides, fatigued with their great exertions, and galled by the French batteries, the infantry was obliged to retire, with a loss of seven thousand men, after having beaten every regiment in the French army. The Duke of Cumberland, though able to withdraw in good order, did not venture after this disaster to face the enemy during the whole campaign. Nevertheless, the Queen of Hungary at this time gained the summit of her wishes by the election of her husband to the imperial throne.

REBELLION OF 1745.

The misfortunes of the British arms on the Continent, and the distractions which prevailed among the people and the Parliament, encouraged Prince Charles Stuart, eldest son of the Pretender, to make an attempt at this time to recover the throne of his ancestors. In the previous year, he had been furnished by France with a large fleet and ample stores to invade the British dominions, but had been driven back by a storm, and prevented from again setting sail by a superior fleet under Sir John Norris. The object of France in this enterprise was to produce a diversion in favour of her own army in the Netherlands; at present, in consequence of their victory at Fontenoy, such a division was not necessary; but though the French monarch would not grant him any farther supply, Charles nevertheless resolved to make the proposed attempt, trusting solely to the generosity and valour of his friends in Great Britain. He therefore landed from a single vessel, with only seven attendants, on the coast of Inverness-shire, where the clans most attached to his family chiefly resided. By merely working upon the ardent feelings of the Highland chiefs, he soon induced several of them to take up arms, among whom were Lochiel, Clanranald, Glengary, and Keppoch. On the 19th of August, he raised his standard at Glenfinnin, within a few miles of the government fort entitled Fort William, and found himself surrounded by about fifteen hundred men. The government was at first inclined to disbelieve the intelligence of these proceedings, but was soon obliged to take steps for its own defence. A reward of thirty thousand pounds was offered for the head of the young prince, whose family, it ought to be stated, was under attainder by act of Parliament; and Sir John Cope, commander of the forces in Scotland, was ordered to advance with what troops he had, into the Highlands, and suppress the insurrection at once. Cope proceeded on this mission with about fourteen hundred infantry, but on finding the Highlanders in possession of a strong post near Fort Augustus, thought it necessary to go aside to Inverness. Charles, taking advantage of this ill-judged movement, immediately poured his clans down into the Lowlands, gaining accessions every where as he advanced, and, there being no adequate force to oppose him, took possession successively of Perth, Dundee, and Edinburgh.

At the latter city Charles took up his residence in Holyroodhouse, and caused his father to be solemnly proclaimed King, and himself Prince Regent, of the British dominions. He was here joined by a thousand fresh troops from the Highlands, but found it impossible to raise any recruits in the city. Having learned that Cope had transported his troops into the Lowlands by sea, and was advancing through East Lothian to meet him, he marched his army to Tranent (September 20), and there came in sight of the English troops, which had taken up a position on the field to the east of Preston. The two armies amounted each to about 2000 men; but Cope had the advantage of dragoons and artillery. The prince lay all night on a peas-field in the midst of his Highlanders, and, before daylight next morning, led his forces by stealth into the plain on which the royal troops were reposing, where he formed them in two lines, the best armed clans occupying the front. A rapid advance was then made against the English army, which had hardly time to arrange itself, when the Highlanders, after a discharge of fire-arms, rushed upon them sword in hand. The uncertain light, the suddenness of the attack, and the ignorance of the troops as to the mode of warfare pursued by Highlanders, all tended to inspire a panic in the assailed party. The two regiments of dragoons instantly fled, leaving the foot comparatively defenceless. The artillery was also but once discharged, when the Camerons overpowered those who had the charge of it. Some companies of infantry alone stood firm, under the direction of Colonel Gardiner, but in a few minutes the whole were cut down or swept off the field, and there was only a confused flight, in which the broadswords of the clans were used with unsparing vigour. Nearly the whole infantry, fourteen hundred in number, were either killed or taken prisoners, and the military chest and other stores of the army became a prize to the victors. Charles returned next day to Edinburgh in triumph, and the fruits of his success were soon seen in the large accessions of force which he received, including the Earls of Kelly and Kilmarnock, Lords Elcho, Pitsligo, Ogilvie, Balmerino, and other noble and distinguished persons.

Such was the defenceless condition of England at this juncture, and such the consternation inspired by the defeat of Cope, that, if Charles could have led four or five thousand men into that country, he could hardly have been prevented from taking possession of the capital. He was detained six weeks, however, before he could collect forces to that amount, and in the meantime troops more numerous in proportion were brought over from Flanders to oppose his progress. He commenced his march, November 1, and entered England at the western border. Carlisle, after holding out three days, surrendered to him. He pressed on through Westmoreland, disregarding a small army under General Wade at Newcastle, and, November 29, entered Manchester. He expected that before this time the English Jacobites would have been flocking to his standard; but they still waited to see the risk of such a movement somewhat reduced. Two hundred recruits, whom he raised at Manchester, and placed under the command of a Catholic gentleman named Townly, was all the addition he could gain to his army in England. To oppose his march, an army of ten thousand men was now rendezvoused in Staffordshire, under the Duke of Cumberland. Nevertheless, he still pushed on, hoping that Wales would produce some considerable reinforcements. By a dexterous movement, he eluded Cumberland's army, and, December 4, reached Derby, where he was only a hundred miles from the metropolis.

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THE BRITISH EMPIRE, AND ITS RESOURCES.

THE power, commerce, and wealth of Great Britain, so far surpass all that has been witnessed in former times in the world, that they have become an object of wonder to every thinking person, both in this and other countries. It is naturally asked, What can have elevated so small an island to power and influence so unexampled? What can have given to a people of only twenty millions in number, wealth and resources surpassing those of the most populous nations on the face of the globe? The phenomenon of British greatness having excited so much curiosity, both among the learned and unlearned, it is the purpose of the following sheet briefly to unfold its origin, and to exhibit its great and almost incredible extent.

The first cause undoubtedly of the internal prosperity of Britain, has been her insular situation, which placed her aloof from many of the wars which devastated the Continent. Every invader was there a destroyer also, and aimed not so much to possess the country, as to crush its rising manufactures and institutions: while, in the civil wars of England, the different candidates for the crown sought rather to conciliate the people, and to preserve from devastation what they hoped to inherit: hence, whatever manufacture was once established in England, took root there firmly, and had little hazard of being eradicated. Another principal cause of British prosperity, has been the happy form of her government. From a very early period, the commons of England had a voice with the great barons in the enactment of the laws, and in the granting of taxes. They had it, therefore, in their power to do the king considerable service or disservice in the matter of supplies; and it became his interest to conciliate them, by granting such privileges as assured them in the quiet prosecution of their crafts, and in the possession of their property. Another of the moving causes of the prosperity of Britain, was the early revolution in the state religion, by which the people were brought into the enjoyment of an extraordinary degree of liberty of opinion or conscience, before they were put in possession of the civil rights which they have latterly enjoyed. In other countries, where the political revolutions have *preceded* that of religion, every thing has gone wrong—their social system has been rendered defective, and will not work. This bad management of surrounding nations has been an additional cause of the prosperity of this country of freedom. These are some of the causes which first sowed the seeds of British prosperity; but one of the most remarkable sources of her wealth, it must never be forgotten, lies in the unexampled industry of her people. Habits of activity and enterprise are common to most islanders, and are generated in them by the natural necessities of their situation; but in no other case have these been quickened and directed by that quenchless thirst for improvement, whose results have raised these countries to such a pitch of eminence. The industry of the British nation, from the wealthiest merchant to the meanest tradesman, is unceasing and unwearied; their very hours of leisure are generally employed in some useful pursuit. The country weaver, who is eleven hours every day at his loom, finds yet another hour to hoe his potatoes, to attend to his pig or tame rabbits, or to cultivate his garden; and we have seen several who employed their spare moments in constructing optical instruments, or toys in bone and ivory. Thousands of those ingenious inventions in the mechanical arts, which have contributed so much to facilitate the working of machines, and the saving of labour, have been contrived in the leisure hours of industrious workmen. Even apprentices struggle to have some spare time, that they may devote it to reading and acquiring knowledge, or to some pursuit which has become a favourite with them. We do not assert that all are so occupied; but we say that a habit of unceasing industry is the general character of the people; and that it is this national trait, operating in all the concerns of life, which renders the British so wealthy at home, and so powerful abroad. Such industry could not indeed exist, except under a government which assured to every one the possession of the fruits of his own exertions; and it has been the fortunate chance of the British islands to possess institutions which fulfil that inestimable condition to its greatest extent.

FORM OF THE BRITISH GOVERNMENT.

Every regular government may be divided into two parts: one which frames the laws of the country, and which is called the *Legislative*; and another, called *Executive*, which is charged with the duty of seeing the laws obeyed, and of preserving the public peace against foreign or internal enemies. In Britain, the legislative part of the government is composed of two deliberating bodies, with the king at their head, without whose sanction none of their resolutions are valid. The one of these bodies is called the *House of Lords*, the other the *House of Commons*. The persons who compose the House of Lords form a separate class or rank in the nation, which is called collectively the Peerage, and whose members enjoy certain exclusive privileges and honours in virtue of their birthright, which will be explained afterwards: this body consists at present of about 430 members, but may be enlarged at pleasure by the king, a power which is in general very sparingly used. The other legislative body is called the *House of Commons*, and is composed of members who are chosen for that purpose by certain classes of the people; the privileged electors in each district appointing one, and in some populous places two: the whole number is 658. These two houses, with the king, have the power to pass laws, impose taxes, borrow money, make inquiries into the management of the public revenues, or the transactions of the great officers of government, and even to bring the latter to trial, if necessary. They inquire into the manner in which all great public institutions or boards of management are conducted, such as those for education, for purposes of charity, for the erection of lighthouses on the coast, for the construction of harbours, and generally, indeed, into all the business which is entrusted to the executive part of the government; they cannot direct what is to be done, but may always make scrutiny into it afterwards, if any error or mismanagement has taken place. The discussions on these subjects are often very warm and eager, and bring to light facts of great public importance. No act of the two deliberative bodies becomes valid as a law, without the assent of the king; and all propositions relating to money to be raised for the public service, must originate with the House of Commons, the lords merely giving their assent as a matter of form, without being allowed to alter any thing. This circumstance gives a much larger share of influence to the commons than is possessed by the lords; the former having it in their power, whenever they are dissatisfied with the measures of government, to stop the supplies of money, and bring the whole machinery to a stand. Parliament generally sits in London for the dispatch of public business, six or seven months each year, and is summoned together or prorogued for that purpose by the king: the members of the House of Commons must be elected anew at least once every seven years, though in fact the re-election takes place generally every fourth or fifth year, the king having it in his power to dissolve one parliament and call another at his pleasure. The parliament is always dissolved on the death of the king.

Each of the two houses has one presiding member, whose duty it is to preserve order, and see that the regulations of the assembly be attended to by the members; he is also the person through whom any communication passes between the house and the king, he alone having the privilege of addressing his majesty in name of the house. Hence, in the House of Commons this officer is called the *Speaker*; in the House of Lords he is commonly known as the *Lord Chancellor*, from another office which he holds; but the duties of the latter are quite the same as those of the Speaker of the commons. There are numerous forms established for the regularity of business in parliament, but of these there are only a few which need be mentioned here. Any proposal which is laid before either of the houses, in order to pass into a law, must be made out by its promoter *in the form* of an act of parliament, but is only known by the name of a *bill* while under discussion: permission must first be obtained to introduce the bill, and it must then be read and considered by the house three several times, besides being once scrutinised more closely by a committee or select number of the members, and, if a public bill, by the whole house sitting as a committee, where each member is permitted to speak as frequently as he sees occasion, whereas in the regular sittings of the house no one is allowed to speak more than once, except to explain where his first statements have been misunderstood. If it is not rejected in any of these three readings, or given up in the committee, the bill is said to have passed. It must then go through the same process in the other house, where it is sometimes adopted, sometimes rejected; but if any alterations are made in it here, they must be reported to the house where it first originated. If the two cannot agree on the changes proposed, the bill falls to the ground; but some modification is generally contrived which satisfies both parties. It still remains to obtain the sanction of the king, which is hardly ever refused, when the *bill* becomes an *act of parliament* or *law*.

The members of both houses have certain personal privileges, which are deemed necessary for enabling them properly to attend to their public duties. In Parliament, they enjoy absolute freedom of speech, and cannot be questioned out of the house for any thing said in the debates; they and their servants are exempted from arrest (except in criminal cases) during their attendance in Parliament; and they can receive and send a certain number of letters daily through the post-office, without payment.

The Executive.—The king, who forms the chief of the legislative body, is also the head of the executive part of the government. In this capacity he is charged with the duty of seeing the laws enforced which Parliament has enacted, of levying taxes granted for the public service, of protecting the internal peace of the country against crime and violence, and of defending it against foreign enemies. He also conducts all intercourse with the rulers of other nations, forming treaties and alliances, declaring war or concluding peace. He has the duty of protecting the persons and trade of British subjects in foreign countries. For this purpose, he has the sole appointment of the officers who perform these duties; of judges in the several courts of law; of officers in the army and navy; of public ambassadors, and of consuls at foreign ports for the safety of trade; and of the officers who levy the taxes. He has also large forces, both naval and military, at his disposal, which are stationed in different parts of the empire where he or his advisers think that they are wanted for the time. The task of managing all these extensive concerns, which would fall into confusion in the hands of one man, is deputed by the king to a number of persons, who are denominated his *Ministers*, and sometimes the *Cabinet*. These are nominally selected and appointed by the king himself; but as his choice would be in vain if it were to fall on men who were disagreeable to Parliament (which might in that case refuse to grant money for carrying on the public business), the ministry is generally chosen from among such men as enjoy the confidence of the public. They have all some high public office. The chief is the *First Lord of the Treasury*, whose nominal duty is the receiving and issuing of the public money, while his actual station is that of leader of the administration; he is the first who is appointed in any ministry, and generally selects all the other members, according to his own views of their abilities, or of the influence they possess in the country or in Parliament; and any changes afterwards made are generally at his suggestion, or at least with his full assent. Next is the *Lord High Chancellor*, who presides in the highest law-court of the kingdom, and is Speaker of the House of Lords; he is chief adviser of the king in all that relates to the laws of the country, and has the disposal of a great number of clerical and law offices. After him are the principal secretaries of state, who are five in number, each having a separate charge; the first is Secretary for the Home Department, after whom are the Secretaries for Foreign Affairs and for the Colonies, the Secretary at War, and the Secretary for Ireland. These, with the *Chancellor of the Exchequer*, and several others of the high officers of state, form what is called the *Ministry*, the *Cabinet*, or the *Cabinet Council*; and all the measures of the executive government are settled by their deliberations.

This regular division of labour which is established in the British government, is one of its chief excellencies; because every secretary, or other officer of state, having a particular department assigned to him, the responsibility for any error or mismanagement is established at once, and may be either rectified or punished. Parliament itself has its own duties; and when these are not performed to the satisfaction of the electors, the members can be dismissed at next election, to make way for others who deserve better. The British constitution has also the invaluable property of admitting gradual amendments without violence to the general system; and by this principle it has accommodated itself, without any convulsion, to the changes and improvements which for many generations have been going on in society. The late reform bill is an instance of this, and others (though not all to the same extent) have occurred in every age within the reach of history.

REVENUE AND EXPENDITURE.

The revenue of the British empire has varied exceedingly of late years; from 1761 to 1774, which was a period of peace, it increased from L.6,800,000 to L.10,265,673; and since that time, from the various wars in which the country was engaged, the immediate expenses, and the interest of public debts, it has continued to augment till within these last ten or twelve years. From 1775 to 1783, which was the period of the American war, it rose from ten millions to twelve millions, and during the peace which followed till 1793, it was increased to seventeen and a half millions, a-year.

After this period the French revolutionary war commenced. That war was by no means unpopular with the nation; and it was besides gilded by the many splendid victories which continued to be obtained by British seamen as long as the enemy had a fleet to appear at sea. Heavy taxes for defraying the expenses of this war were therefore submitted to without remonstrance, and the public revenue rose accordingly to a very large amount. From 1794 to the peace of Amiens in 1801, which only lasted two years, the revenue was increased from seventeen and a half millions to twenty-eight millions; and from 1803 till 1816, the year after the final conclusion of peace, it had risen to L.76,834,494, which was the largest sum raised by taxes in one year. After this it was gradually reduced, till it now amounts to about L.46,000,000 (1833).

The sums thus raised in taxes, large as they were, did not, however, meet the expenditure of the country during these periods of war. In order to defray the great charges which arose, it became necessary also to borrow to a great amount. The following table will show the sums raised by the taxes, the sums borrowed, and the total expenditure for each of the years specified.

Year.	Raised in Taxes.	Borrowed.	Total Expenditure.
1794	L.17,674.395	L.5,079,971	L.22,754,366
1801	28,085,829	33,532,159	61,617,988
1803	38,401,738	23,072,742	62,373,480
1806	53,898,124	22.358,672	78,056,790
1810	66,029,349	22,763,202	88,792,551
1814	70,926,215	52,309,445	122,235,660
1816	76,834,494	54,471,464	130,305,958

These sums will appear altogether enormous, and must give the most extraordinary idea of the resources of a government, which, while it raised such a large yearly amount in taxes, had yet credit to borrow the immense additional sums which were wanted. This happened too, it must be recollected, at the most critical periods of a war, wherein it was continually asserted that the independence, nay, the very existence of the nation, was at stake.* It may be easily believed that when shrewd capitalists were willing to advance such sums on the credit of the revenues and public faith of the country, there was little real danger in the case; these men saw that the boundless resources of Britain were sufficient to carry her through the contest in which she was engaged, and scrupled not to lend her government treasures which were greater than the revenues of any empire in the world, and which will be the astonishment of all history. The whole sum which was expended in the wars of the revolution, from 1794 to 1816, amounted to 1700 millions of pounds sterling, a sum so far beyond all ordinary dealings, that we can have little conception of its amount or value. All the mines that are at present wrought in Europe and America would not furnish gold and silver equal to it in less than 310 years.

Expenditure of 1831 and 1832.—Having noticed the expenditure during war, we shall now give an account of that of the present period of peace. The whole charges of government amounted in 1831 to about fifty millions; which are distributed in the following manner:—

1. *Interest and charges on money borrowed in the time of war.*—This amounts to twenty-eight millions yearly, and forms a permanent charge, which cannot be reduced except by paying off the debt itself. A small part of it, which was borrowed by annuities on lives, is terminable.

2. *The Dead Weight.*—This is a phrase employed to denote the money paid by government to persons who are not at present rendering any service in return. It includes the pensions granted to aged or disabled soldiers and officers; the half-pay of officers whose services are not required, but who, by the regulations, cannot be discharged; pensions to widows of officers; and, lastly, allowances to retired ambassadors, law-officers, to the members of the royal family, and to various others. This portion of the public expenditure amounts to about six millions, and is, like the former, nearly a permanent charge from year to year; its decrease depending only on the death of the pensioners. The total pensions, allowances, half-pay, &c., to persons connected with the army, is three millions; of which the pensions to disabled and aged soldiers form L.1,434,502. The total to the navy is L.1,290,381; of which the pensions to private sailors form L.250,000. Another class, comprising the royal family (not the king), retired ambassadors, &c., receive L.648,782; of which the royal family have one-third part. And the fourth class, called the *civil dead weight*, consists of persons who have been employed in the public offices, such as the Treasury, Post Office, Exchequer, &c., and who are now supposed to be unfitted for their duties. The amount is L.962,370.

3. *Charges for Effective Service.*—The sums yet mentioned do nothing towards carrying on the government of the country, paying its armies, fleets, magistrates, courts of law, &c. After defraying the interest of the debt, and the dead weight, there remains out of the whole fifty millions, about sixteen millions for these purposes. This is distributed as follows:—

Charge for collecting the revenue .	L.3,401,345
Management of the debt and finance .	417,401
Expenses of the army . .	5,123,166
——— navy . . .	3.295,251
Executive, legislation, law, and justice	1,192,477
Expenses of the colonies . . .	220,375
Expenses of ambassadors and consuls in foreign countries . . .	264,616
Civil government and miscellanies .	891,710
Public works	490,750
Trade and manufactures (bounties, quarantine, expenses, &c.)	273,580
Expenses of the royal establishment and household	435,000

Some farther particulars on the principal of these items is given in another page.

TAXATION.

The taxes are raised upon a great variety of different articles, which are all, however, reduced to the following heads.

1. *The Customs.*—These are taxes levied upon the foreign commerce of the country, being the duties paid upon articles imported from abroad, such as sugar, coffee, &c. They include also a few on some goods exported, such as coals, wool, and skins. Their whole amount is L.17,940,264; of this sum about three millions arises from duties on foreign spirits, brandy, gin, &c.; four and a half millions from wines; three millions from tobacco and snuff; from corn and grain of all kinds imported, L.614,138; from foreign fruits, such as currants, raisins, oranges, &c., L.646,000; from sugar, four and a half millions; from timber, one million and a quarter; from coffee, half a million; besides smaller sums from a vast variety of other articles.

2. *The Excise.*—The excise taxes are those which are levied on goods of British manufacture, such as glass, malt, paper, &c. The duty is paid back again to the maker, if the commodity is to be exported to foreign countries. This class of taxes yields altogether L.17,339,614. The principal articles are malt, which yields about four and a half millions; home-made spirits, yielding five millions; tea (which is reckoned here, though a foreign product) about three millions and one-third. Glass yields half a million; paper, two-thirds; soap (now lowered) gave above a million.

3. *Stamp Duties.*—These consist of the prices affixed to stamped papers, upon which the law makes it imperative that every document for the transfer of property, or other obligation, shall be written; deeds, settlements, and bills; bills of exchange, receipts (above a certain small amount), and a great variety of other instruments of business, are required to be stamped in this manner; and the prices affixed to the stamps, which are often high, bring a large revenue. Under the head of stamps, are also included indentures, cards and dice, duties on plate, and other anomalous items. The whole amount is L.7,070,773. The principal sources are from deeds, probates of wills, legacies, &c., three millions and a half; from bills, receipts, stamps on bankers' notes, and other commercial instruments, L.885,840; marine and fire insurances, one million; newspapers, almanacks, pamphlets, and advertisements, L.665,151; stage-coaches and post-horses, L.654,342; gold and silver plate, L.74,216; quack medicines, L.38,618.

4. *The Taxes.*—What are technically called "the taxes," are those duties which are levied on land and houses, on windows, servants, riding-horses, dogs, &c.—all of which, except the *land-tax*, are called also *the assessed taxes*. The amount of this class is L.5,217,741; the produce of the land-tax by itself is a little above one million; the house tax and window tax produce together two and a half millions; riding-horses and carriages give L.649,301; game duties, L.125,431; and dogs, L.161,002.

5. *Post Office.*—There is a considerable revenue derived from the Post Office, after paying all the expenses of the establishment; and from the great convenience and regularity of the system, which is kept working at all hours from one end of the country to the other, the additional charge is not much felt or grudged. The amount is L.2,227,354.

6. The income derived from rentals of *crown property*, and the sale of timber, bark, &c., from the crown lands (with other incidents), yield a yearly revenue of L.373,769.

7. There are some small *miscellaneous branches* of revenue, which amount to L.159,530. Of this sum the duty on hackney coaches gives L.35,695; that on hawkers and pedlars, L.35,207; and those on offices, pensions, and personal estates, L.39,255.

8. Some *incidental revenues* are derived from matters connected with the regular taxes; such as duties collected at the Isle of Man, L.21,860; fines, and goods seized for taxes, L.24,654; these, with a number of other casual receipts, amounted, in 1832, to L.67,838.

The whole revenue derived from these sources in the above year was L.50,806,137; last year, as we have already stated, by a better management, only about forty-six millions were required.

This sum is still reckoned large; but, besides its amount, it is said that the same sum might be levied in a manner which would do much less injury to the various interests which pay it. Some of the taxes, particularly those on home manufactures, such as bricks, glass, soap, and paper, are said to prevent the extension of the manufactures on which they are levied, and by this means to keep a number of workmen out of employment. Others, such as those on olive oil, dye stuffs, drugs, timber, &c., prevent the cheap introduction of articles of prime necessity in different trades and manufactures, which are thereby much cramped, and prevented from increase. The high duty (L.8 per tun) on olive oil (which is as useful as tallow in making soap) renders us entirely dependent on the Russians for their tallow, and enables them to raise the price at pleasure. The corn and grain duties are also strongly objected to in their present shape; the duties on tobacco, foreign spirits, and silks, are at present so high, that large profits can be made by smuggling them; and there is a necessity for keeping up a large force along the coast in order to prevent this illegal traffic. The yearly cost of this service is L.644,352, most of which, it is believed, might be saved, were the duties on the articles we have mentioned lowered, so as to make smuggling unprofitable; while the increased consumption at the lower price, and the enlarged trade of the legal dealer, would prevent the revenue from suffering any thing. In answer to these objections to particular taxes, it is said that ministers are quite sensible of the bad effects of duties on such articles as glass, soap, paper, &c.; but that it is so difficult to find a new tax as a substitute (every class refusing to submit to any burden for the purpose of relieving others), that they cannot act as they would wish. As for the high duties on foreign spirits, tobacco, &c., which are the chief source of smuggling, we believe that measures are in contemplation to have the evil removed.

There is another objection stated to some of the taxes, which we cannot but notice. It is said that most of the articles on which duties are levied are of such a nature as to be more in demand by the poor and the middle classes than by the rich; so that the weight of taxation is made to fall chiefly on those who are least able to bear it. The following taxes are mentioned to show that this is the case:—On butter and cheese (imported); on hops, malt, soap, home-made spirits, and tobacco—these taxes are supposed to fall almost entirely on the poor, and amount to about fourteen millions. The next are a set of taxes which are reckoned to fall chiefly on the middle classes and people in business, such as those on licences and certificates, bills of exchange and receipts, insurances, stage-coaches, brandy, and gin—these amount to about four and a half millions. In short, by those who hold this doctrine, it is maintained, that, of the whole taxes, the rich pay only about seven

* It will be observed that in this paper we enter into no inquiry as to the policy or impolicy—the justice—or necessity, of these wars. Our only object is to show what the resources of the country have been able to effect.

millions, in which is included the land-tax.' There can be no doubt of the truth of this statement; it is obvious, indeed, on a bare inspection of the tables: but we must at the same time remark, that the inequality arises from no intention to oppress the poor man or favour the rich, but merely from the circumstance that taxes, to be really productive, must be laid on articles which are in very general use, such as malt, tobacco, spirits, sugar, coffee, &c. Now, these are consumed in much larger quantities by the mass of the working classes than they can by the few who are rich; and, therefore, the former are necessarily left to pay the larger part of the tax. Taxes imposed on commodities which are used only by the wealthy, produce hardly any thing if they are low; and when they are raised, the rich give over using the article. The duty on race horses, for instance, produces only L.1317; that on gold and silver plate brings L.74,218; on armorial bearings, L.54,889; but if the duties on these last were raised, fewer would use them, and the amount collected would not increase. The most odious taxes to the general community are those which are of a *direct* nature, such as the house and window duties; large sums being exacted by tax-collectors, without giving any apparent equivalent. These are felt additionally burdensome in towns where the local assessments are generally heavy.

We shall now mention the taxes levied upon a few of the principal articles of use or luxury.

British spirits, in England, per gallon	7s 0d
Do. in Ireland and Scotland	3s 4d
Brandy and gin	22s 6d
Rum	6s 0d
Sugar, from British West Indies, per lb.	0s 2¼d
Do. from foreign colonies (Brazil, &c.)	0s 6¼d
Coffee, from British West Indies	0s 6d
Do. from British East Indies	0s 9d
Tea—The duty is equal to the price on fine teas, and a small fraction less when the price is below 2s. (This is to be changed somewhat after April next year, when the East India Company charter ends.)	
Butter (imported)	0s 2d
Cheese (Do.)	0s 1d
Malt, per quarter	20s 0d
Tobacco, from British possessions in America, per lb.	2s 0d
Do. from any other country	3s 0d
Do. in segars, or otherwise manufactured	6s 0d
Starch	0s 3½d
Olive oil, per tun	169s 0d
Raisins, from L.2, 2s. 6d. to L.1, 2s. and L.1.	
Wines—Cape, 2s. 9d.; French, and all other foreign wines, of whatever quality, per gal.	5s 6d
Lemons and oranges three-fourths of their value.	
Seeds from foreign places—Carrot seeds, 9d. per lb.; clover and grass seeds, L.1 per cwt.; all forest and garden seeds not mentioned in the lists, 6d. per lb.; onion and leek, 1s. 6d. per lb. &c.	
Paper, per lb.	0s 3d
Glass—Plate, per cwt. L.3; crown, L.3, 13s. 6d.; broad, L.1, 10s.; green (for bottles, &c.) 8s. 2d.	
Cinnamon, cloves, mace, and nutmegs, from 2s. 6d. to 3s. 6d. per lb.	
Pepper of all kinds from British colonies	1s 0d

Wheat imported—The duty varies according to the prices in the home market, being low when British wheat is dear, and higher when it is cheap. When that is selling at 73s., the duty is 1s.; and when British wheat is on an average for six weeks at 62s., the duty on foreign wheat imported rises to 24s. 6d.; after which, for every shilling that the home article falls, the duty on the foreign is increased by the same sum.

THE ARMY AND NAVY.

The Army.—The efficiency of the British army has been demonstrated by so many splendid triumphs, that it does not here require an eulogy. The army doubtless owes its efficiency, in the first instance, to the firmness and energy of the national character. The same cause which gives rise to the industry of our people, is the origin also of the successful gallantry of our soldiers. The next cause is, that the British army was generally well served with all necessary stores; and that its higher officers, who were sent out on active service, were men trained and experienced in military operations.

The army at present consists of the following numbers and descriptions of force:—

	Horses.	Men.	Officers and non-commissioned officers.	Expense, pay, clothing, &c. £
Cavalry.				
Guards, 3 Regts.	822	1,053	258	87,129
Line, 21 Regts.	5,240	5,876	1,129	336,850
Infantry.				
Guards, 3 Regts.	-	5,104	613	194,074
Line, 91 Regts.	-	66,322	8,635	2,224,330
Total 118 Regts.	6,362	78,357	10,635	2,842,196

To the account of expense mentioned above, there is to be added about L.340,576 for recruiting, for medicines, chaplains, &c.; and there is also what is called the civil department of the army, or the army management, consisting of the salary of the Secretary at War and his office, the Commander-in-chief and his office, the medical departments, &c., which amount altogether to L.194,210. Reckoning the military actually on duty, the average yearly cost of each man (privates and officers together) is about L.36. There are nearly 10,000 officers in the British army, or one to every six men; this number is considered greatly too high, the French, with a well-disciplined army, having only one to each twenty-four men.

Besides the cavalry and foot regiments, there is another description of force called the ordnance, which includes artillery, engineers, miners, &c. They have the management of fortifications, with their guns, stores, &c.; the making of rockets, and different kinds of shot for great guns. The number of men is 7841, and the yearly expense of the force, with its equipments, L.010,779.

The distribution of the army may be stated as follows:—In Great Britain, 25,636; in Ireland, 20,415; in the colonies, 30,437.

The statements which we have made above relate entirely to the effective force of the army, which is either on active duty or ready to be so employed. But, as we have already remarked under the head of Expenditure, there is a great number of persons attached to the army, who do no duty, though receiving pay like others. Some of these are pensioners, who have either been long in service, or have suffered by wounds, &c., so that their allowances are not grudged; but there are also a number of young people who have purchased half-pay commissions, upon which they go on receiving pay; and some of them are even promoted to high rank in that condition, without ever having really been in the army at all. There has been also a large number of general officers created, who all receive the pay of their rank, though there are no duties for so many commanders. By the terms of the constitution, a permanent standing army is not held to be legal; the army is therefore maintained from year to year by the passing of what is called the Mutiny Act; and if this act of Parliament were not regularly passed, the whole of the standing army would be virtually disbanded. The army now acts almost entirely as a military police, and, as such, is chiefly required in Ireland, and in the vicinity of the large towns in England and Scotland.

THE NAVY.

If the army of Britain has been distinguished for its efficiency and the triumphs it has gained, her navy has added not less to the fame of the country. The series of victories, indeed, which were achieved by the fleets of Britain during the late war, were altogether unparalleled in history; nothing approaching them either in importance or splendour has been written in the annals of any other nation. In regard to the navy, the truth of the remark which we made concerning the effect of the national character on the composition of our military force, will be still more clearly seen; there is no one who doubts that the whole efficiency of our marine is owing to the excellent nursery afforded it by the merchant service: a *sailor* who has never been at sea but in a *man-of-war*, is hardly thought worthy of the name; it is only in merchant vessels that good mariners are trained. A law exists, by which men may be *pressed* into the service of the royal navy without their consent. This is a most unfortunate characteristic in the formation of our sea forces, and its continuance is held as disgraceful by the country at large, especially since good pay would form a sufficient temptation to enlistment.

We shall first mention the expenditure for the navy, and then the nature and distribution of the force. The *civil department* costs altogether L.138,504; this includes the salaries of the Lords of the Admiralty and their office, surveyors, store-keepers, draughtsmen, &c.; pay-office, naval college, and school for ship-building; royal observatory at Greenwich, &c.

The navy expenses, properly so called, may be stated as follows:—

Wages of 28,065 seamen and marines	L.923,175
Dock-yards for repairing and building ships	590,790
Materials, timber, sailcloth, cordage, &c.	457,297
Victualling Office—provisions, L.495,517; management, L.179,805	675,322
Miscellaneous	150,453

The average pay of a sailor is L.2, 7s. per month, with victuals, which are estimated at about L.1, 4s. additional. Much complaint is made of the high salaries paid to people about the dock-yards; the master-workmen receiving L.250 per annum, and the artificers from 5s. to 12s. 6d. per day. During the war, Great Britain had upwards of 1000 ships, manned by 184,000 seamen. The present number of vessels, and their description, will appear from the following table:—

	Number of Guns. 90-120	50-84	43-48	24-39	16-22
Ships in commission	3	19	18	19	42
Ships in ordinary	16	101	69	20	33
Ships building	9	15	30	3	10
Total (409)	28	137	117	42	85

This does not include the smaller vessels, sloops, yachts, bombs, &c., which amount to about 200 additional; making the whole 606 (1827).

The ships in ordinary are vessels which are dismantled, and put aside in a harbour, with only a few persons on board to take care of them. A ship in service, or even thus taken care of, will waste and rot, it is said, in fourteen or sixteen years; but a plan has lately been devised by which those not in service may be hauled up out of the water, and placed under a dry shed, which would make them stand much longer.

There are six marine arsenals or dock-yards—Deptford, Woolwich, Chatham, Sheerness, Portsmouth, Plymouth. The principal foreign stations for the navy are Gibraltar and Malta, in the Mediterranean; Halifax and Quebec, in North America; Jamaica and Antigua, in the West Indies; Trincomalee and Bombay, in the East.

MANUFACTURES.

The manufactures of Great Britain surpass in extent and variety those of any other country, and indeed of all other countries; they are sought for and exported to the most remote and unknown regions, as well as to the most refined and wealthy. Their principal branches are those of cotton, woollen, silk, linen, and hardware.

The Cotton Manufacture is the most extensive of the whole, both in respect to the capital which it occupies, and the number of people to whom it gives employment; it is supposed to form one-fourth part of the total industry of Britain. The number of work-people in its various departments (reckoning spinners, weavers, bleachers, &c.; engineers, smiths, and others engaged in the works) is estimated at 1,200,000; and their wages at five and a half millions. The capital invested in it at present is reckoned at about seventy-five millions; the total value of goods made is supposed to be above thirty-six millions; of which nearly one-half is consumed at home, the other half being exported to foreign countries.* The raw material, or cotton-wool, is brought chiefly from America, and a part also from the East Indies and Egypt. The chief seats of the manufacture are Manchester, Glasgow, and Paisley; and the magnificent apparatus of factories, machinery, warehouses, with which these cities are filled, for this sole business, are the astonishment of all visitors.

The reason why the cotton goods of Britain are so much more in demand than those of any other country, is chiefly the superior excellence of the machinery which her manufacturers have contrived and applied to this purpose; it is calculated that the various inventions now in use enable one man to do as much work as one hundred and fifty could have done when spinning and weaving by the hand were the only methods known. Even after deducting the cost of the machinery, the goods can therefore be sold greatly cheaper than formerly; and as no other nation has either such a variety of experienced workmen for the different kinds of machinery, or for the other departments of the business (such as printing, dyeing, &c.), none of them offer to compete with Britain. The whole of this manufacture has been created since 1760, at which time its produce did not amount to L.200,000.

The Woollen Manufacture.—This manufacture was the earliest established in England; it gives employment to above half a million of people, who receive on an average, men, women, and children, about L.15 per annum. The goods manufactured are valued at twenty millions; the finer qualities of the raw material are imported from Germany, or from our colonies of Australia; the coarser are produced at home: the value of the whole is estimated at six millions. The goods exported amount to about five millions and a quarter. This manufacture, particularly the finer kinds, is chiefly carried on in the north of England; some of the coarse fabrics, such as plaidings, duffles, &c., are made at Galashiels in Scotland; and Kilmarnock and Stirling drive a thriving trade in carpets, bonnets, &c. In the finest kind of broadcloths, the Prussians of Eupen are said to excel the English.

The Silk Manufacture has been carried on in this country for a long time, having been first introduced in the fifteenth century by emigrants from France. It was for many years confined chiefly to Spitalfields in London, and to Coventry. There were then prohibitory duties on all foreign silks, but this, instead of fostering the manufacture, as was intended, only encouraged its proprietors in indolence, as they knew that they had the home market to themselves. These prohibitions have been partly removed since 1824, and those regulations which confined the manufacture to some particular spots, are also done away with; so that the trade has been roused from its inactivity, and a great deal more business is done than formerly. The quantity of silk for working imported in 1823 (the year before removing the restrictions) was two and a half millions of lbs.; the average quantity of the same material imported since, has been three and a half millions. The consumption of silk goods at home has increased more than a half. The annual produce of the manufacture is now estimated at eight millions; and it is supposed to give employment to 700,000 work-people. Its chief seats are London, Coventry, and latterly Manchester, Paisley, and Glasgow, where some of the most beautiful fabrics are now made.

The Leather Manufacture is of considerable importance. The value of the different articles of which it is the material, is estimated at L.15,000,000: this includes gloves, saddlery, boots and shoes, &c. The increase of this trade in late years has been very great; *hides* are imported from all quarters of the world, and the quantity has doubled within a few years. The number of lamb and kid *skins* imported, in 1830, was about three millions.

Iron, Cutlery, and Hardware.—This is one of the manufactures in which Britain particularly excels. The abundance of her mines of iron, copper, tin, lead,

* In America, the whole produce of the cotton manufacture is less than six millions, or one-sixth of that of Britain; yet, either from want of skill, and consequent loss of time, or from the higher rate at which work-people are paid, the amount of wages is about two and a half millions, or nearly one half of those of Britain.

and coal, and the easy access which can be had to them at all points by sea, river, or canal, give facilities which are possessed by no other country. The annual value of the manufactured goods is estimated to be above L.17,000,000, and employment is given to 370,000 men in the working of copper, brass, pewter, steel, tin, and other metals. The declared value of the exports, in 1827, was L.1,387,204. The chief seat of the manufacture of the finer and more skilled articles, is Birmingham, Sheffield, and the immediate vicinity; and from these districts metal goods of all descriptions, implements of war, and the most elegant ornaments of peace, are dispatched to all parts of the world. For heavy cast-iron goods, cannon, parts of machinery, &c., Carron, in Scotland, has been long celebrated. The quantity of iron smelted from the ore in 1827, was 700,000 tons, from 284 furnaces, the greater number of which are in the west of England and in Wales.

The Earthenware, China, and Glass Manufactures, rank next to those we have mentioned. The number of people employed cannot be easily estimated; but as no money has to be sent abroad to purchase any part of the material of these works, the whole proceeds of the goods go to pay wages at home. The annual value of the glass manufactured is about two and a half millions, and that of the pottery and earthenware about three and a half.

The whole value of the manufactures of all kinds produced annually in Great Britain, is reckoned to be about a hundred and fifty millions of pounds sterling.

COMMERCE.

The commerce of Britain next demands our attention. The local situation of the British islands gives them many advantages for carrying on traffic with their own people in different districts, and also with the countries by which they are in some manner surrounded. Their abundance of minerals, tin, salt, coals, iron, gave them materials for trade in very early ages. As soon as the monarchies of Europe began to have intervals of peace after their feudal commotions, the British set about to avail themselves of their advantages, and to prosecute commerce in earnest. They gradually shook themselves free at home of many monopolies and restrictions which long continued to fetter the internal trade of other nations. Colonies were settled, which by degrees gave them civilised communities to purchase their goods, where formerly there had been only savages and a wilderness. These occurrences began to take place chiefly during the peaceful reign of James the First (1601–1624). At that time the exports of England amounted to two and a half millions; the number of seamen in merchant-ships to 10,000; but the good-will of the mercantile interest began now to be an important consideration with the government, from the taxes which it paid. The civil wars of 1642–50 did not interrupt its progress, both parties willingly conceding it their protection; and the naval successes of the republic over the Dutch, with the increased respect which these brought to the country among the other nations of Europe, greatly accelerated the rapid steps which it was now enabled to make. Jamaica, the possession of which was the origin of our West Indian connection, was first occupied by Cromwell, in 1655. Since the middle of the last century, the rapid progress of improvement in our manufactures has continued to afford new materials and goods for exportation, and the increase of trade has been in proportion.

The following table and explanations will give an idea of the trade of Britain with all parts of the world, in 1829:—

	Official value of imports.	Official value of exports, British and colonial.
Europe . .	L.14,525,883	L.34,057,078
Africa . .	1,189,106	1,357,750
Asia . . .	7,985,106	6,807,924
America & its islands	18,632,374	23,837,918
Total .	L.42,332,549	L.66,180,668

In the European trade, the imports from Russia, chiefly tallow, hemp, and timber, are about four millions; the exports to that country a little above three. To Germany, which sells a great deal of our manufactures to other countries (Poland, Hungary, Turkey, &c.) the exports are ten and one-fourth millions; the imports from thence only one and a half. Our trade with France is very inconsiderable, owing to the number of restrictions and high duties on both sides, which fetter commerce. Our imports are only two millions, and the exports not one million. Gibraltar takes nearly a million of British manufactures, which are principally smuggled into Spain, a country where all manner of difficulties and high duties are thrown in the way of trade. Italy takes about four millions in value of British goods; not sending one million of imports; one of her chief articles, olive oil, is almost prohibited by a high duty.

Of the trade to Asia, nearly eight millions of imports, and six and a half of exports, belong to the East Indies and China. The trade of our settlements in Australasia amounts to L.125,720 imports, and L.344,649 exports from Britain.

Of the American commerce, eight and a half millions imports, and six millions exports, belong to the British West Indies; nearly one million imports, and two exports, to the Canadian colonies. The United States have, of imports and exports, each about six millions. Buenos Ayres, about half a million imports, and one and a third million exports, chiefly manufactured goods. Brazil takes, of manufactured goods, four and a half millions.

Kinds of British Goods exported.—The following table will show what were the principal articles of British export in 1828. (The declared value is stated.)

Brass and copper manufacture .	L.678,786
Bacon and beef, butter and cheese .	712,017
Cotton manufactures . . .	17,244,417
Earthenware of all kinds . .	502,215
Herrings	157,532
Glass	500,356
Hardware and cutlery . .	1,387,204
Tin and tinware . . .	413,532
Iron and steel, wrought and unwrought	1,226,617
Linen manufactures . . .	2,000,000
Leather manufactures (saddlery, gloves, &c.)	275,976
Machinery and mill-work . . .	262,115
Silk manufactures	255,871
Woollen manufactures . . .	5,125,983

Description of articles imported.—The following quantities of foreign goods were imported and returned for home consumption in 1828, being some of the principal articles of foreign commerce:—

Coffee, lbs.	17,114,635
Corn—Wheat, quarters . .	805,849
Do. All other grain . . .	351,072
Do. Wheat, meal, and flour, cwts.	126,703
Hemp, undressed	460,544
Flax, tow, and codilla of hemp . .	882,286
Furs of different kinds, number .	1,694,311
Hides untanned, cwts. . .	214,735
Indigo, lbs.	3,064,915
Molasses, cwts.	383,761
Oil—Olive, gallons . . .	1,753,336
Do. Palm	120,509
Pepper and pimento, lbs. . .	2,237,900
Clover seed, cwts. . . .	136,000
Flax seed, bushels	1,965,800
Silk (raw material), lbs. . .	4,546,529
Spirits (brandy and geneva), gallons	4,048,070
Sugar, unrefined, cwts. . . .	3,001,405
Tallow	1,040,806
Tea, lbs.	29,305,757
Timber—(From the various different shapes in which this article is imported, it is impossible to guess at the whole quantity.)	
Tobacco unmanufactured, lbs. .	18,504,510
Cotton wool	208,987,744
Sheep's wool	31,031,461
Wine of all different kinds, gallons	7,162,376

Internal Trade.—These tables, and the explanations we have given, will convey some idea of the foreign commerce of Britain. But an equal source of activity and wealth remains in the inland trade, which is far superior in importance to that with foreign nations. To prove this, we need only state, that, of the whole quantity of cotton goods manufactured, one-half is consumed in the home market. Of hardware, the whole amount made is estimated at L.17,300,000; the quantity exported hardly rises to three millions. The value of woollen goods produced is estimated to be above twenty millions; the quantity exported is only stated at five millions. In like manner, the linen trade, which produces annually (according to the best estimates) about eleven millions, does not export on an average so much as two. There are also a vast number of manufactures, which are carried on exclusively for home consumption, such as beer and porter, in which the mere wages of labour (exclusive of the material) amount to L.3,200,000. Haberdashery, hats, straw manufactured into bonnets, making of furs into muffs, &c.; in these the wages of labour only amount to about L.3,000,000. In like manner, the wages expended on soap, candles, bricks and tiles, and gunpowder, amount to L.2,650,000. Those on steam-engines, machinery, &c. to L.1,200,000. All these articles are for home consumption alone; and as there are a vast variety of other articles of the same kind, it will be seen, that, though the foreign trade of the country is important in furnishing *materials* for many manufactures, and employment to others, it by no means constitutes the largest portion of the industry of the country. The people of Britain are in truth their own best customers; and, from their great wealth and unceasing industry, this fact cannot surprise any one.

The Commercial Marine.—The number of ships employed in the trade of Britain is in proportion to its great extent. The following is an account of their number, tonnage, and crews, in 1830:—

	Vessels.	Tonnage.	Men.
United Kingdom .	19,675	2,168,016	130,000
Guernsey, Jersey, & Man	499	32,676	3648
British plantations	4549	330,227	21,163
Total	23,723	2,531,819	154,809

The following is an official abstract of the number of steam-vessels in 1829:—

	Vessels.	Tons.
England - -	241	20,611
Scotland - -	75	5953
Ireland - -	26	4791
Total	342	31,355

None of these accounts include, of course, the vast number of canal-boats, or, what forms a very considerable item, the number of fishing-boats of from ten to fourteen tons, with which many parts of the coast are swarming.

PUBLIC WORKS, CANALS, RAILROADS, BRIDGES, DOCKS, &c.

Connected with our manufactures, are the great works of the civil engineer, which cover every part of the kingdom—the canals, roads, docks, bridges, piers, &c.—works which attest, more obviously than any others, the activity, power, and resources of the country. Magnificent as they are, however, they seldom attract the admiration which they merit. They are, for the most part, seen rather as a matter of chance, and passed by with a gaze of idle wonder, than studied as monuments of art, and as ministering largely to public utility. It is to the facility of internal communication, afforded by these works, that the heaviest goods, though manufactured in the interior of the country, can be carried to sea-ports for exportation, without any burdensome addition to their price; and materials for their different manufactures can be carried to inland towns from sea-ports, by canal or railroads, with the same advantage. Had we had bad roads, few bridges, and no canals, all trade must of necessity have been confined to the sea-coast.

The length of the turnpike-roads, in 1823 (the latest authentic account), was 24,531 miles; annual income, L.1,214,716; debt, L.5,200,000. The income, of course, was from tolls, and was intended for repairing the roads, and paying the interest of the money borrowed for constructing them. The total length of the canals, in the same year, was 2869 miles; the income on these canals amounted to L.13,205,116, which, besides keeping them in repair, afforded an average profit to the proprietors of 5¾ per cent. on their capital.

The *Bridges, Aqueducts, and Tunnels*, which have been erected in connection with roads and canals, are more magnificent and numerous than those of any other country in the world. To estimate their number would be difficult; but we may mention, that, in London, the Waterloo and London bridges alone cost very nearly two and a half millions of money. The iron bridges which have been erected in different places, are the admiration of all foreigners. Their arches are constructed of a number of strong ribs of metal, standing apart from each other like the joists of a house, and on these the floor or roadway is formed. Bridges of suspension are now also common, in which the roadway is suspended by iron bars, from strong chains which are fixed in the earth, and then hung over high pillars at each end of the bridge; by this means bridges can be constructed over deep and broad waters, where it would have been altogether impossible to stretch an arch of any other kind. There is a fine specimen of this kind of bridge at Montrose, over a tide current, whose rapidity did not admit of stone arches and piers; it carries the road over 432 feet of water; the cost was L.20,000. On a well-frequented road, bridges costing L.14,000 or L.19,000 are often constructed merely to shorten the distance by a mile or two, or to avoid an inconvenient ascent in the old track. Were it possible to estimate the amount of capital laid out on this kind of improvement alone, it would be a matter of astonishment.

The number of *Railroads* at present in active employment is above sixty. They are of various magnitude; but few of them, except the yet unequalled one betwixt Manchester and Liverpool, are more than twelve or fifteen miles in length. The latter celebrated work is thirty-three miles long, having double tracks laid with iron; and it is constructed almost on a perfect level, over bogs, through banks of rock and gravel, and at some hollow places raised several feet above the soil in order to preserve the level. The cost was about one million of money, and the yearly expenses of the moveable steam-engines which are employed to drag along the carriages, are high, from their liability to wear and to accidents; but yet the company, notwithstanding that they have greatly reduced the price both of carriage and travelling on this road, make very liberal profits, amounting, we understand, to eight or nine per cent. on the capital expended. The original shares, which were L.25, are now selling at L.52. The success of this great enterprise has encouraged the undertaking of a great many others of a similar kind. Nine new railways received the sanction of Parliament this season; among which, there is a remarkable one from London Bridge to Greenwich, of 3¾ miles in length, which it is proposed to carry over the tops of houses and through streets, for two miles and a half, upon arches and pillars of iron. Another of great extent is also begun from London to Birmingham; this will cost two and a half millions, and is to be of 112½ miles in length, with ten tunnels; the rate of travelling to be twenty miles per hour. As it may gratify our readers to know the distribution of the money laid out in these undertakings, we subjoin an account of the estimates for another magnificent work of the same kind, that is proposed to be made between London and Bristol, which will be 120 miles long. The country, except a short distance next Bristol and Bath, is remarkably level.

Parliamentary and other preliminary expenses	L.50,000
Purchase of land, including compensations for damages	340,000
Entrances to London, Bristol, and Bath, with the erection of warehouses, &c.	223,000
Excavations and embankments, including tunnels and their masonry . . .	835,300
Bridges and masonry, exclusive of that of tunnels	474,800

Rails, and laying ditto, making road, &c.	L.620,700
Lesser depôts, stopping places, and lighting tunnels	28,000
Moveable or dragging steam-engines, and water stations . . .	78,500
Total estimated expense of railway	L.2,650,300

On these railways, a moveable or drag steam-engine draws along waggons conveying merchandise of 240 tons, at the rate of fourteen and fifteen miles an hour. It would take 100 horses, working for a day on a good turnpike-road, to do what a single steam-engine can effect in an hour and a half on a railroad. From the cheapness with which all kinds of goods or passengers can be carried in either direction on these iron roads, every disposable article fetches a higher price by the difference of carriage; and some that could not formerly be sold at all, become highly valuable—such as building materials, &c., for the new erections that start up along their line. From these reasons, the construction of a railroad in a track judiciously chosen, increases at once the value of land and the rate of wages along its whole line. In making the Bristol railroad, about two millions will be expended in paying work-people.

We have been a little particular on the subject of railroads, from the vast employment which the new works of that kind now constructing are thus affording to all kinds of industry, from the engineers who plan the line or construct the steam-engines, to the thousands of workmen who are occupied in the manual labour of the immense operations which are required. The improvement which they promise to afford in the matter of carriage, the saving of time, of labour, and of expense, will be to this generation a boon similar to that of the new cotton machinery of the last.

Docks, Piers, and Lighthouses.—Docks are artificial basins built of stone for the reception of ships: they are of two kinds, wet and dry. A dry dock is a receptacle where vessels are built or repaired; after which the tide is admitted by flood-gates, and they are floated out to sea. Wet docks are constructed for the use of ships when loading and unloading, it being found that when they are allowed to settle down unequally on the mud or sand of rivers and harbours, their timbers are strained, and the vessels considerably damaged; in the wet docks they are kept always afloat. The capital expended by some of the dock companies in London is immense: that of St Catherine's is L.2,252,800; the docks and buildings cover twenty-four acres of ground, and ships of 800 tons are received into them without difficulty. The capital expended by the London Dock Company in purchasing ground (chiefly the sites of houses and streets) was more than one million; and the whole cost of the works was L.3,038,310: this undertaking, however, has not paid the original subscribers, the shares being now worth only about L.60.

The docks at Liverpool have a water-room of one hundred and eleven acres, and the quay space is eight miles in total length. The business transacted may be conjectured from the fact that the dues paid by vessels using them in 1830 was L.151,328. The dues received at Bristol in the same year were L.24,754; at Hull, in 1827, L.22,381. Few of the large seaports are without the accommodation which docks yield to commerce: those at Leith contain ten acres of water-room, and have cost L.285,108. It would be idle to attempt a description or even enumeration of the immense number of piers and harbours which have been constructed at the different sea-ports. At every place where the profits of trade seemed to authorise such erections, capital was seldom wanting to complete them.

The *Lighthouses* of Britain are perhaps the most remarkable part of the nautical apparatus of the islands. The capital expended upon them has been large, and the skill with which some of them, such as the Bell-Rock and Eddystone lighthouses, are constructed for durability in the midst of a tempestuous sea, could only have been erected in a country where mechanical science existed in its highest perfection; and there is hardly a dangerous or doubtful point along the coast where the mariner is not guided by a light on some headland or rock. There is, however, much complaint concerning the dues levied from ships for lighthouse expenses; some of them are held as profitable tolls by private families, and in others money is applied to purposes quite unconnected with lighting. Many of the dues are thought, by commercial people in general, to be greatly too high.

AGRICULTURE.

The improvements which British industry has introduced into agriculture, have not done less to advance the wealth of the country than those effected in commerce and mechanics. The regular and scientific rotation of crops, according to the nature of soils and of the different plants; the creation of the turnip husbandry, and of artificial grasses; the management of different kinds of manure; the systematic attention to improvement in the breeds of cattle, horses, and sheep; the perfection of the different kinds of agricultural machinery. In all these, Britain has made advances which no other nation has yet thought of: some have improved their breeds of sheep, others have soils which raise large crops of grain with less expense than ours, but the total produce of a given quantity of land is in no country to be compared to the value of that in Britain. This produce also is raised with less labour than the smaller returns of foreign countries. In France, two-thirds of the population are required for the mere cultivation of the soil, while in England and Scotland that business is performed far more productively by one-third part of the people. A great part of the work which is done in France by men is in this country performed by machinery (such as *fanners* for winnowing, and mills for thrashing the corn), or by horses and other cattle. It is calculated that by the two latter aids (cattle and machinery) the farming interest of Britain have brought into operation a force greater than twelve times the number of labourers whom they employ. In France, the assistance derived from the same sources is only five times the force of the labourers employed. Bengal is reckoned one of the most fertile countries of the East, and it is nearly of the same size as Great Britain; yet, with all its advantages of rich soil and warm climate, the inhabitants can only raise from it crops of the average value of L.1 per acre, of which, from their want of skill, three-fourths are consumed in the expenses of cultivation. In Britain, the *average* produce of the cultivated land of all qualities is L.5 per acre; and the expense of cultivation does not exceed one-third of this return; so that the profit or remainder for rent and outlay of capital in Bengal is only five shillings, while in England it is L.3, 6s. 8d. Such is the unskilfulness of farmers in that country, that it takes four-fifths of the people to do the work of cultivation, leaving only one-fifth for all other trades: in Britain, as we have seen, farming work brings five times as much gross produce, and leaves eleven times as much for rent and profit of capital—employing only a third of the population, and leaving two-thirds for other occupations. These results are entirely owing to the superior industry and ingenuity of the people, for our soil and climate are greatly inferior either to those of Bengal or France.

The following statement is taken from a report of the emigration committee, 1829:—

Acres.	Cultivated.	Wastes capable of improvement.	Unprofitable.	Total.
England & Wales	28,749,000	3,984,000	4,361,400	37,094,400
Scotland . .	5,265,000	5,950,000	8,523,930	19,738,930
Ireland . .	12,125,280	4,900,000	2,416,664	19,441,944
British Islands .	383,690	166,000	569,469	1,119,159
Total .	46,522,970	15,000,000	15,871,463	77,394,433

In England and Wales, it is calculated that the cultivated land is distributed in the following proportions: Three and a quarter millions of acres are in wheat; four and a half millions in the other grains—barley, oats, rye, pease, &c.; 2,400,000 in green crops, one half for grass, and the other for turnips, &c.; 2,100,000 fallow; 17½ millions pasture; 10,000 pleasure grounds; 1,200,000 hedge-rows, copses, and woods; and there are 1,300,000 acres in roads, highways, and water courses.

RELIGION AND THE CHURCH.

All religions are allowed to exercise their different forms of worship in Great Britain, and no violence can be offered to any man in matters of conscience. Every different denomination of Christians have their own churches, employ whom they please as their pastors, and are equally under the protection of the law in the performance of their sacred rites.

The churches of England and Scotland, or, as they are commonly called, the established churches, enjoy a pre-eminence over the other denominations. Their clergymen are provided with salaries, paid by taxes or tithes levied on all men equally, whether of that particular sect or not.

The income of the church of England is given as follows, on rather a low estimate:—

Income of the parish clergy .	L.3,447,138
Incomes of bishoprics . .	150,000
Do. deans and chapters . .	275,000
Total revenue of English church	L.3,872,138

The following table exhibits a summary of the value of the income of the parish ministers of Scotland:—

172	parishes at	L.150 each .	L.25,800
200	do.	200 . .	40,000
200	do.	250 . .	50,000
200	do.	300 . .	60,000
100	do.	325 . .	32,500
76	do.	350 . .	26,600
948			L.234,900
948 houses and glebes, valued at L.30 each,			28,440
Total income of Scottish church			L.263,340

In Scotland the stipends of the established clergy are paid by landholders, who have all had their tithes commuted upon an old and very low valuation. In no part of this country, therefore, is the church felt to be burdensome in a pecuniary sense, except in Edinburgh, where the clergy are supported by a money-tax levied from a certain class of the inhabitants. The incomes of the Edinburgh clergy average about L.600 a-year each, which enhances the amount in the above table.

The aggregate revenue of the church of Ireland is reckoned to be nearly L.1,300,000. The latter sum is much grudged by reformers, because it appears, that, out of a population of seven millions, Ireland contains scarcely half a million who attend this church, five and a half millions being Roman Catholics, and the rest Presbyterians or Dissenters of various denominations.

The total income of the established church in England, Scotland, and Ireland, is therefore L.5,307,470. There are many complaints, in England particularly, as to the distribution of this money, and of the large sums received by the bishops and other dignitaries, who are not actively employed in any church duties, or of others who hold two or three offices merely for the sake of the salaries. The inferior clergy who minister to the congregations are said at the same time to be ill paid. Lord Henley states that the duty in 4530 parishes is performed by curates (*assistants*), one sometimes serving two parishes; about 3000 of these assistants have less than L.150 per annum; 248 have under L.40, and 60 have less than L.30.

It would give us pleasure, had there been space, to enumerate some of the splendid buildings which have been erected in this country for the convenience of religious worship, and which are an equal proof of the wealth and of the correct habits of the people. We do not allude merely to those which have been raised at the public expense, but to others erected by different denominations of Christians, which decorate some of the finest streets of our cities, or give interest to the solitary beauty of many of our remote villages. A school or a dissenting chapel, in the latter kind of places, are proofs at once of industry and devotional feeling among their humble inhabitants, which are the surest pledges of national prosperity. In England, the number of congregations of the establishment is 10,000; of dissenters, 6500.

EDUCATION.

There are several great and richly endowed universities for the education of young men devoted to the learned professions. The establishment of Cambridge and Oxford in England, those of Edinburgh, Glasgow, Aberdeen, and St Andrew's in Scotland, with the Dublin University for Ireland, thereby conferring a sort of elevated rank on a class of the professors of learning, have served to give it importance in many circles where it might have been neglected, had it appeared in a humbler shape. But it is not to these that we would principally direct the reader's attention at present: the academies which are rising in every town of any considerable size, for the education of young people of the middle and commercial classes, are an object of deeper interest, and of more extensive utility: of these we are sorry that we cannot estimate the number, nor their proportion to the population; we can only say that there are few of our large towns, where, by the exertions and subscriptions of the inhabitants, one has not been established, in which all the requisite branches of knowledge are taught by men of the most respectable qualifications. In other parts of Europe there are many public institutions and colleges; but of academies like these, supported by the private wealth of the citizens for their own service, Britain shows the only example.

With regard to the provision made for the education of the great body of the people, considerable pains have been taken by Parliament to collect what information could be found. A committee was appointed in 1816 for this purpose, in regard to England and Wales; and the result of their inquiries was as follows:—

England and Wales.

	No. of Schools.	Scholars.
Endowed schools (rev. L.303,342)	4,376	173,058
Unendowed day-schools .	14,854	501,825
Sunday schools . .	5,463	477,226

Scotland.

Parish schools (rev. L.20,611)	912	54,161
Endowed schools (rev. L.13,679)	212	10,177
Unendowed day-schools .	2,479	112,187

The number of unendowed schools varies from year to year, but the Parliamentary Commissioners saw reason to think they were gradually increasing, and that they have been augmented considerably since 1818. Great exertions are now making by the people to educate themselves, in which they are a good deal assisted by those of the wealthier classes, who have the sense to reflect that knowledge promotes industry, and leads the labouring people to have a pride in depending for every thing on their own exertions. In the unendowed schools, the number of children under tuition at present is about one million.

In Ireland, the number of teachers is about 12,500, and the scholars 568,964. Many of these schools are of the poorest kind, with teachers of a very low class, whose appearance and character can inspire their scholars with no respect for learning. Government has lately appropriated funds for the assistance of such school-districts as may consent to use lessons that can be read without offence by either Protestants or Catholics, so that both may attend the school; and this measure promises to do much for the diffusion of education in Ireland.

The *country parts* of Scotland are much benefited by their parish-schools, an institution which has long existed in that kingdom: this advantage, however, is not felt by the population of towns and burghs, where the original form and use of the parish-school, as applicable to the wants of the working classes, are no longer known. This inequality is the more felt, that the population is becoming continually more concentrated in large towns, where the advantages of a Scottish education are no longer within their reach. The case of towns in this respect deserves the careful attention of government.

YEARLY INCOME OF THE EMPIRE.

A curious estimate has been formed of the total annual income of all classes of people in Britain, with the aggregate value of the articles of use and luxury which each produces in the course of the year. This cannot of course be considered as perfectly accurate, but it serves as an approximation, to exhibit the surprising amount of *goods* or wealth created yearly by the inhabitants of this country, and shows at the same time the relative importance of each class in respect of production.

Agriculture—		
Grain of all sorts	L.86,700,000	
Green crops of all kinds	122,000,000	
Gardens, nurseries, seeds, timber	6,400,000	
Cheese, butter, eggs	6,000,000	
Cattle	3,500,000	
Hemp and wool	12,000,000	
		L.236,600,000
Mines and minerals—		
Slate, chalk, stone, gravel	1,000,000	
Salt and alum	600,000	
Metals	7,900,000	
Coal	11,000,000	
		21,400,000
Inland trade—Profits		41,425,000
Coasting trade—Do.		2,550,000
Fisheries—Produce		3,400,000
Shipping and foreign commerce—Profits		34,398,059
Bankers' profits		4,500,000
Foreign income, from estates in West Indies, interest on money lent abroad, &c.		4,500,000
Manufactures—(The separate articles under this head are mentioned in another page)		148,050,000
Total of produce and property annually created in Great Britain		L.503,823,059

ESTIMATE OF THE PUBLIC AND PRIVATE PROPERTY IN THE EMPIRE.

An estimate has also been formed of the value of the whole property, public and private, which has been created and accumulated by the people of this country, and which they now actually possess. This value, when the sum is expressed by figures, is so immense, that it eludes the imagination to conceive it; the relative proportions of the different parts may, however, be understood, and are really interesting; as for instance, whether there is more money laid out by the country in shipping, or in agricultural property and implements, &c. We subjoin the table:—

Capital invested in the following articles.

I. Productive Property.	
In cultivated land of all kinds	L.1,600,000,000
Tithes due to laymen	106,000,000
Mines and minerals	109,800,000
Canals, tolls, railroads, and rough timber	66,200,000
Dwelling-houses, warehouses, factories, &c.	533,000,000
Manufactured goods unfinished, finished, and on sale	186,300,000
Foreign merchandise paid for	53,300,000
British shipping of all kinds for trade	35,300,000
Agricultural property, consisting of grain, hay, straw, cheese, butter, &c., with implements of husbandry	59,900,000
Animals tame and trained, horses, cattle, sheep, hogs, goats, asses, poultry, game	242,000,000
Fisheries on the coasts and rivers	13,200,000
Total productive private property	2,995,000,000
II. Unproductive Private Property.	
Waste lands, at present unproductive	L.176,000,000
Household furniture in dwelling-houses	246,000,000
Wearing apparel	27,000,000
Plate, jewels, and ornamental articles in houses	58,000,000
Coin and specie in circulation and hoarded	19,900,000
Money in saving banks	14,400,000
Money belonging to suitors in Chancery	38,900,000
Total unproductive private property	580,700,000
Total private property	L.3,575,700,000
III. Public Property.	
Public buildings, as palaces, churches, hospitals, prisons, bridges, &c.	L.35,200,000
Public arsenals, castles, forts, &c., with the artillery, stores, &c., thereto belonging	22,000,000
Dock-yards, and all materials of ship-building and repairing	13,000,000
Ships of war of all descriptions	20,000,000
Military, naval, and ordnance stores	13,000,000
Total public property	L.103,800,000
Total public and private property	L.3,679,500,000

By *productive property* in the above valuation is meant all such as is held chiefly for the purpose of being employed in the production of other articles: all kinds of tools, machinery, cultivated land, agricultural live stock, roads, canals, &c., are therefore *productive property*. The name *unproductive property*, again, is given to such articles as are held without any purpose of being made useful in producing new commodities; under this head are household furniture, horses not kept by business-people, pleasure ground employed merely as such, and so forth.

The wealth of the empire is distributed in the following proportions between the three countries:—

	Productive private property.	Unproductive private property.	Public property.
England	2,054,000,000	374,300,000	42,000,000
Scotland	318,100,000	51,100,000	3,000,000
Ireland	622,100,000	116,400,000	11,900,000

The proportion which these values bear to the population in each country is not suggested by the table; but in England (taking productive and unproductive property together) the ratio is L.186 to each person; in Scotland, L.160; and in Ireland, L.96.

Were it possible to procure tables of the same kind as these two, with regard to the other countries of Europe, the comparison would show in a strong light the immense superiority of Britain in the industry and wealth of her inhabitants. Instead of there being L.186 of property for each person as in England, L.160 as in Scotland, or L.96 as in Ireland, it would be found that in most of these countries there would hardly be L.15 for each, in some much less, and (excluding Holland) not L.30 in any of them.

EFFECTIVE POWER AT WORK IN BRITAIN.

In the absence of tools, machinery, and trained animals, every kind of labour would have to be performed by the mere strength of men. There are many things now done, indeed, which no mere human strength could effect, such as the draining of deep mines, and many others; but supposing that some method were discovered of applying men's strength to all these, it would be a curious inquiry to discover what number of men would be able to exert power sufficient for producing all the force now yielded by steam-power, machinery, and the power of animals, in Great Britain. The researches of a foreign statist, Mons. Dupin, have enabled us to give an answer (or at least an approximation) to this curious question.

The population of England and Scotland may be taken in round numbers at fifteen millions; from this number are to be deducted females, children, old people, men not engaged in any productive or mechanical employment; and the remainder, actually at work, will be 6,397,339.

Agricultural force.

Men—effective labourers	2,132,446
Animals—horses, a number equal in power to	8,750,000 men
Do. oxen, a number equal in power to	13,750,000 men
Estimate for Ireland; power of men and animals, equal to	7,455,701
Total living force in agriculture, equal to	32,088,147 men

Force employed in Manufactures.

Men—effective labourers	4,264,893
Animals—equal in power to	1,750,000 men
Estimate for Ireland—men and animals	1,260,604 do.
Total living force in manufactures	7,275,497 men
Mills and water power	1,200,000 men
Windmills	240,000
Wind and navigation	12,000,000
Steam-engines	6,400,000
Estimate of mechanical force for Ireland	1,002,667
Total inanimate or mechanical force in manufactures	20,842,667

Taking all these together, it appears that the whole force of men, animals, and machinery, which is in operation in Great Britain and Ireland for agriculture and manufactures, is equal to the strength of more than sixty millions of working men; and this power, it must be recollected, is created and managed by little more than a tenth part (6,397,339) of that actual number of people, which is the whole proportion really at work.

In France, notwithstanding that the population is much larger (about thirty-one millions), the force applied to manufactures is only about eleven millions and a half; while the total force employed in agriculture, and the arts of all kinds, affords only the result which would be given by the strength of forty-nine millions of working men. Thus, though the population of Britain be less than that of France in the proportion of twenty-three millions to thirty-one millions, the power of labour in Britain is greater in the proportion of sixty to forty-nine, or nearly five to four.

POPULATION.

An account of the population of the empire has been taken at intervals of ten years from 1801; and the following table will show the gradual increase which has occurred during these intervals:—

	1801.	1811.	1821.	1831.
England and Wales	8,872,980	10,163,676	11,978,875	13,894,569
Scotland	1,599,068	1,805,688	2,093,456	2,365,807
Ireland	—	4,500,000	6,801,827	7,734,365
Army and navy	470,598	640,500	319,300	277,017
Totals	10,942,646	17,109,864	21,193,458	24,271,758

The increment from 1811 to 1831 is forty-one per cent. When the population of a country is thus steadily on the increase, it is the best proof that the comforts and means of living among the people are also gradually improving. When the people, on the other hand, are becoming poorer and more destitute, families have not means to rear up their young children, by affording them those comforts and attentions which are necessary for protecting life at that tender age; hence numbers of them die early. It is calculated that in Russia one-half of all the children die before they are a year old; while in Britain there are not more than thirty in the hundred who do not survive that time. This proceeds solely from the miserable and degrading poverty of the Russian parents, and the comparatively comfortable circumstances of those in England. The same cause makes persons who fall into weakly health much more liable to a fatal issue in poor and barbarous countries, than where the population enjoys a moderate degree of comfort. And, accordingly, it is found that people on an average live much longer in this country than in most others of Europe. A statement was lately published by Mons. Moreau de Jonnes, from which it appears, that, in Italy, 1 person in every 30 dies during the year; in France, 1 in every 39; in Germany, Denmark, and Sweden, 1 in 45; in Ireland, 1 in 53; in England, 1 in 58; and, in Scotland and Iceland, 1 in 59. The author attributes this difference in the number of deaths solely to the effect of climate, concluding that men in general live longer in northern countries than in the south. It appears, however, that the cause of the difference depends almost altogether on the proportion of civilisation and comfort existing among the labouring classes in each country.

The increase has been greatest in the manufacturing districts, where, in some instances, it has been double of those which are merely agricultural; as, for example, the increase in the manufacturing counties of England, from 1821 to 1831, was 22 per cent., while, in the agricultural counties, it was only 10½. The increase in the population of towns and considerable villages has also been large and steady, while that of the merely rural districts has remained the same, or has in some cases even diminished, particularly in Scotland. The reason of this difference in both cases is the same, viz. the greater facility of procuring employment in manufacturing places, and in towns which attract settlers from the farming districts, and the more rapid increase of population, arising from this greater ease of making a subsistence for families.

Much discussion has taken place among people learned in such matters, whether the means of the country to maintain her people has increased at an equal rate with the population itself; that is, whether there be an equal stock of necessaries in the country for giving employment to each person now, when the population is twenty-four millions, as there was in 1811, when it was only seventeen millions. Has the *capital* (or stock of goods, machines, and subsistence) increased at an equal rate with the numbers of the people? This is a question which admits of a very ready answer; for, as it is confessed on all hands that the bulk of the people are now in more comfortable circumstances than they were in 1811, or at any former period, and as the same fact is proved by the greater average length of human life, which has gone on increasing for the last century, there cannot be a doubt but that capital has increased much faster than population; that is, that every provident individual is richer, or in more comfortable circumstances, than he could have been at any former period. When we look into the houses of any of the labouring classes, such as fishermen, for example, and find them stocked with neat and comfortable clothing—their room furnished with a wainscot or perhaps a mahogany table, a large bible, and an eight-day clock—when we see that they are now able to provide these things for themselves by their own industry, while thirty or forty years ago it would have been impossible—what is this but a proof that the capital of these men has increased faster than the number of their families? The same observation may be extended to all classes, for the circumstances of all are much more comfortable than they were fifty years ago; at which time one *hodden gray coat* (home-done grey) was made to last with a countryman for his Sunday's dress during a whole life; when country houses had no fire-places but a corner of the floor, and no chimneys but straw plastered with coarse clay. It is surely needless to say, that every person has better means of living now than he had then; and if the goods of each individual be increased, the *capital* of the country is increased in the same proportion; that is, it has increased a great deal more rapidly than the number of the people; and each of the people, though their numbers be greater, has a better stock of necessaries and comforts than he had at former periods. We do not mean to deny that there are several classes who are in distress (such as the hand-work weavers, who are obliged to compete against the cheaper steam-loom), or that there are some important interests which labour under heavy difficulties; our position refers only to the general state of the country, which is manifestly improved.

DIFFERENT CLASSES OF PEOPLE.

The Peerage.

There is, properly speaking, only one body of individuals in the empire which can be said to form a separate and distinct class, having rank and privileges different from those of the other subjects. This class is called the *peerage*, and sometimes the *nobility*, or *aristocracy*: its members are distinguished by certain titles, which are the badges of their rank; some of them being of higher degree than others. The titles stand in the following order, from the lowest to the highest:—Baron, viscount, earl, marquis, duke, and prince: the last title is conferred only on members of the royal family. These titles are at the disposal of the king only, and are given to men who have distinguished themselves in any high situation in the service of the state; such as judges, admirals, and the commanders or great officers of armies; and they are also bestowed on the heads of wealthy and influential families, to whom it is thought right, by such means, to give additional weight in their several neighbourhoods. The title, once bestowed, becomes hereditary in the representatives of the first possessor: hence the existence in the country of aristocratical or titled families as a distinct class. They are in general wealthy, as well as titled; and, by intermarriages with the rich mercantile classes, they preserve in their families a show of great opulence. There is an order, however, commonly called the *high aristocracy*, which intermarry only amongst themselves: the incomes of some of these are very large, reaching, it is said, in two or three instances, to L.300,000 per annum. It may be mentioned, however, that, rich as many of the aristocracy are individually, their whole income is but a drop in the bucket compared with that of the other classes; on the largest calculation, they cannot have more altogether than fourteen or fifteen millions from their estates annually; while the rest of the country has two hundred and forty-six millions from agriculture alone, and from all sources more than five hundred millions. The circumstance of the aristocracy living much together as a body, and possessing certain privileges which confer distinction upon them in Parliament and about the court, attracts an attention to their families, which, were wealth alone regarded, they could not enjoy. Any individual peer is entitled to demand an audience of the king, and to state to his majesty his opinion upon public measures under discussion. British peers have seats in the House of Lords in virtue of their birth, and those of Ireland and Scotland elect a certain proportion of their own number to sit there; the Irish elected peers sitting for life, those of Scotland during the Parliament for which they have been chosen. A peer can only be tried, in any criminal case, by a jury of persons of his own rank. These privileges, and some others, give to individuals of this rank an elevation and distinction in the eyes of the other classes, which generally makes their company or alliance much courted and sought after. Of late years, many different opinions have been broached as to the utility of their legislative functions, but this is not a place to argue such a point.

The number of the peerage varies from time to time, by the creation of new families, and the extinction of titles to which heirs are not found in the prescribed lines. The number of the British peers, or those who sit in the House of Lords, is about 400; of which titles, about one-half have been conferred within the last fifty years, and only forty-seven existed before the year 1700. The Irish peerage is about one hundred and sixty in number; of whom twenty-two have titles of earlier date than 1700. The Scots peers are about eighty, whose titles are all dated before 1707, and about twenty before 1600. Twenty or thirty of the Scots peers are also British peers, and have seats in the House of Lords.

The Clergy.

The clergy, though apparently existing as a separate order, are so in regard to their profession only—in the same manner as lawyers, merchants, and others. They are composed of men sprung from all orders of the community—the richer benefices in the church being open to all young men of the wealthy classes who are not dissenters, and the lesser livings and curacies to every order of aspirants who can procure the requisite education. The revenues of the church have been already mentioned, together with some particulars in regard to their distribution. The English clergy have a gradation of rank among themselves, with a number of titles unknown to the Presbyterian churches: as, for instance, archbishops, of whom there are two in England; bishops, of whom there are twenty-five; deans, and sub-deans. There are also certain clerical offices belonging to the cathedrals, such as prebendaries and others. These dignities are generally held by some of the parish clergy in conjunction with their parochial office.

The Law.

The nature of their education and business detains lawyers chiefly in the capitals of the three kingdoms, at least those of them who aspire to eminence in their profession; and as they are an influential body, associating much with one another, and having many interests in common, they assume somewhat of the appearance of a separate class. They furnish individuals for occupying the most important offices of the state, and those on which peace and justice through the country most immediately depend—as the Lord Chancellor, the whole of the judges, the assessors (or interpreters of law), who are appointed to assist magistrates of towns in the discharge of their duties, and many others. Men of property or large business are generally obliged to have an adviser from the same body, to inform them on matters where there is any difficulty of law. A great part of the most important transactions of the country, therefore, pass through the hands of men of this profession. There appears to be a disposition at the present time, among the highest members of this body, to remove some of those antiquated legal incumbrances whose delays and expenses the people so often feel to be a denial of justice.

The Mercantile and Manufacturing, or Middle Classes.

These classes are united more by being engaged in similar occupations, and having the same interests, than by standing in one rank in society; for they are of all gradations, from the small capitalist or manufacturer, who struggles for a living, to the wealthy merchant or owner of factories, who could raise and depress prices and wages almost at his own pleasure, were it his interest to do so. It is on the industry, foresight, and economy of this large class, that the prosperity of the country mainly depends. Were they rash and ill-informed, instead of a continual progress of the whole body to increased opulence and larger capital, there would only be a succession of bankruptcies and commercial panics, which would ruin the trade of the country in a few years. But they are *in general* men of sound views, trained to a practical acquaintance with the objects of trade, and the means which are necessary for its success. The merchants and great manufacturers of Britain are frequently the best educated and most liberal men of the country; for as their occupations lead them to associate with persons of different countries and of all professions, they acquire a knowledge of the interests and habits of all, and have both their knowledge and their curiosity enlarged at the same time.

With regard to the lesser class of capitalists and manufacturers, we generally find them to be men who have risen in life by the skill and economy they have displayed in surmounting difficulties of a very arduous kind, and who are silently laying the foundation of a still higher ascent for themselves, or, if that be too late, preparing their children by an useful education to rise from the step which they have gained. It is by this useful ambition, and the industry and economy to which it gives rise, that the capital of the country keeps always ahead of its increasing population.

Farmers, and the Agricultural Class.

British farmers, generally, occupy a much higher status in society than the cultivators of the soil in other European countries. But their situation is said to have become much worse of late than it was twenty years ago; rents, it is alleged, have not fallen in proportion to the fall in the prices of grain and other agricultural produce; so that the farmer has no encouragement for laying out money in improving either his land, his breeds of stock, or his modes of labour. Yet there is as great a competition for farms as ever; and the farmers themselves, by their offers, will not allow rents, of which they complain, to fall. The reason of the latter circumstance (which is the source of the whole) is, that the family of a farmer, living with him in a kind of seclusion, apart even from villages, see and know nothing as they grow up but their father's business, and that of other farmers, so that they learn to neglect every other as matters in which they have no concern. It is different with young persons brought up in towns or large villages, who daily encounter people of many different professions, and seldom adopt that of their father. The sons of farmers, on the other hand, see no occupation but one, at least so as to become familiar with them; hence most of the young men become passionately attached to that one, and there are almost always too many bidders for every farm. Though the profits of agriculture have fallen, the wages of farm servants continue nearly steady, which is owing to the increased demand for men in manufacturing places.

Mechanics and other Operatives.

There is a great difference between the value of the time of different mechanics, according to the different degrees of strength, skill, or delicacy of handling which their businesses require. Hence there are almost as many different grades of society and ways of living among the class of tradesmen as among those of higher rank. Those whose business requires great skill and tedious apprenticeships, receive very high wages; and if they have a taste for neatness and comfort at home, they are able to furnish their dwellings in a style of much good taste, and even elegance; besides giving their children a correct and useful education.

Our article on POLITICAL ECONOMY treats so largely of the principles affecting the condition of the operative classes, that nothing need here be added on this branch of our subject.

Summary of Classes.

It has been ascertained, that, in 1831, there were of the classes belonging to the aristocracy in Great Britain, from 3000 to 4000 families; of squires and gentlemen, who are land-proprietors, stock-holders, money-lenders, &c., from 50,000 to 60,000 families; of learned professions—36,000 clergy of all denominations, about 30,000 lawyers, and 50,000 physicians, surgeons, apothecaries—making 116,000 families, with half as many more dependents; of farming tenants, about 250,000 families, and of their labourers, 400,000 families; of merchants, shopkeepers, and general traders, 900,000 families; of artizans, 200,000 families; of manufacturers in all lines, 500,000 families; of labourers, porters, and servants, 600,000 families; and of destitute paupers, soldiers, &c., 800,000 families.

THE COLONIES.

The foreign possessions of Great Britain are much more extensive and populous than those of any other country recorded in history. They may be divided into three different classes:—First, colonies occupied and cultivated by people who have emigrated from this country, and which, in respect of language, manners, and religion, are not different from Britons. Second, slave colonies, in which the greater part of the population are black slaves, and the proportion of Britons who live among them do so in the capacity of proprietors, masters, overseers, merchants, skilled workmen, &c., being in every respect the ruling and superior class. Third, countries which have been conquered from their own inhabitants, and which Britain still holds as conquests; the people having the occupation of the soil, but the right of making and enforcing laws, of placing and displacing magistrates, &c., being in the hands of the conquerors, and such servants as they may appoint for that purpose.

1. With regard to the first kind of colonies, or those which are occupied entirely by emigrants from Britain, and their descendants, it may be remarked, that this country has been the only one which has ever succeeded in rearing such establishments, and making them thrive. The experiment was tried by France in Lower Canada, and in settlements on the river Mississippi; but the colonists who were sent out, though the best for the purpose that France could afford, have never made any advances in prosperity; and instead of becoming wealthy or powerful, either retained, as in Canada, all the old-fashioned and inconvenient practices of French agriculture, or fell, as in the settlements on the Mississippi, into association with the savages of the forest, and adopted their habits. Canada, after it had been 210 years in possession of the French, had only 27,000 inhabitants (1714). The Spanish colonies, though much older than those of Britain, are, *except in the great towns*, in a state little removed from barbarism; the mixed descendants of the European settlers are few in number, and content themselves with the pride of being descended from white people, without seeking any distinction from superior intelligence; and the black and copper-coloured population are mere tillers of the ground, without knowledge, without arts, and without trade. Were we asked what has made Britain successful, where other nations more populous and as powerful have failed, we must answer that it is entirely owing to the state of information, and to the character of the people in the different countries. Britain has abundance of men skilled in all the arts which are necessary in a new colony—carpenters, boat-builders, mill-wrights, machine-smiths, &c.; each of these, in general, with a little capital, besides being full of energy from confidence in the resources and intelligence of himself and his comrades. The French colonists, again, were only poor uninformed creatures, without capital, and without trust in themselves; and the country had no others which it could spare to send away.

The principal colonies of this description which Britain retains in her possession, are those of Canada, New Brunswick, and Nova Scotia, in North America; with New South Wales and Van Dieman's Land, in Australia. The colonies of Upper and Lower Canada, particularly the former, are those to which the attention of emigrants is at present principally drawn. This country possesses resources for maintaining a population many times larger than that of Europe. The following table will give an idea of the present state and resources of these colonies:—

	Population, 18[illegible].	Cultivated Lands.	Uncultivated Lands.	Estimated value of annual productions and fisheries.	Exports from England, 18[illegible].
Lower and Upper Canada	612,188	8,066,656	100,000,000	L.9,737,102	L.1,117,421
New Brunswick	72,932	800,000	20,000,000	2,651,982	274,922
Nova Scotia	142,548	1,333,333	12,000,000	3,476,440	
Cape Breton and Prince Edward's Island	83,561	106,666	3,200,000	380,980	297,968
Newfoundland				1,420,792	373,817

About 100,000 have been added to the population of Canada, by emigrants, since the date of the above census.

The value of property, public and private in the same colonies, is estimated as follows:—

	Public property, Forts, Arsenals, &c.	Private property, viz. Buildings, Implements, Merchandise, Fisheries, Ships, and Specie.
Canada, Upper and Lower	L.2,133,333	14,951,145
New Brunswick	13,333	3,399,664
Nova Scotia	600,000	8,336,932
Cape Breton and Prince Edward's Island	156,909	1,254,330

Prince Edward's Island and Cape Breton are important in the hands of a naval power, as commanding the entrance of the river St Lawrence. The latter has an additional value, from the excellent coal which is found there, and which can be carried by sea to all parts of the adjoining coasts, both of the British possessions and those of America.

The average expenditure for the government and protection of these colonies is about L.348,000, part of which is defrayed by Britain, part by the colonies themselves: the latter portion is L.233,356; so that Britain pays L.115,361.

Australian Colonies.—The other colonies settled by emigrants from Britain are those in the southern hemisphere—New South Wales, Van Dieman's Land, and Swan River. The first of these settlements was only planted in 1788: their progress since that time has been remarkable: the population in 1828 was 39,684. The estimated value of property in buildings, ships, merchandise, money, &c. L.2,045,000; and they had about 300,000 acres of cultivated land. Their annual exports from Britain amount to L.96,123. They produce finer wool than any European country, and import large quantities of it into Britain, which are bought with avidity. Great part of the original population of these colonies consisted of criminals, sent thither for punishment and hard labour: their descendants are said to betray no symptom of such an origin. The expense of the Australian colonies, in 1829, was L.294,998; of which, however, only the sum of L.10,103 was paid by Britain.

The emigration to all these colonies has increased greatly of late years, as the following interesting Parliamentary document will show:—

Emigrants from Britain in the under-mentioned years—

	1827.	1828.	1829.	1830.	1831.	1832.
To the British colonies in America—Canada, Nova Scotia, &c.	12,648	12,084	13,307	30,574	58,067	66,339
To the C. of Good Hope	114	135	197	204	114	196
To the Australian colon.	715	1056	2016	1242	1561	3733
To the United States	14,526	12,817	15,678	24,887	23,418	32,872
Total	28,003	26,092	31,198	56,907	83,160	103,140

The number of emigrants who have sailed for Canada this year (1833) has not been so large, not perhaps exceeding 30,000, on account, it is believed, of the alarm excited by cholera among the inhabitants and some emigrants last season. A large number also now proceed to Canada by way of the United States, as being more commodious. Of these it is impossible to say how many reach and settle in Canada.

Slave Colonies—West Indies.

The principal of the British slave colonies are in the West Indies; they form part of a chain of islands which stretch across the outside of a large bay or gulf betwixt North and South America. The islands are all remarkably fertile, and most of the tropical productions are furnished by them. Sugar, cotton, tobacco, coffee, cocoa, the different kinds of pepper, &c., are indigenous and abundant. They are not, however, very healthy for English residents, and hence most of the labour is done by slaves brought from Africa. Their total population is reckoned at 776,500, of whom 626,800 are slaves. Jamaica, the largest and most populous of the islands, is supposed to have 402,000 people, of whom 37,000 are whites, and 342,098 slaves: Barbadoes, the next in respect of population, has 15,000 whites, 5000 free blacks, and 79,000 slaves; Trinidad, 4000 whites, 16,000 free people of colour, and 24,500 slaves. The other islands, which are smaller, have their population from 10,000 to 30,000 divided into similar proportions of free people and slaves.

The quantity of cultivated land in these islands is about two and a half millions of acres, or about one-twentieth of the cultivated land of England. The estimated value of their gross annual produce is twenty-two and a half millions of pounds sterling, of which they export five and a half millions, chiefly to Britain. The estimated value of public property, in fortifications, artillery, court-houses, &c., is about four millions; of private property, thirty-nine millions, including agricultural stock, warehouses, merchandise, shipping, specie, &c. The value of the negro slaves, whom it was customary to reckon as part of the stock of their farms, was stated by the colonists so high as forty-two and a half millions. Government have agreed to allow them twenty millions as compensation, in order to have the slaves set at liberty at the end of seven years. The injustice and oppression of slavery will, therefore, no longer have the sanction of British influence, and cannot, on being deprived of that support, exist much longer in any part of America.

The expense of governing the West Indian colonies amounts to L.550,303, of which the mother country pays only L.70,213. In this, however, is not included the large naval and military expenditure for their defence, and their military police, which falls upon Britain.

In concluding our notice of these colonies, and those of North America, we must remark, that many faults have been found with the way in which they are managed; principally in regard to their not being left free to buy and sell in those markets which best suit their necessities; and, in the mother country, being *thirled* (as the Scots express it) to them by a line unprofitable bond. It is also said that much waste and favouritism has taken place in regard to their revenues. These complaints have all some foundation, both in the West Indian and Canadian colonies; but it is evident, notwithstanding, that they have both been better managed than the colonies of any other European country, *because they are comparably more thriving.* In raising these countries (as well as our old colonies, the United States of America) to their present state, the British government, and people have performed a service to humanity, by filling the desert with civilization, which no other nation, from the beginning of the world, has ever effected or approached to.

The only other considerable slave colony possessed by Britain, is that of Mauritius, a small island in the Indian Ocean, near Africa, conquered from the French. Its population, in 1832, consisted of 8844 whites, 15,851 free coloured people, and 76,774 slaves; total, 101,469. The quantity of cultivated land, 106,060 acres; the exports, under half a million; and imports, somewhat above that sum. The value of private property, in houses, merchandise, ships, &c., is about L.5,793,890, to which the planters add four and a quarter millions more, as the value of their negroes.

The Cape of Good Hope.—This African colony originally belonged to the Dutch, and most of the white population is originally from Holland. This is an important settlement, in respect of our Indian possessions, and might afford many useful resources for their defence, should an attack be meditated by any European power, all of whom are sensible that they could neither take nor hold India while we occupy the Cape. Emigration from Britain has not lately flowed in that direction, though the wages of mechanics are fully 6s. per day, with a fine climate and cheap provisions. The importance of having a British population gradually introduced into such a colony, cannot be easily appreciated, and should not be forgotten by government. The population of the Cape colony, in 1831, was 55,075 whites, 37,352 free coloured people, and 35,509 slaves; in all, 129,036. The land under cultivation is estimated at 400,000 acres. The value of private property of all kinds (except land) is L.3,870,000.

Britain has some other possessions in Africa, such as Sierra Leone, Senegal, Goree, and Fernando Po. Little national importance or value is attached to these settlements: their population altogether amounts to 1487 whites, and 23,153 free coloured people. Their exports from the United Kingdom are about half a million; the private property about L.800,000.

CONQUERED COUNTRIES—BRITISH INDIA.

This is by far the most extensive and important of all the foreign possessions of Britain. It has long been under the separate management of an incorporated company, who conducted both its trade, military defence, and civil government. Their charter has now expired, and in future they are not to interfere at all in commerce, while the business of government is still to rest with them under the superintendence of the ministries of this country.

India affords no direct revenue or tribute to England, as conquered countries are in general supposed to do. The only advantages which we derive from our occupation of these immense countries, are the undisputed possession of their trade, and the fortunes (sometimes very large) saved out of their salaries by British subjects who are appointed to discharge the duties of government. It is to the trade of the country, however, that we must look for any considerable and permanent advantage; and as this can only be made to increase by the cultivation of peace and order through the country, the interest of Britain becomes directly involved in maintaining henceforth the peace of India. The improvement which a few years of peace effects in these fertile countries, is astonishing: the population of a certain portion is supposed to have nearly doubled in the period of comparative peace from 1811 to 1830, being in the former year only forty-five and in the latter almost ninety millions. Till she came under British rule, India never enjoyed twenty years of peace and orderly government in all her former history. There are many faults and oppressions laid to the charge of the English in India, from which it is impossible to defend them. The taxes (which fall chiefly upon the *land* and the poor peasantry) are very oppressive, and are rendered more so by the unprincipled conduct of the natives who are employed to collect them. Justice also is administered in a foreign language (Persic), and the courts are so few that districts which are larger than Scotland have hardly one to each. Notwithstanding all this, the preservation of public order and of peace has conferred advantages on the country of the most inestimable kind.

The territorial extent of the British possessions in India is 514,190 square miles; the population, as far as it has been ascertained, 89,577,206; to which may be added eleven millions more for districts not included in the census. There are several states which are under British *protection*, though not directly governed by our establishments; these have an area of 614,610 square miles, and a population estimated at forty millions. The number of Europeans resident in India not in the public service was, in 1830, 2016. The amount of exports from Great Britain in 1829 was L.4,100,264; the imports to India, L.6,218,284. The total revenue of British India in the same year was L.22,753,041; the expense and charges of its government L.22,162,101. The following table will give some other particulars:—

	British India
Population	100,577,206
Dependent states	40,000,000
Troops, Native	187,057
—— European	36,604
Cultivated lands, acres . . .	134,200,000
Public or government property .	L.15,529 243
Estimate of private property, houses, stores, merchandise, &c. . .	L.800,000,000
Colonial shipping	L.593,000

In this estimate is not included Ceylon, a fertile island, and capable of great improvement, lying near the south point of India. It contains two millions and a half of acres, cultivated or capable of cultivation, and has a population of one million; the property on the island is estimated at four millions nearly; its exports to Britain L.202,668, and its imports from thence L.46,496.

The number of Christians in Calcutta, the capital of India, as reported in 1822, was 13,138; of whom 10,884 were half-castes, or children of native women by Europeans. These are now becoming a numerous and influential class; and as they are educated in a familiar knowledge of the English, as well as of some native languages, they are exceedingly useful; their total number in India in 1822 was about 20,000; the attornies generally belong to this class.

Britain has several other foreign possessions which are useful in a political or military view, though not of great extent—such are Gibraltar, Malta, the Ionian Islands, in the Mediterranean; and St Helena and Ascension on the African coast; Bermuda, in the North Atlantic.

EXTENT OF THE BRITISH EMPIRE.

The great extent of the British empire, and the immense space over which its parts are distributed, form one of the most remarkable phenomena ever exhibited to the world. She has dominions in North America, which are themselves larger than the Roman empire at its greatest extent. She possesses seventeen rich islands in the West Indies; the countries of Australia, which are themselves larger than all Europe, are entirely at her disposal, and will one day be occupied by a population speaking her language, and proud of their descent from her people. In India she has another large and populous empire, which is her own not only in right of conquest, but almost in right of creation; for it is the regular government, the suppression of internal wars, and the leisure for agriculture, which she has bestowed, that have rendered India what it now is, and what it never was formerly, either in respect to population or commerce. The population of these immense dominions, lying in four quarters of the globe, speaking different languages, and having interests entirely different from each other, look to Britain for protection, for the regulation of their laws and government, and for the continuance of a prosperity which the foreign possessions of no other country have ever enjoyed. The number of people in all the different British possessions may be recapitulated as follows:—

Extent and Population of the Empire.

	Population.	Sq. Miles.
British Islands . .	24,271,758	90,948
British dependencies in Europe	247,701	
North America, Canada, &c.	1,068,208	1,930,060
West Indies . . .	884,050	
Australian colonies . .	39,683	1,496,000
Islands of Ceylon & Mauritius	1,034,730	23,000
British possessions in Africa	154,046	91,000
East Indian empire .	89,577,206	826,650
	117,375,390	4,457,598

This table shows that Britain rules over a population about five times as numerous as her own, and over an extent of country fifty times as large as the whole British Islands.

WILL THE PROSPERITY OF BRITAIN CONTINUE?

The question is often asked, Will this singular people always remain as prosperous, and as much superior to the other nations of the world, as they now are? Will not their far-extended empire, made up of so many different elements, one day crumble in pieces? Will not their unrivalled manufacturing skill be one day surpassed, and driven from the market?—their points, on which their grandeur is founded, be given to others?—and their immense national wealth dissipated, in vain rivalship with more skilful competitors? We may answer this question by simply asking another—On what does the superiority of Britain rest? It is not on her large armies, or her powerful fleets. These, whatever they are, are supported and created by her resources, and do by no means give birth to them. It is her admirable form of government, the equality of her laws, the advantages of her insular situation, and, above all, the steady industry and perseverance of her people, which have given her her present superiority; and the same causes which have bestowed, will maintain it, till some other nation be found better governed, more secure from foreign invasion, furnished with better roads, canals, and harbours, &c., and with a people more industrious and skilful.

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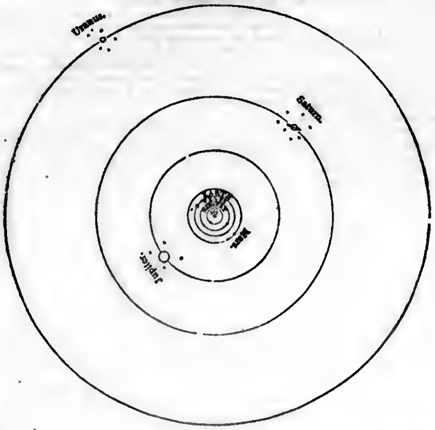
A POPULAR VIEW OF ASTRONOMY.

THE SOLAR SYSTEM.



SATURN.

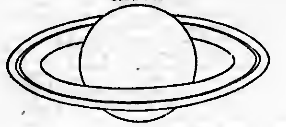
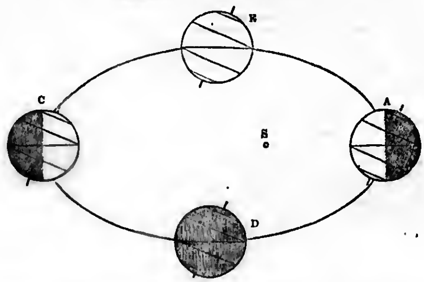


ILLUSTRATION OF THE SEASONS.



THE term Astronomy is derived from two Greek words, signifying the laws of the stars. This science, therefore, treats of the magnitudes, motions, periods, eclipses, and all other phenomena connected with the heavenly bodies. It is a sublime subject of investigation, perhaps the most sublime to which the human mind can turn its attention, as it undoubtedly was the earliest. The bare aspect of the starry firmament, as it appears to the naked eye, is calculated alike to excite curiosity and astonishment. But when it is examined by those subtile instruments made use of by astronomers, and we ascertain that the solid contents of the sun exceed those of our globe, gigantic as it appears to be, nearly a million and a half times, and to an absolute certainty that it is removed from us to the distance of ninety-five millions of miles, the imagination becomes overpowered, and seeks in vain to form any thing like an adequate idea of such magnitudes of matter and quantities of space. In proportion, however, as the magnificence and grandeur of the subject developes itself to a reflecting intellect, it more and more excites a desire to know something of its details. It is for the purpose of gratifying in some degree this desire, that we have undertaken to give such an account of astronomy as will be generally intelligible, and at a rate which will place an acquaintance with the subject within the reach of every one who wishes it. The algebraic formulæ in which the sublime truths of the science are usually disguised (of course with reference to the general reader), has hitherto kept back many from following out the study; and although we confess that the universe, in all its grandeur and magnificence, can only be displayed to the eye which contemplates it through the radiant atmosphere of a sublime geometry, still a very intelligible idea of the nature and laws of the heavenly bodies can be obtained without it. Others, again, are deterred from proceeding farther than the threshold of inquiry, from the natural vastness of the subject overawing them into a hopelessness of ever attaining to any thing like a definite understanding of it. But this is a very erroneous idea. The pyramids of Egypt present at a distance a very formidable appearance, and to reach their summits seems utterly impossible. But when we approach nearer to them, the illusion vanishes. We find them provided with a series of steps which reach from the bottom to the top, and render the ascent comparatively easy. This will be found to be the case with astronomy, and indeed every science. Moreover, by frequently contemplating vastness of size, we become familiar with it, and it soon ceases to overawe, almost to excite astonishment. The mind enlarges, as it were, its own dimensions to the measure of that which it surveys.

SYSTEM OF THE UNIVERSE.

The idea to which astronomers have arrived respecting the universe, is, that it consists of an infinite multitude of *suns*, like that in our own sky, round which revolve *planets* similar to our own globe, being in all probability the residences of *intelligent beings* akin in nature to ourselves. These suns are so distant from us, that the nearest of them appear as only little specks of light in the sky; while others are far beyond the reach of even the most powerful telescope. Astronomy chiefly concerns itself with the *system* connected with our own sun; which consists, so far as ascertained, of that luminary, as a fixed centre, eleven primary planets whirling at different distances around it, and eighteen secondary planets, which revolve round certain of the primary ones, as our moon revolves round the earth; besides which there are several eccentric bodies called comets, the nature and motions of which are not as yet well explained. The names of the planets, in the order of their nearness to the sun, are, Mercury, Venus, the Earth, Mars, Vesta, Juno, Ceres, Pallas, Jupiter, Saturn, Uranus. One moon attends upon the Earth, four upon Jupiter, seven upon Saturn, and six (it is supposed) upon Uranus.

Almost all this information is contrary to the notions of an uninstructed person, who sees, as he thinks, the earth firmly fixed, as a level plain, beneath his feet, while the sun, moon, planets, and stars, are all whirling around him. To reconcile the appearances of the system to its realities is our present office; and, in performing it, we shall first exhibit the general laws of matter and motion, as observed in that portion of the universe which is under our own immediate control.*

* Before proceeding farther, we must make mention of an awkwardness which will frequently occur, and from which there is no possibility of entirely extricating the subject. From the close and intricate manner in which the different branches of it are interwoven with each other, in order to prove the truth of one given point, we must occasionally take another for granted, the demonstration of which will appear afterwards in its own proper place.

PROPERTIES OF MATTER.

The essential properties of matter, or those characteristics of which it is impossible to deprive it, are, *extension, figure, divisibility, impenetrability, attraction*, and what is called inertia: it is only in the two latter that we are at present particularly interested. Motion is sometimes denominated a property of matter; but, strictly speaking, it is no more so than colour or sound. Motion, however, is an accidental quality, or one with which it can be endowed, and, as such, is intimately connected with the succeeding observations. The tendency of particles of matter, however minute, and of masses of matter of whatever kind and magnitude, to unite together, and form, as it were, one mass, is found to operate universally wherever man has been able to extend his scrutiny, either upon the objects of which the globe he inhabits is composed, or upon the celestial bodies which without number people space. Examples of it arrest our attention wherever we turn our eyes. We witness it in the globular form of the dew-drop which lies upon the flower, in the descent of a stone to the earth when thrown upwards, and, as we shall see, in the motion of the heavenly bodies. Like the puzzle of Columbus, this law appears very simple, and easily comprehended, when once shown to exist; notwithstanding this, however, its universality is a discovery of comparatively recent date.

GRAVITATION AND INERTIA.

The descent of a body to the earth, when deprived of support in the air, was witnessed from age to age, without the occurrence giving rise to any speculation as to the cause worth mentioning. But, in the seventeenth century, there sprung up a man, whose appearance may be compared to the rising of the brightest of those luminaries, for a correct knowledge of whose laws we are so much indebted to him. The fall of an apple before the eye of Newton, laid the foundation of that noble superstructure which the science of astronomy may be now entitled. The doctrine which he deduced from this every-day event, was, that all the heavenly bodies mutually attract each other. Might not, he all-wisely reasoned, the same power which draws the fruit to the ground be that which draws the moon to the earth, the earth to the sun; and, if so, may not the law be extended to all the heavenly bodies? But, before the reader can fully appreciate the important nature of this profound conjecture, and see the beauty of the theory which resulted therefrom, he must first be informed of another equally important principle which belongs to matter, namely, its inertia, or that innate disposition which it has to resist any change. Dr Arnott calls it figuratively an obstinacy, or stubbornness, and the words very well express the idea. By this we are to understand, that a body at rest would for ever remain so, if something external to itself did not set it in motion; and that, when once set in motion, it would continue for ever to move, if its course were not interrupted by some other power. If, for instance, we project a stone through the air, that stone, we are certain, would proceed onward through infinite space, and never come to rest, if it were not impeded by some cause or causes: the principal one is that power or property which the earth has of drawing every body towards its centre. We have not said any thing with regard to the resistance offered by the atmosphere to all bodies passing through it, because that is at present foreign to our subject. Here, then, we have two grand antagonist forces operating continually in nature—centrifugal force, from two Latin words, signifying *centre-fleeing*; and *centripetal* force, from two words in the same language, signifying *centre-seeking*. The former is the result of gravity, and the latter of inertia. In philosophical works, the power of gravitation is said to be directly, as the masses of matter; and inversely, as the squares of their distance from each other. Thus, the greater the quantity of matter in the attracting bodies, and the nearer they are to each other, the more is the force of the gravity exercised. It may be added, that the large body invariably draws the small one towards it; not that the latter is entirely destitute of attraction for the former—for it is mutual between them—but its strength depending upon the quantity of matter, the large body, being superior in this respect, attracts the small one to its centre; and this is the cause of a stone, or any other substance, falling to the earth.

CENTRIFUGAL AND CENTRIPETAL FORCE.

Centrifugal force, as may have been gathered from what we have already said, is that force with which a body, revolving round a centre or about another body, endeavours to recede from that centre or body. Thus, if a stone be whirled round at the end of a cord, it will stretch the cord by its tendency to fly, or centre-fleeing force; and if the velocity be sufficiently increased, the cord will at length be broken, and the stone will fly off at what is called a tangent. There are two kinds of centrifugal force, viz., that which is given to bodies moving round another body as a centre, usually called the projectile force, of which we have just given an example; and that which bodies acquire by revolving upon their own axis. We shall have to give an example of both in the diurnal and annual revolution of the earth. But in order that the reader may clearly understand this important law, we shall in the meanwhile illustrate it by a familiar one. We have seen, in the case of the stone whirled round by the string, that the greater the velocity, the greater the tendency of the stone to fly off, or the greater the centrifugal force. Suppose, then, any circular body, as a coach wheel, is placed so as to turn freely round upon an axis. Let small pieces of any tenacious substance, as clay, be attached to the spokes, beginning at the upper extremity, and gradually coming downwards to the opposite ends next the nave. If the wheel be now set in motion, these pieces of clay on the outside will fly off first, those below them next, and so on, in a progressive degree, to those situated undermost. This plainly arises from the centrifugal force being generated to a greater extent at the place where the motion is most rapid; and this depends upon the distance at which it is placed from the centre of the motion.

Centripetal force, which is a term of the same import with attraction and gravitation, is that force with which a moving body is perpetually urged towards a centre; and, instead of proceeding in a straight line (for all bodies when set in motion have a tendency to proceed in a rectilinear or straightforward path), is made to revolve in a curve.

GENERAL LAWS OF MOTION.

Motion is the act of shifting from one place to another; it is the opposite of remaining at rest; and the power which puts the body in movement is called *force*; and if the force act but momentarily, it is called force of percussion or impulse; if it act constantly, it is called accelerative force; if constantly and equally, it is called an uniform accelerative force. In that immortal work, Newton's Principia, are the three following laws, usually called Newton's laws of motion. He was not the first inventor of them, however, since they are found in a work of Des Cartes (another great astronomer), which was published before the Principia.

Law I. Every body perseveres in its state of rest, or uniform motion in a straight line, unless it is compelled to change that state by forces impressed thereon.

Law II. The alteration of motion, or the motion generated or destroyed in any body, is proportional to the force applied, and is made in the direction of that straight line in which the force acts.

Law III. To every action there is always opposed an equal reaction, or the mutual action of two bodies upon each other, are always equal, and directed to contrary points.

There are various laws of compound motion, upon which our limits will not permit us fully to enter. We can only refer the reader to that noblest production of the human mind, where they were first clearly propounded, Newton's Principia. Two of them, however, we shall notice, as indispensable to a full understanding of the subject. 1st, "That the curvilinear or circular motions of all the planets arise from the uniform projectile forces of bodies in straight lines, and the universal power of attraction which draws them off from these lines." 2d, If one body revolve round another, so as to vary its distance from the centre of motion, the projectile and centripetal forces must each be variable, and the path of the revolving body will differ from a circle.

The proof and illustration of these laws brings us at once to the subject of celestial motion. The earth being the planet in which we are most particularly interested, demands our first attention.

FIGURE AND MAGNITUDE OF THE EARTH.

The Earth is a globe measuring 24,856 miles in circumference. That such is its figure, is proved by many circumstances, but particularly these two—that its shadow, seen upon the moon during an eclipse, is circular, and many navigators have sailed round it. When we say its figure is that of a globe, we mean that it is nearly so. It measures 26 miles less in diameter between the north and south poles, than between any two points in the contrary direction. In order to demonstrate this in a more satisfactory manner, it will be necessary to take a view of the terrestrial globe, as it appears delineated by geographers.

THE TERRESTRIAL GLOBE.

Astronomers, for the convenience of their science, have supposed certain lines to pass through and around the globe. One passing through the centre, between north and south, is called the axis of the globe, from a Greek word signifying axle. The two extremities are called the poles, from the Greek word *polos*, signifying a pivot. A line girding the globe in the middle is styled the equator; all to the north and south of which are respectively called the northern and southern hemispheres. The circuit of the earth, both in its girth between east and west, and between north and south, is divided into 360 parts, called degrees. At the distance of twenty-three and a half nearly of these degrees from the equator, in both directions, are two parallel lines called the tropics, and at the same distance from each pole is a parallel circle, styled in the one case the arctic, and in the other the antarctic circle. The space between the tropics is called the torrid zone, because the sun, being always vertical in some part of that space, produces a greater degree of heat than what is felt elsewhere. The spaces between the tropics and the arctic and antarctic circles are called the temperate, and the spaces within these latter circles the frigid zones. Lastly, a line which cuts the equator obliquely, touching upon opposite points of the tropics, is called the ecliptic. The ecliptic and equator are called greater circles, because they cut the earth at the thickest parts; the others are called lesser circles. A series of lines drawn from pole to pole over the earth's surface (like the division lines of a peeled orange), and cutting the equator at right angles, are called meridians (from the Latin word *meridies*, mid-day) or lines of longitude. Every place upon the earth is supposed to have one of these passing through it, although only twenty-four are described upon the terrestrial globe. When any one of these is opposite the sun, it is then mid-day or twelve o'clock with all the places situated on that meridian, and, consequently, midnight with those on the opposite meridian on the other side of the earth. The exact situation of a place upon the earth's surface, or its latitude and longitude, is determined by means of these circles. They are all divided, as already hinted, into 360 parts, which parts are called *degrees*; these degrees again into 60 equal parts, called minutes; the minute into 60 others, called seconds, and so on. They are all indicated by certain signs placed behind the figure, and near the top of it—thus, 8° 5′ 7″ is eight degrees, five minutes, seven seconds. A degree is 60 geographical miles, or 69 English statute miles; a minute is the 60th part of that; and so on. The *latitude* of a place is its distance measured in that manner from the equator. If it lies north of that line, it is in north latitude; if south of it, in south latitude. There being only 360 degrees in the circumference of the earth, and the distance from the equator to either of the poles being only a fourth part of it, a place can never have more than 90° of north or south latitude. The longitude of a place is the distance of its meridian from another, which is called the first meridian. The first meridian is quite arbitrary, and it is a matter of indifference through what point we draw it, provided it be settled, and well known, which one we adopt, so as to prevent mistakes. Foreigners fixed upon the principal observatories of their respective countries. In Germany, the island of Ferro is generally adopted; in France, the observatory of Paris; and in England, that of Greenwich. Of course, longitude is reckoned either east or west of the first meridian; and as a meridian stretches from pole to pole, it must therefore contain 180 degrees. Some geographers, however, reckon longitude all the way round the globe. From the shape of the earth, which we have observed is flat at the poles, the degrees of longitude decrease as we approach these in either direction. The degrees of latitude, however, never vary in length, because the meridians on which they are reckoned are all of the same dimensions.

The other great circle called the ecliptic is divided into twelve parts, called signs, which bear the name of the constellations through which this circle passes in the heavens, as shall be afterwards explained. There are other smaller circles which run round the earth parallel to the equator; these are called parallels of latitude, because, being every where at the same distance from the equator, the latitude of every point contained in any one of them is the same. In this manner are artificial globes and maps of the world, and of particular countries, formed. A globe, or general map of the heavens, may also be constructed, and the stars laid down in their proper situations. This is called *uranography*, from two Greek words, *uranos*, the heavens, and *graphos*, to write; this subject will be afterwards treated of. In geography, it is necessary to take notice of the parts of the earth's surface occupied by sea and land, the configuration of the latter as broken into mountain and valley, and also the changes which its figure undergoes from various causes, such as the action of the sea on the land. But as these have been fully described in our "Account of the Globe," No. 6 of this work, we refer the reader to it.

MEASUREMENT OF DEGREES.

The earth, we have said, is of a spheroidal shape; that is, somewhat of an oval. This notion originated in observations on pendulum clocks, which being fitted to beat seconds in the latitudes of Paris and London, were found to move slower as they approached the equator, at which place it was found necessary to shorten the pendulum about one-eighth of an inch, to make the clock keep proper time. It is well known that the longer a pendulum is, the slower it moves; and heat, by expanding bodies every way, of course increases its length. The first conjecture was, that the error might be easily accounted for in this way, because the heat continually increases as we approach the equator, where it is greatest. However, Sir I. Newton, and Huygens, a celebrated Dutch mathematician, thought the difference much greater than could result from heat alone, and separately they discovered that the earth was flattened at the poles. It is weight which causes the pendulum to move; and if weight be decreased, it will oscillate slower. Under the head centrifugal force, we have explained the way in which gravitation is affected by it, or, what is the same thing, weight; the latter decreasing as the former increases. Suppose, then, the earth to revolve upon its axis, the farther bodies are removed from this centre of motion, the greater will be their tendency to fly off. Weight will thus vary at various situations of the earth's surface; in mountain elevations less than on low-lying ground; and at the equator more than the poles; and this has been proved to be the case by incontestible experiments.

But still this was not sufficient to account for the difference; and Sir I. Newton clearly demonstrated, that the distance from the centre of the earth to the equator must be greater than to either of the poles; in other words, that the earth is heightened at the equator, and flattened at the poles. He finally arrived at the conclusion, that "the diameter of the earth at the equator, is, to its diameter from pole to pole, as 230 to 229."

It is evident that the measurement of a degree of latitude at various parts of the earth's surface, was of essential importance in determining its exact figure and dimensions. The king of France, at his own expense, ordered the measurement of two degrees, one as near the pole as possible, and the other at the equatorial regions. The result confirmed the calculations of Newton. Since that time, degrees have been frequently measured, and calculations made regarding the earth's figure and magnitude; and it has been found that its equatorial diameter is 7924 miles, and its polar diameter 7898 miles; the mean being 7916, and the difference twenty-six miles. What its exact shape is, has never been accurately demonstrated; and all that can be gathered from works upon the subject, is, that the earth is *something more flat at the poles than at the equator*. The flattening is accounted for by supposing that it was originally in a fluid state, as the spheroidal form is that which a fluid body would take in revolving upon an axis.

WEIGHT OF BODIES IN DIFFERENT SITUATIONS.

Weight, we have seen, depends on gravity, and gravity is counteracted by centrifugal force. Bodies, then, should weigh less upon the tops of mountains than in places lying near the level of the sea. This has been proved to be the case by experiment. But let no erroneous impression be entertained upon this point. Bodies are relatively of the same weight on all parts of the earth's surface. A pound of tea, being weighed at the equator and at the poles, on the sea-shore and on the top of Chimborazzo, is neither more nor less than *one* pound of tea; for it is evident that the pound weight undergoes the same change from heaviness to lightness as the substance that is weighed; so that they remain always of the same weight in relation to each other. If the earth, then, revolves upon its axis, the elevated portions of its surface will thus move round with the greatest velocity; but there is no occasion to be alarmed in scaling a mountain of any height; for even at the equator, where the centrifugal force is greatest, that of gravity is still 288 times greater.

From a calculation of the sun's magnitude, and the quantity of matter which it contains, it is proved that a mass which weighs 170 lbs. on our earth, would there weigh 4743 lbs. Man, therefore, as he is constituted, could not possibly exist on a globe so large as the sun, because his strength would be inadequate to bear up under the force of attraction exercised over his body, which would accordingly be crushed to pieces. It is incompatible with our limits to enter farther into this interesting subject; but we will have occasion afterwards to notice facts connected with it.

In fine, we are to consider attraction as universally exercising an influence, wherever matter is to be found, at once over the minutest particles composing the masses of our own earth, and over the most gigantic globe in the universe.

DIURNAL MOTION OF THE EARTH.

The motion of the earth was denied by the ancients, and the movement of the heavenly bodies was adopted, and generally entertained, until the beginning of the sixteenth century, when Copernicus discovered the diurnal and annual rotation of the earth. His theory is now universally assumed to be true, and goes by the name of the Copernican system. Succeeding astronomers have produced such a number of forcible arguments in favour of its truth, that every impartial inquirer must give his assent to it. The earth, then, has two principal motions—a daily one round its own axis, and a yearly one round the sun. In reference to the slow movement of a pendulum at the equator, we have already given one strong argument in favour of the earth's diurnal motion. There are a number of others, many of which, however, cannot be demonstrated without using mathematical symbols, which are incompatible with the nature of this treatise; but still a few remain that are independent of such proof, and which are calculated to carry conviction to the mind.

One very striking argument in favour of the earth's moving, is, that if it were not the case, almost every star must move with a velocity different from the rest, for which difference of velocities not the shadow of reason can be assigned. Indeed, the supposition of millions of these bodies revolving round an imaginary line with various velocities, yet all moving through their circles in precisely the same time, so as to account for appearances, is one that we cannot entertain for a moment, when we consider that all is satisfactorily accounted for, and the observed laws of matter and of motion strictly fulfilled, by simply granting the rotation of the earth upon its axis. The latter hypothesis is greatly strengthened by the observance of a like motion in the planets, and also by their shape. For instance, Jupiter is found to be flattened at the poles in the same way as our earth, and the flattening in both cases no doubt arises from the same cause—namely, the centrifugal force resulting from rotatory motion upon their axes. Moreover, it has been proved that a stone dropt from a considerable elevation falls a little eastward of the perpendicular, precisely what would happen if the earth turned upon its axis from west to east. In order to prove this, we have only to recall to the reader's recollection the observations made upon centrifugal force. The top of any building—say St Michael's Tower, in Hamburgh, where a German philosopher performed the experiment—moves more rapidly round than the base; hence there is greater centrifugal force there. Now, a ball of, say a pound weight, let fall from it, having a greater velocity at the time it was dropt than the base of the tower, must move a little more in the direction in which the earth moves, than a plumb-line which is made to strike the foot of the tower; because the plumb-line being lower down, has less impulse eastward. On the other hand, a ball shot perpendicularly into the air returns to the exact spot from whence it departed; because, however high it may have ascended, it does not on that account receive any additional impulse eastward, but only retains that which it possessed when fired off.* Many additional reasons might be given, some of which will appear in the sequel, but these are quite decisive of the point. It is no argument against the earth's diurnal motion that we do not feel it; for it must be familiar to every one who has been carried along in the cabin of a ship in smooth water, that neither his own nor the ship's motion was perceived. Neither does the earth's motion cause bodies to fall from it, or rather scatter them about by its centrifugal force, because they are held firm to the earth by the power of attraction. Under the head "Trade-Winds" there will be found a most convincing proof, if any were wanting, of the earth's rotatory motion.

We are, then, fully entitled to conclude that the earth has a diurnal motion upon its axis, from which evidently results the vicissitude of day and night. This motion, which is from west to east, accounts for the apparent diurnal motion of all the heavenly bodies; hence they seem to rise and set by turns according to their various situations.

CIVIL AND SIDERAL DAY.

The revolution is performed in twenty-three hours fifty-six minutes four seconds; and this is what is called a sideral day, because the earth is then in the same relation to the stars as it was the day before. The fixed stars are so immensely distant from our earth, that its whole orbit is in respect to them but a point; so that no sensible difference is produced by its revolving round the sun. But the sun being a great deal nearer us, any movement made by the earth can be appreciated. The time which elapses from the sun's being on the meridian of any place to its returning to the same spot next day, is exactly twenty-four hours, and is called an astronomical day. The natural day would always be the same as the sideral day, if the earth had no other motion than that upon its axis. But in the same time that it has performed one of its daily revolutions eastward, it has also advanced about a degree westward, or in the opposite direction, which is the course it takes round the sun; so that, before the sun can shine exactly upon the same meridian, the earth must make up as it were its lee-way, and this it does in three minutes fifty-six seconds, the difference of time between a natural and sideral day. If the earth, then, had no other than its diurnal motion, we should have 366 days in the year.

DAY AND NIGHT.

From the revolution of the earth upon its axis results the vicissitude of day and night. At noon-day, or twelve o'clock, we come to a position where the sun is at its highest, or the meridian altitude; and of course this point varies in every situation on the earth's surface. All those parts of the earth to the east of us have this position of the sun earlier than us; while, on the contrary, the parts to the west of us have it later. Thus, the hour of the day varies in every part of the globe where the longitude or meridian line is different. When it is twelve o'clock noon with us in any particular part of Britain, it will be twelve o'clock at midnight in a corresponding point on the opposite side of the globe, near New South Wales; and the intermediate hours, sooner or later, will all lie in the countries between these two points, exactly according to their position or degrees of longitude. Although the earth's daily revolution is performed without any perceptible motion by us, yet any place at the equator is carried along at the prodigious rate of 1000 miles per hour; and we do not feel it, because every thing around us in the earth and the air is carried along at the same time. This motion, however, has an effect on the atmosphere, and influences the direction of the trade-winds, as we shall afterwards find. For the appearance of twilight, we are principally indebted to the light reflected by the atmosphere; as, were it not for this, the moment the sun went below the horizon, or edge of the circle of the earth, we would have complete darkness. On the contrary, while the sun is sinking to a certain distance below the horizon, his rays are projected to a portion of the air visible to us, from whence light is reflected to the earth; and all that gorgeous array of many-coloured clouds results from the refraction of the rays of light.

As we have mentioned the reflective power of the atmosphere, we may also mention another singular and important property which it has, namely, the power of refraction.

THE ATMOSPHERE, AND REFRACTION OF LIGHT.

The atmosphere is that invisible fluid called air, which surrounds the earth all round to the height of between forty and fifty miles. This aërial ocean, which has the sea and land for its bed, is considered to be of nearly equal thickness at all parts of the earth's surface, but of very unequal density, the lower portions being much more compact, and containing a great deal more matter, bulk for bulk, than those higher up. This arises from the pressure which the under portions sustain from those superimposed upon them. Clouds (which are just thick mists, or particles of vapour drawn together by attraction) float in this thin envelope of our globe, just as mud does in water; and the greatest height to which they rise is about ten miles. The atmosphere is subject to great fluctuations, of the nature of waves similar to those of the ocean. These are well known under the name of winds, for which see below. One property which air possesses enters as a provision to be allowed for into the nicest calculations of astronomy; that is, its power of *refracting the rays of light*, or bending them from the straightforward course which they would otherwise take. When a ray of light proceeding from the sun, moon, or a star, enters the upper regions of the air, it does not descend in a straight line to the eye of the spectator, but takes an oblique path. It is a law of optics, that light passing from a rare to a dense fluid or substance, such as water or oil, and called technically a medium, is bent to the denser medium. Now, there being something approaching to a vacuum, that is, a place destitute of any matter whatever, beyond the atmospheric region, when the beam of light penetrates the comparatively dense medium of the air, it is of course twisted from its rectilinear course to one *nearer a perpendicular to the zenith of the observer.* Hence, all the heavenly bodies appear higher than they really are; and the nearer they are to the horizon, the greater will be the refraction or difference between their apparent and true altitudes. At noon the refraction is the least. The sun and the moon appear of an oval figure sometimes near the horizon, by reason of refraction, for the under side being more refracted or raised than the upper, the vertical diameter will be less than the horizontal one, which remains unaltered. This, however, is not the reason of the dilated size which the sun and moon assume near the horizon; this is a mere illusion of the judgment, arising from the proximity of these bodies to terrestrial objects, with which they are thus brought into close comparison. Insulated in the boundless expanse of sky, we have no means of valuing their magnitudes, which are hence underrated.

TRADE-WINDS.

Winds in general are caused by the heat of the sun expanding the air, which becoming thus specifically lighter, rises upwards in a current, while colder air rushes in to supply the place which it has left. But two other causes operate in the formation of the trade-winds—the unequal exposure of the earth's surface to the sun's rays, by which it is continually more heated in one place than at others, and also the rotation of the earth from west to east. The sun is constantly vertical over some part of the tropics, so that the earth in that quarter has a temperature much above what obtains in those regions to the north or south of it nearer the poles. Hence two currents of air are continually flowing to and from either of the latter, over and above which is the rarified air of the equator, and are below the cold and dense air of the poles, which rushes in, according to the laws of hydrostatics, to occupy the comparative void which has been left; thus a perpetual circulation is kept up. It is self-evident, that, if there be no disturbing cause, these winds will be simply northerly and southerly; but this is not the case—they are permanently *north-easterly* and *south-easterly* winds. The cause is to be sought for in the rotation of the earth. On that point we explained that the equatorial regions were whirled round with greater velocity than the polar. Now, as any thing upon the surface of the earth just has the same motion as the earth at any place where the object is situated, columns of air setting in from the north and south poles towards the equator, will come into contact with regions travelling a great deal faster than themselves; and unable all at once to acquire this new velocity, they are left behind the general movement, or rather they are partially impelled to follow a new direction, and from being south and north become north-east and south-east winds. Their easterly tendency diminishes as they approach the equator, where it is lost altogether; and, besides, the two currents there meet and mutually destroy each other. The result is the production of two great tropical belts: in the northern one a north-easterly, and the southern a south-easterly wind, always prevails, while between them there is an equatorial belt, where the winds are comparatively free from any particular tendency like the others. The south-west and westerly gales which prevail in our latitudes, and the universally westerly direction of the North Atlantic winds, are due to the heated air which flows from the equator. It is evident that the drag which the polar winds hang upon the earth and atmosphere will have a tendency to retard the motion of the former upon its axis, but, on the other hand, the upper winds which blow from the equator have a tendency to accelerate the earth's rotation, and thus an equilibrium is maintained. What wisdom, what design, is apparent in those things, which at first would appear only irregularities of nature! In fine, we may remark, that the direction of the trade-winds affords another proof of the diurnal motion of the globe.

ANNUAL MOTION OF THE EARTH.

The annual motion of the earth will be readily admitted after its daily rotation has been granted; for either the earth moves round the sun in a year, or else the sun revolves round the earth in that time—a supposition which is at total variance with the laws of matter and motion. To conceive of the sun as revolving round the earth, would be to suppose that the lesser body had the greater power of gravity, which is contrary to nature and fact. Attraction is invariably in proportion to the quantity of matter; and as the sun very greatly exceeds the earth in size, it must follow, therefore, if there be any consistency in the laws of nature, that the earth moves round the sun. It is also evident that its motion is from west to east; for if the sun be observed to rise with any fixed star near the ecliptic, or line in which the earth revolves round the sun, in a few days it will appear to the eastward of that star, and in the course of a year it will arrive at the same star again. But a direct proof of the orbital motion of the earth is afforded by the aberration of light, for which see below.

The earth is at a mean distance of ninety-five millions of miles from the sun, and performs its revolution round him in a sideral year, which is 365 days 6 hours 9 minutes 11 seconds, mean solar time. The earth travels at the rate of 68,000 miles per hour. Besides this motion, which is common to all the inhabitants of the earth, those at the equator are carried 1042 miles every hour by the diurnal revolution of the earth upon its axis, while those in the parallel of London are carried only about 644 miles per hour. The earth's orbit is not a circle, but an ellipse, the sun being situated in one of the foci, that is not in the centre, but near one of the ends of the oval-shaped figure, a discovery which was made by Kepler, a celebrated German astronomer. Neither does the earth go round the sun in an upright or perpendicular position; its axis is slanting or oblique. The degree of obliquity is 23° 28′. The points at which the ecliptic cuts the equator, are called nodes: the period of time at which it does this, the equinoxes (a Latin term, signifying equal nights, for the days and nights are then of equal length all over the world). In consequence of this obliquity, during

* The fact is, that it would fall a little to the westward, and still be a proof of the earth's diurnal motion.

one part of the earth's course the north pole is turned towards the sun, and the south is dark; and during another part of its course, the south pole is turned to the sun, and the north is dark; and this is the cause of the difference of seasons, which will be better understood by referring to the figure in our first page, entitled, "Illustration of the Seasons."

THE SEASONS.

Let S represent the sun, and A B C D the earth at various places of its annual circuit; when the earth is at B or D, these are the periods of the equinox, when the line of the equator intersects or cuts through the line of the ecliptic. At this period, one-half of the globe is illuminated from pole to pole, or there is over all the earth an equal day and night of twelve hours. But when the earth has proceeded to A, the pole or axis still keeping the same position, or pointing to one particular place in the starry heavens, it will be turned more directly from the sun; a greater proportion of his rays will shine on any particular spot of the northern half of the globe, and the period of day, or sunlight, will exceed that of darkness by the proportion of the light and shade parted in the circle of the earth. It will be observed, also, that within the circle of the north pole, the sun will shine continually as the earth revolves on its axis, or, in short, to the inhabitants of that part of the globe the sun will never set for several months. When the earth has proceeded on to D, one-half of its annual course is finished, or this is the spring equinox, or equal day and night. At C, again, the earth has arrived at our longest day in summer, when the axis is turned to the sun, and the regions around the pole are in the light for a greater period, while darkness, or night, prevails for a less. It will be seen, too, that now the pole and circle around it revolve in perpetual light; or to the inhabitants of that region, the sun never sets for some months, but they have one continued and uninterrupted day. At the other, or south pole, the same changes take place, only matters are reversed—there it is summer while we have winter, and the winter of the north pole is the summer of the south—in the middle regions of the earth, or around the equator, the sun's place does not suffer a very great change; and, accordingly, there the heat is nearly of the same intensity all the year through; and the length of their days and nights is nearly equal, or nearly the same as at the periods of the equinoxes. But the orbit in which the earth travels round the sun is not an exact circle; it is, as we have already mentioned, an ellipse, and the sun is placed near one end of it, as at the small circle and letter S. In consequence of this circumstance, the sun is much nearer us at one period of the year than another, and this happens in our winter; accordingly, the sun appears about one-thirtieth part larger in January than in June. But in proportion as the earth approaches in her orbit the sun, her motion is quickened, and she passes over the winter half year in nearly eight days' less time than the summer. It is principally from this circumstance, as well as the shorter period of the day, that although the sun be nearer us in winter, and, consequently, his power of imparting heat greater, yet the actual quantity imparted is, on the whole, much less in the one season than the other. We have said that the north pole of the earth always points to a particular spot in the heavens; this is not, strictly speaking, correct; the pole or axis makes a circle round the centre of the axis of the ecliptic in a long period of years, and it is this motion that gives rise to the precession of the equinoxes, which will be afterwards described under that title.

A very natural question here arises, how it happens that, when the earth is at A in its perihelion, or nearest point to the sun, it should not be fairly drawn into collision with it by the force of gravity? for, in that situation, it is more powerfully attracted to the great centre of motion than in any other. Startling as this may appear to the uninitiated reader, it admits of the happiest explanation. We have already shown, that, as the earth approaches the sun, her motion is quickened, consequently her *centrifugal force* is increased; and this, invariably acting in opposition to attraction, or *centripetal force*, compensates for the increased tendency of the earth to be drawn to the sun; nay, more, it overcomes it for the time being. It does not, however, overcome it so much as to carry the planet off at a tangent, but just to an extent sufficient to take it a little farther away from the sun, as it appears at B. It is by the unerring operation of the same laws, that the earth, at its aphelion in the opposite extremity of the ellipse, instead of going beyond the sun's attraction altogether, is made to bend in its course, and move round it in a curve; for, although gravity be there least, centrifugal is also there least. Thus, these two grand powers of nature go on increasing and decreasing at equal rates, and acting continually as mutual checks upon each other. Indeed, the very cause which augments the one, increases the other likewise, so that error or derangement is impossible. Perhaps there is nothing in the whole system of the universe so grand yet so simple, so admirable in design, and so efficient in operation, as this law. We may observe, that the earth is nearer the sun when in perihelion, than in aphelion, by somewhat more than three millions of miles.

ABERRATION OF LIGHT.

Although the most convincing proof of the earth's orbital motion is not to be found in any circumstance of which the senses can take immediate cognisance, but is afforded by the full developement of the planetary system, there is, however, one direct proof of it in a phenomenon discovered by Bradley, an illustrious astronomer. It is called the aberration of light, and is manifested by a small difference between the apparent and true places of a star, occasioned by the motion of light combined with that of the earth in its orbit. Vision, it is well known, arises from rays of light proceeding from any object, and entering the eye; and we see the object in the direction in which the rays have come. If both the body giving forth light and that one which receives it be at rest, the former will be seen in its true place, at least in so far as aberration is concerned; but let either of the bodies move, and this will not be the case. In order to render this plain, suppose a shower of hail to fall perpendicularly upon a number of tubes—say the pipes of an organ; if the organ remain stationary, the hailstones will descend sheer from the top to the bottom without any deviation right or left; but move the organ in any direction, and they will strike the side opposite to the direction in which the motion is made. Now, it is just in this way that the eye misses the perpendicular ray, and, meeting an oblique one, receives an impression that the star lies in that direction. The object thus appears displaced, and the amount of displacement is *aberration*. The earth travels at the rate of about nineteen miles per second, and therefore is every instant changing its direction. Time is also occupied by light in traversing space, which it does at the amazing rate of 192,000 miles per second; so that also requires to be calculated for by astronomers. The effect of aberration is to make a star apparently describe a small ellipse in the heavens, in the centre of which it would be seen if the earth were motionless. The reader must carefully distinguish between aberration and refraction; their effects are the same—namely, to displace the ray-projecting object—but they proceed from very different causes. Besides these corrections which astronomers have to make in their calculations, there is another, resulting from what is called parallax, which may be as well introduced in this place.

PARALLAX.

The word parallax, in its general signification, denotes change of place; but in astronomical books it has a conventional meaning, and implies the difference of apparent positions of any heavenly luminary when viewed from the surface of the earth and from its centre. The centre of the earth is the general station to which all astronomical observations are referred; the situation of a heavenly body, observed from the surface of the earth, is called the apparent place; and that at which it would be seen from the imaginary place of observation at the centre of the earth, the true or mean place. Hence the altitudes of the heavenly bodies are depressed by parallax, which is greatest at the horizon, and decreases as the altitude of the object increases. This may be rendered very plain, by supposing that two persons placed individually at the end of a straight line, look at a candle removed at, say, 100 yards' distance from them. It is evident that the burning body will appear to be projected upon the wall of an apartment, or any other background, at very different positions to each of the spectators. The angle which this difference of position makes, is similar to parallax. The farther they remove from the light, allowing them still to remain at the same distance from each other, the more obtuse the angle would become, and the less the parallax. Thus, the fixed stars, being so far removed from us, when viewed from any two positions upon the earth's surface, are seen at the same place upon the celestial sphere, and hence have no perceptible parallax. It is different, however, with the luminaries belonging to our system, and by this means astronomers have been enabled to estimate the quantity of space which separates us from them. For a complete account of the means by which this is accomplished, we must refer the reader to more elaborate treatises than the present. A general and correct enough idea of it may be formed from the familiar example we have given. In the same manner, suppose two observers, one in the northern the other in the southern hemisphere, at stations on the same meridian, observe on the same day the meridian altitudes of the sun's centre. "Having thence derived the apparent zenith distances," says Sir J. Herschel, whose language would be deprived of clearness were it abridged, "and cleared them of the effects of refraction, if the distance of the sun were equal to that of the fixed stars, the sum of the zenith distances thus found would be precisely equal to the sum of the latitudes north and south of the places of observation; for the sum in question would then be equal to the meridianal distance of the stations across the equator. But the effect of the parallax being in both cases to increase the apparent zenith distances, their observed sum will be greater than the sum of the latitudes by the whole amount of the two parallaxes. This angle, then, is obtained by subducting the sum of the latitudes from that of the zenith distance; and this once determined, the horizontal parallax is easily found, by dividing the angle so determined by the sum of the signs of the two latitudes." It may be observed, that the angles are determined by means of very nice instruments. The parallax thus obtained is called the *daily* or geocentric, in contradistinction to the annual or heliocentric, by which, in general, is understood the difference of place of a heavenly body, as seen from the earth and from the sun; in particular, however, it denotes the angle formed by two lines from the ends of the diameter of the earth's orbit to a fixed star, which, as we have already observed, from the immense distance of the latter, is inappreciable. Some idea of the importance of parallax may be obtained from the fact, that before the sun's was determined, the distance of that luminary from us was not estimated at within thirteen millions of miles of its true value. Its parallax is a very minute quantity of course, only 8″ 6.

OF SOLAR, SIDERAL, AND ANOMALISTIC YEARS.

There are three different periods at which the sun may, in different senses, be said to return to the same position—when he returns to the same equinox at which he was before; when he returns to the same point in his orbit, or the ecliptic; and when, being in perigee (least distance from the earth), or apogee (farthest distance from the earth), he comes back to either again; or, which is the same thing, when, having been at a given distance from any of these points, he returns to the same point with respect to them. Each of these may be said to be a completion of the revolution of the sun (strictly speaking, it is a revolution of our own earth round him), and a revolution thus performed is called *a year*. The first and shortest is the equinoctial, solar, or tropical year; for his time of returning from tropic to tropic, they being situations holding the same relation to the equinox for the time being, is obviously the same as that from equinox to equinox. The value of this year is 365 days 5 hours 49 minutes nearly. But although the earth has thus returned to the same equinox, it has not made the entire circuit of its orbit, but must travel a little farther to arrive at the same point it was in a year before. This arises from a backward movement of the equinoctial point. (See "Precession of the Equinoxes.") The second is the sideral year, which consists, as we said before, of 365 days 6 hours 9 minutes 9 seconds 6, reckoned in mean solar time, or *a day more*, reckoned in sideral time. Here, then, there is a remarkable difference between solar and sideral time, which requires explanation. If the reader will recollect what was said with regard to a solar and sideral *day*, the discrepancy between the times of the years will become apparent. In the course of twelve months, all the little daily deficiencies, as it were, amount to twenty-four hours, which constitutes the difference between the two years. The sun's apparent *annual* motion among the stars is performed contrary to the apparent *diurnal* motion of the sun and stars; hence the stars gain every day three minutes fifty-six seconds on the sun, which makes them rise that portion of time earlier every day. In the course of a year, the sun will fall behind the stars a whole circumference of the heavens, or one revolution, which deficiency he must make up to complete the number of days in a year. It is evident, then, that the sun apparently, or the earth really, turns 366 times round upon its axis; and had it no other motion, there would be as many days in a year. After the earth or sun has completed a sideral year, before it can finish an anomalistic year it must describe a farther arc of 11″ 6 to arrive at its original position in perihelion, the latter having moved forward to that amount. In so doing it occupies 4′ 39″ 7, which must be added to the sideral period, making the anomalistic year 365 days 6 hours 13 minutes 49 seconds 3 in length. All these periods have their uses in astronomy, but the one in which mankind are most particularly interested is the tropical year, or that on which the seasons depend, and which is a compound phenomenon depending chiefly and directly on the annual revolution of the earth round the sun, but subordinately also, and indirectly on its rotation round its own axis.

MEASUREMENT OF TIME.

Although the sideral day, from its uniformity, is well adapted for astronomical purposes, yet it is scarcely sufficiently marked for the ordinary wants of life. No person but an astronomer ever attends to the culmination of a star; on this account, the diurnal return of the sun to the same meridian has been universally adopted as the measure of time; and this is called a *civil day*. Most nations reckon the beginning of their day from midnight, but astronomers count from noon to noon. The day thus determined is called the astronomical or solar day, and, being regulated by the true motion of the sun, the time which is measured by it is called true or apparent time. Two causes conspire to render astronomical days unequal: first, the variable velocity of the sun in his orbit, and, second, the obliquity of the ecliptic. A mean astronomical day, which is independent of any causes of inequality, has been obtained by astronomers introducing into the system two imaginary suns. These two fictitious bodies are supposed to move uniformly, the first in the ecliptic, the second in the equator; and as the circles are both equal, the actual motion of each of the bodies is equal. To those desirous of studying this part of the subject, we would recommend them to peruse the article *Astronomy* in the new edition of the Encyclopædia Britannica, page 778, where it is well illustrated. The correction or equation, by which apparent time is reduced to mean time, is technically called the *equation of time*. There are only four days in the year when the apparent and mean time are the same, and the equator of time nothing. In the interval between the first and second of these, that is, December 24th and April 15th, and, again, in that between the third and fourth, that is, June 15th and September 1st, the apparent is always later than the mean time, or the clock is before the sun; in the other intervals which complete the year, the reverse is the case, and the clock is after the sun. The greatest difference between solar and true time amounts to between fifteen and sixteen minutes. Tables of equation are constructed for the purpose of correcting the differences.

With regard to terrestrial time-keepers, we have clocks, chronometers, clepsydras, and hour-glasses; the two former are now all that are in use in astronomy. The pendulum clock and balance-watch has been so improved and refined, as to constitute it emphatically a chronometer (from two Greek words, signifying to measure time). To such a degree of perfection have these instruments now been brought, that they do not vary more than a few tenths of a second in twenty-four hours. But the best of these must be corrected by those means which nature has afforded. The fractional parts of time only are measured by clocks; nature counts out for us whole days; and hence, astronomers correct the errors of their clocks, by the transit (or passage over the meridian of an observer) of a bright fixed star, which is always equal. The subject of dialling we have not limits to enter upon.

THE CALENDAR.

It is obviously necessary, for many purposes, not only of chronology and history, but even of every-day convenience, to have the means of dividing time into definite periods of considerable length. The most obvious period to adopt is that which comprehends the natural phenomena of the seasons; seed-time and harvest, summer and winter; and all these are included in an *equinoctial year*. It is the position of the sun, with regard to the equinox, which determines the character of the season; and in his passage through his whole round, from one equinox to another, he occasions the vicissitudes of the seasons, no matter what time he takes to it. This revolution, therefore, has been adopted as the unite of long duration by all civilised nations, and is termed emphatically *a year*, or *the civil year*. It is evident that great inconvenience would result from the year not commencing with the beginning of a day, which, from there being odd hours in the year, would happen, if the length of the civil year were not fixed in some definite manner. In this consists the adjustment of the calendar; and many attempts have been made, at different times and in various countries, to establish an accurate and complete one. It is unnecessary to enumerate here all those which belong to distant ages; but there is one we must notice, famous alike by the celebrity of the individual under whose auspices it was made, and as being, besides, the groundwork of the adjustment now used. The Roman calendar had fallen into great confusion, there being no regular method of correcting it, until the time of Julius Cæsar, who, perceiving that the year was longer than 365 days by nearly six hours per annum, added a day every fourth year to the calendar. It is evident, however, that this was too much, because the difference is only five hours, forty-eight minutes, and odd seconds; so that, multiplying these by four, they do not make a day in four years. The error began to accumulate to such an extent, that the derangement of the seasons was perceived by every one. Accordingly, Pope Gregory the Thirteenth, in 1582, reformed the calendar, by cutting out ten days, and calling the 5th of October the 15th. It was also provided, that, in future, the intercalary day should at certain intervals be omitted. As the excess is about one day in 130 years, it amounts to rather more than three days in 400 years; and, accordingly, it was ordered that the centenary years, 1700, 1800, and 1900, though according to the Julian correction bissextiles, should not be considered leap years; the intercalary day should not be inserted; but inserted in the year 2000, not inserted in 2100, 2200, and 2300, and so on, for succeeding centuries. This is called the *Gregorian correction of the calendar*, and the degree of its accuracy may be easily estimated, in the same way as we have estimated that of the Julian correction; the latter, we found, would introduce an error of a day in about 130 years; the Gregorian will introduce an error of a day in 4000 or 5000 years. The new style was introduced into England on the 14th September 1752, which would have been called, according to the old style, the 3d. The revolutions of the sun and moon are not very easily reduced to proper measurement, the solar year containing twelve lunations, and almost eleven days. But a philosopher discovered, more than two thousand years ago, that nineteen solar years contain exactly two hundred and thirty-five lunations; and this determination is so accurate, that it makes the lunar month only about half a minute too long. Hence it happens, that, in every period of nineteen years, the moon's age is the same on the same day of the year.

URANOGRAPHY.

It is well known, that, besides terrestrial, there are celestial globes, in which the heavens have been maped out, and drawn with lines, to which the distances of stars, clusters of stars, &c., are referred, in the same way as towns and continents upon the earth. The firmament has its north and south poles, and its equator, in the same way as the earth. Indeed, strictly speaking, the earth owes these to the heavens; for it is by observations made on the celestial sphere, that we are enabled to delineate the globe as we do.

The celestial sphere is divided into the same number of degrees as the terrestrial. The celestial poles correspond to those parts of the heavens to which the terrestrial poles always point. The celestial equator corresponds also to the terrestrial, and is, like it, every where ninety degrees distant from the poles. The equator of the earth thus lies directly under that of the heavens; the ecliptic does exactly the same, and cuts the former also at an angle of twenty-three degrees twenty-eight minutes. Instead, however, of a series of zones, we have groups of stars called constellations, which have received the names of men and animals, for the convenience of description and reference. There are also great natural districts in the heavens, such as the milky way, and remarkable regions, such as the zodiac, which may be compared to the continents of our earth.

The place where the ecliptic cuts the equator at the vernal equinox, is called the first point of Aries; and from this point the distance of all celestial bodies eastward and westward of it is measured. This is called their *right ascension*, and corresponds to the terrestrial longitude. Their latitude is determined by their distance from the equator, and is called their *declination*. The declination of the sun or other heavenly body is therefore called north or south declination, according to its proximity to the north or south pole of the heavens. Hence it follows, that when the sun's declination is 10° north, he is vertical at a place whose latitude is 10° north. But the right ascensions do not so correspond with the longitudes, simply because the first point of the constellation Aries does not correspond to the first meridian, Greenwich; and because the longitudes are not measured quite round as the right ascensions are. The sun, which is always in the ecliptic, has of course no latitude, but he passes through all the degrees of longitude in a year. When any other celestial object has the same longitude as the sun, he is said to be in *conjunction* with him; and when the difference of longitude amounts to 180°, half the circle of the heavens, it is said to be in *opposition* to him. Both these terms are comprehended in that of *syzygy*, which, when applied to any celestial object, means that it is either in conjunction or opposition to him. What is called an *equinoctial colure*, is a great circle supposed to be drawn through the pole of the ecliptic and the points where it intersects the equator. The *solstitial colure* is a similar circle, which passes through the solstitial points at right angles to it. The former colure is a secondary to the ecliptic, and the latter a secondary to both it and the equator. The equinoctial points are Aries and Libra, where the ecliptic cuts the equator. The solstitial points are Cancer and Capricorn; and when the sun is in either of them, he is at his farthest distance above or below the equator.

Thus, then, by "comparing things in heaven with things on earth," has the starry sky been maped out, and the places of celestial objects determined and marked down like towns and other places upon the surface of the earth. Unlike those, however, which maintain unchangeably their distances from each other, some of those in the celestial sphere are continually shifting their places; and the whole, indeed, have a certain degree of motion. The former, however, are so very few in number compared to the multitude of luminaries "which no man can number," and the latter is so exceedingly trifling as scarcely to be discernible from one thousand years' end to another, that the aspect of the heavens may be said to possess invariable uniformity. The heavenly bodies are broadly distinguished into two grand classes—those among which no change of relative situation can be detected, unless after many years' observation, and hence called fixed; and those which are changing place continually, and so rapidly as to be discernible by the naked eye; hence called erratic or wandering. These are the planets and comets of

THE SOLAR SYSTEM.

This, as we have previously shown, consists of a centre of light, heat, and motion, denominated the sun; with eleven primary planets, eighteen secondary ones, and an unascertained number of comets, revolving round that centre from west to east in eliptic orbits. The periods depend on the distance of the planet from the sun, those which are near performing their circuit in less time than those which are more remote. They have likewise a rotation upon their axis, which is inclined to the plane of their orbits, and in which they are retained by the same laws as those which regulate the movements of the earth. Moreover, they all make the entire tour of the heavens, and nearly in the plane of the ecliptic. To make this understood, suppose an immense circular plain or level, expanded from the sun all round, and cutting through the earth, stretched to the remotest planet in the system; then the whole of those planets move in the neighbourhood of it, when they sink below it or rise above it, never proceeding very far either way. From the unequal angular motion of the planets (a result of their various distances from us and the sun), some very curious phenomena arise. Mercury and Venus appear to move occasionally backwards and forwards; so that, if their apparent track was maped down by observations made from day to day, it would have a zigzag appearance. This arises, however, from our not observing them from their proper centre of motion. Several facts regarding the planets will strike every observer, that they are exactly circumstanced as the earth is with regard to the sun. They are found really to be globes, of a size equal to, and sometimes surpassing, that of the earth. Their distances from us are in a state of continual change, periodically increasing and decreasing within prescribed limits, which has an obvious relation to their elongations from the sun, and not to the earth, as a centre or focus. Lastly, some of them exhibit phases like those of the moon. If we refer their movements to the sun as a centre, all the apparent irregularities disappear, and every thing assumes an aspect of perfect order and beauty. We perceive a striking resemblance between all the planets—a family likeness as it were. One influence pervades the whole of them, one impulse directs their movements. We shall here only notice facts about which there is no dispute, leaving out of view entirely all those ingenious conjectures which are calculated to amuse the fancy rather than to satisfy the judgment. Let us, in the first place, attend to the laws by which they are retained in their orbits, which are known in astronomy by the name of

THE LAWS OF KEPLER.

Previous to the establishment of the law of universal gravitation by Newton, several great discoveries had been made which cleared the way for it; and amongst the most remarkable and important of these, were the laws of the courses of the planets round the sun. These were deduced by Kepler, a great German astronomer, from observations by Tycho Brahe, and are known in philosophy by the name of the Laws of Kepler. They form the basis of the science, and a knowledge of them will greatly facilitate a right understanding of the movements of the planets. The first is, that the planets do not move in circles, as Copernicus had supposed, but in elipses or ovals. The second is, that an imaginary straight line from the sun to the planets always describes equal sections in equal times. And the third, and by far the most remarkable, and fraught with momentous results, is, that, in the motion of the planets, the squares of the times of revolution are as the cubes of the mean distances from the sun. It is not compatible with our limits to enter into any details respecting these laws; it is sufficient to say, that the application of them affords a beautiful explanation of the movements of the bodies composing the solar system. The expression of the third law, however, requires a slight modification when we come to extreme niceties in calculation, arising from the influences of the masses in the greater planets.

The following table shows at a glance the magnitudes, relative positions, &c. of the bodies which compose the solar system:—

Globes.	Sidereal Revolution.		Rotation.			Distance from the Sun.	Diameter.	Inclination to the Ecliptic.			
	years.	*days.*	*days.*	*hours.*	*min.*	*miles.*	*miles.*	*degrees, &c.* °	′	″	
Sun	-	-	25	14	-		882,000				
Mercury	-	88	1	-	5¼	37,000,000	3,180	7	0	9	1
Venus	-	225	-	23	21	68,000,000	7,800	3	23	28	5
The Earth	-	365¼	-	23	56	95,000,000	——	——			
The Moon	-	27⅓	27⅓	-	-	——	2,160	——			
Mars	1	321	-	24	40	143,000,000	4,100	1	51	6	2
Vesta	3	249	Not ascertained			225,000,000	Not ascertained, but very small. Pallas is supposed to be only eighty miles in diameter.	7	8	9	0
Juno	4	130				254,000,000		13	4	9	7
Ceres	4	220				263,000,000		10	37	26	2
Pallas	4	220				263,000,000		34	34	55	0
Jupiter	11	306	-	9	56	490,000,000	87,000	1	18	51	3
Saturn	29	167	-	10	16	900,000,000	79,000	2	29	35	7
Uranus	84	8	-	7	-	1800,000,000	35,000	0	46	28	4

THE SUN.

The mass of this magnificent luminary exceeds that of all the planets which revolve round it put together, eight hundred times. The density of the sun is, however, a great deal less than that of the earth, so that it must consist of far lighter materials, especially when we reflect how much the central parts must be condensed by the force of the immense superincumbent mass. Hence it has been supposed, that a great heat prevails in its interior, which gives it an elasticity sufficient to neutralise the effect of this tremendous pressure. The extent of solar gravity we have already noticed. The rotatory motion of the sun, which, like that of the earth, is from west of east, has been ascertained by means of a variety of dark spots which are discovered by the telescope on his disc. They first appear on his eastern limb, and, after a period of about thirteen days, disappear in the western. These spots vary both in number, magnitude, and shape; sometimes forty or fifty, and at other times only one or two, are visible. Most of them have a very dark nucleus, or central part, surrounded by an umbra, or faint shadow. Some of the spots are as large as would cover the whole continent of Europe. We have already spoken of the apparent motion of the sun, and shown that it results from the real movement of the earth. The sun is affected by the attractive power of the planets, from which a minute motion results. These various "perturbations" will be explained afterwards. From the observations of Sir William Herschel, it appears probable that the sun is a solid and opaque body, surrounded with luminous clouds, which float in the solar atmosphere, and that the dark nucleus of the spots is the opaque body of the sun appearing through occasional openings in its atmosphere.

The temperature at the visible surface of the sun is supposed to be very elevated; but how the enormous conflagration is kept up, if such it really be, there is no satisfactory means of accounting for.

We have already enumerated some of the benefits which we derive from the sun. "His rays," says Sir J. Herschel, "are the ultimate source of almost every motion which takes place upon the surface of the earth"—we may add, and that of every other planet in the system, of which he is the *active verb*. It is by his heat, as we have seen, that winds are produced, that vapour is exhaled into the atmosphere, from whence it descends in showers to fertilise the soil. In a word, by the efficiency of the sun, the elements of matter have imparted to them that vital energy by which they are enabled to go through their endless rotation of existence, and perpetuate the multiform varieties of organic life which people the globe.

About the months of April and May, after sunset, or at the opposite months of the year before sunrise, there is a curious phenomenon observed, called the *zodiacal light*. Extending from the horizon obliquely upwards, and following generally the course of the sun's equator, there is to be seen at these times and seasons a faint stream of light, and of a conical shape. It is supposed to be a thin lenticularly formed atmosphere, which surrounds the sun, and certainly extends beyond the orbits of Mercury and Venus; but any thing more definite regarding it has not been ascertained.

In his apparent motion among the stars, he is said to enter such and such a sign, at such and such a definite period of the year. These signs are constellations belonging to the zodiac, a region of the heavens which we have more than once mentioned, and one to which we shall hereafter frequently refer, so that an account of it is necessary before we proceed farther.

THE ZODIAC.

The word zodiac is derived from the Greek, and signifies animals; the region of the heavens to which it refers has been so entitled, because its various divisions have been named after animals. It is an *imaginary* ring, or broad circle, in the firmament, in the form of a belt or girdle. It extends eight or nine degrees on each side of the ecliptic, which runs through or round the middle of it. It is divided into twelve parts, each of thirty degrees, called the signs of the zodiac. The names of the signs, and the days in which the sun enters them, are as follow:—*Spring signs*—Aries, the Ram, 21st of March; Taurus, the Bull, 19th of April; Gemini, the Twins, 20th of May. *Summer signs*—Cancer, the Crab, 21st of June; Leo, the Lion, 22d of July; Virgo, the Virgin, 22d of August. These are called northern signs, being north of the equinoctial. *Autumnal signs*—Libra, the Balance, 23d of September; Scorpio, the Scorpion, 23d of October; Sagittarius, the Archer, 22d of November. *Winter signs*—Capicornus, the Goat, 21st of December; Aquarius, the Water-bearer, 20th of January; Pisces, the Fishes, 19th of February. These are called southern signs. Within the zodiac are performed the revolutions of all the principal planets. The accounts given of the signs of the zodiac, and of the constellations, are contradictory, and involved in fable. It is conjectured, however, that they have reference to the seasons of the year, and are a hieroglyphical representation of the characteristics of each month. Thus the spring signs were distinguished for the production of those animals which were highly esteemed, such as sheep, black cattle, and goats; the latter, being the most prolific, were represented by the twins. When the sun enters *Cancer*, he changes his course backwards, and this retrograde motion was typified by the crab, which apparently goes backwards; and so on with the other signs. The constellations to the north of the zodiac are called northern constellations, and those on the south of it, southern constellations. They are named in the same fanciful manner as the zodiacal signs. The whole constellations amount to between ninety and a hundred in number.

With regard to the sun's entering the zodiacal signs, some important particulars will be found under the head "Precession of the Equinoxes."

THE MOON.

Next to the sun, the moon is to the inhabitants of the earth the most remarkable and important of all the heavenly bodies. The mean horizontal parallax of the moon is 57′ 48″; and her mean distance from the earth 236,847 miles. Like the sun, the moon advances in the heavens in a motion contrary to that of the stars. Notwithstanding the vast distance she is from us, it is little more than one-fourth of the sun's diameter, and the globe of that magnificent luminary would nearly *twice* include the whole orbit of the moon! It has various motions; as a secondary planet, it revolves round the earth, which is its primary. Along with the latter, it revolves round the sun, and it has a rotatory motion upon its own axis. Owing to the sun's apparent movement in the heavens being in the same direction with that of the moon, only slower, the latter has to make up for that slowness in the same way as we have mentioned with regard to the earth, and the time it takes constitutes the difference between the sideral and synodic month or lunation. The sideral month is 27 days 7 hours 43 minutes 11 seconds 5, in which time the moon performs a complete revolution round her primary; and the other is 29 days 12 hours 44 minutes 2 seconds 87, the time which elapses between two new moons, or two conjunctions of the sun with the moon. It happens that its revolution upon its axis is performed in the same time as its revolution round the earth, so that the same side of her orb is always presented to the latter planet. Although the moon's rotation on her axis is uniform, her motion in her orbit is not so, and we are by this means enabled at times to obtain a peep of the equatorial portions of her eastern and western sides. Her axis, also, is not perpendicular to her orbit, and a small part of each of her poles alternately becomes visible. These phenomena are known by the name of *librations* of the moon, and they are of two distinct kinds, the result of different causes. The moon being the nearest to us of all the heavenly bodies, by the aid of telescopes we have been enabled to examine her more minutely than any of the other planets. In the first place, great inequalities are discovered on her surface, which are evidently caused by mountains and vallies. That mountains of considerable height exist, is certain, from the jagged appearance which the illuminated edge of the moon presents, and from their casting long black shadows on the plains. The height of these elevations has, from measurements, been ascertained to be about one and three-quarters English miles. These mountains are very numerous, occupying by far the larger portion of the surface, and are almost universally of a circular cup-shaped form, with flat bottoms. Many of those with broad bases have a high conical summit, exactly corresponding to the form of volcanic mountains on the earth. Indeed, in some of the principal ones, decided appearances of successive deposits or layers of ejected matter, may be clearly traced. Dr Herschel more than once saw volcanos burning with great violence in the moon. Nothing corresponding to the appearance of oceans or large sheets of water is discernible in the moon, although there are large portions of the surface perfectly plain and level; neither has the moon any clouds or indications of an atmosphere.

PHASES AND ECLIPSES OF THE MOON.

The phases and eclipses of the moon depend upon the position which she is in with regard to the earth and sun. At new moon, this body is in a direction between the sun and the earth. As she gradually revolves in her monthly orbit, she recedes from this position, until she comes to the first quarter, when she is half illuminated, or seen with one-half of her face turned to the sun; another quarter's advance brings her to a position opposite to the sun, when his beams shine full on her disc, and it becomes full moon. In a clear state of the atmosphere, an appearance is often witnessed at new moon of the faint illumination of the remaining part of the disc, or the new moon is said to have the old in its arms. This arises from the strong reflected light sent from the earth.

The wisdom and beneficence of the Deity are strikingly displayed in the economy of moonlight, as distributed to our globe during various seasons of the year. The remarkable phenomenon of the *harvest* moon is familiar to every one. During the time that our satellite is full, and for a few days before and after, in all about a week, there is less difference between the time of her rising on any two successive nights, than when she is full in any other month of the year. By this means, an immediate supply of light is obtained after sunset, so beneficial for gathering in the fruits of the seasons. To conceive of this phenomenon, it must be recollected that the moon is always opposite to the sun when she is full; that she is full in the signs Pisces and Aries, these being the signs opposite to Virgo and Libra, which the sun passes through in September and October, our harvest months. Thus, although, whenever the moon enters the two former signs (and she does so twelve times in a year), the same circumstance takes place with regard to the time of her rising; yet it is not observed on these other occasions, just because she is not *full* at the time. The reason of there being little difference in the time at which she rises on several consecutive nights, is, that, at these periods, her orbit is nearly parallel to the horizon. The harvest moons are as regular in south latitude as with us in north latitude, only they happen at different periods of the year.

Solar eclipses are caused by the moon coming between the earth and the sun, and lunar eclipses by the earth coming between the sun and the moon. The places of the earth's orbit and the moon's do not exactly coincide, but cross or intersect each other; and the consequence is, that, in general, the moon, when she is in conjunction with the sun, either passes on one side or the other, and therefore does not intercept the sun's rays, or produce an eclipse. An eclipse of this kind can only take place when the earth and moon are in conjunction in that part of their orbits which cross each other (called the nodes), because it is then only that they are both in a right line with the sun. If the orbit of the moon were parallel to that of the earth, an eclipse would happen every month. Partial eclipses, again, are caused when the moon, in passing the earth, is not directly in a line with the sun, but a little on either side; the consequence of which is, the edge of one side of the moon only dips into the sun's disc. When the sun is eclipsed, the total darkness is confined to one particular part of the earth, but the lunar eclipses can be seen from every part of the earth, when the moon is above the horizon; and both circumstances prove that the earth is a good deal lower than the moon. The moon arrives very nearly at the same situation with respect to the earth, after making two hundred and twenty-three revolutions, which are performed in eighteen years, of three hundred and sixty-five days, fifteen hours, seven minutes, and forty-three seconds, each. So that, after a period of about eighteen years, the series of eclipses recommences nearly in the same order, a circumstance observed by the ancients. The mean number of eclipses which occur in a year is about four, and there are sometimes as many as seven. There must necessarily be two solar eclipses, but it is possible that there may not be even one lunar. A remarkable eclipse, called an annular (or circular) solar eclipse, happens when the moon being in conjunction with the sun, the edge of the latter appears for a few minutes as a narrow ring of light encircling all round the dark disc of the moon. A great solar eclipse, visible in England, will take place May 15, 1836; another in March 15, 1858, and a still more remarkable one, when the whole disc will be nearly covered, in August 19, 1887.

The eclipses of some of the satellites are of great importance in astronomy, and will be noticed when we come to speak of these bodies generally.

TIDES.

The ebb and flow of the sea evidently result from the attraction which the moon exercises over the earth. The land is as much attracted as the water; but the cohesion of solids prevents their parts from being affected as those of fluids are, which easily yield to the force of gravity; and, in consequence of this, the waters immediately below the moon are drawn up in a protuberance, producing a full tide, or high water, at the place where it happens. So far all is perfectly simple. But since the earth only turns *once* upon her axis during the twenty-four hours, and, in consequence, can only, in the same space of time, show any meridian of her surface to the moon no more than *once*, or, in other words, that any individual portion of the sea is *once* under the influence of the moon's attraction in the course of a day, how comes it, then, that there are *two* full tides in that time?—and, what is still more singular, how does it happen that our antipodes should have high water at the very same time as ourselves? The opposite tide is rather more difficult to explain than that which is drawn up under the moon, and yet it admits of a perfectly satisfactory explanation. Let the reader suppose placed before him a globe, of a foot diameter, which is for the present destitute of any attraction but that of the particles for the centre of the one-foot globe. On the outside of this sphere, there is a fluid, such as water, which is one inch thick all round. Bring another globe, of similar dimensions, within two feet of it, at which distance we shall suppose the latter has the power of attracting the former; the point attracted is, for the moment, say the north pole, that directly opposite being the south pole. Now, at this vanishing north pole, the waters are heaped up by the attractive power of the last introduced globe, say to the depth of one and a half inches. A little farther on either side of the point where the water-encircled globe is nearest to the other sphere, the depth will be less, say an inch; because the attraction must there be less, for the force of the latter always decreases according to the distance. As the latter increases, the former loses its intensity, and the depth becomes less and less, until we arrive at that part which is equi-distant from either pole (corresponding to the equator), where it is least. Still, however, the attraction is greater there than at the south pole, where it evidently must be smallest. But, observe, it is not the *water* alone that is attracted, it is the *whole* globe; so that the latter is drawn away from one extremity of its moveable surface, and thus leaves a protuberance. The tide at the point most strongly attracted is produced by the waters receding from the earth; at the opposite side, it is the earth fleeing or receding from the waters. The earth is continually *falling*, or *drawn out* in an oblong shape towards the moon, the two high tides being always at the two points from which, if a line were drawn, it would measure most. The tides, then, are just a broad wave which sweeps round the earth, following the apparent track of the moon. When the elevated part of this billow strikes our coasts, it is high water; when the lower touches us, it is low water. By the sun's attraction, a similar wave is also produced. When the solar and lunar attractions coincide, and act in the same way, we have what are called spring or large tides; when they act in opposition to each other, we have neap or small tides. The spring tides happen twice a-month, when the moon is at full and at change; and the neap, when the moon is 90° from the sun. The reason of the tides being about three-quarters of an hour later, is, that the earth takes that time above the twenty-four hours in bringing any given meridian again beneath the moon. The tides are thus retarded for the same reason that the moon rises three-quarters of an hour later every day. It is evident that the tides will be greatest at that point of the earth's surface which is nearest to the moon, or where the latter is vertical. She is so at the torrid zone; and, accordingly, the tides are there greatest, and they diminish as we approach either poles. The moon is not vertical to any given spot where high water may be, because, as the earth revolves from west to east, the waters of the deep have a motion in that direction, and, by the law of inertia, formerly explained, have a *stubbornness* to resist any change. The waters, therefore, do not immediately give way to her attraction, and the effect is not complete till three hours after she has passed the meridian, when it is full tide. Twice a-year—namely, in March and September—the tides are higher than at other times, because then the attractions of the sun and moon are the strongest. A number of causes connected with the relative position of land and water conspire to disturb the regularity of the tides; but a detail of these we have not space for. The influence of the sun and moon, also, produces a minute tide in the atmosphere.

THE OTHER LUMINARIES OF THE SYSTEM.

Some of the peculiarities of the inferior planets, Mercury and Venus, we have already noticed. The intense brilliancy of the latter luminary precludes observers from discerning any thing distinctly. A uniform brightness, however, can be perceived, and neither mountains nor shadows similar to those perceptible in the moon. These two planets perform their circuit as attendants upon the sun. They are sometimes seen to the east of it, when they appear just after sunset in the west as *evening* stars; and sometimes to the west of it, when they appear before the rising of that luminary as *morning* stars.

Mars, however, exhibits a different aspect. Seas and continents can be distinctly traced; the former are greenish, and the latter of a ruddy hue; in both cases the colour no doubt arises from that of the reflecting surface. An atmosphere of some extent has also been ascribed to it, and a whiteness at its poles has led some to conjecture, and with a degree of probability, that snow is by no means a phenomenon.

Jupiter is a remarkable planet, being furnished with four satellites, which revolve round him as the moon does round our earth. A series of dark belts cross his disc in one direction, which never changes, and is parallel to the equator of the planet. It is supposed that they are the opaque body of the planet appearing through tracts of clear sky. The figure of Jupiter, as we formerly observed, is spheroidal, like that of the earth, and it has been calculated, with a remarkable degree of correctness, that, comparing its oblateness at the poles with that of the earth, it exactly corresponds with the dimensions of the planet, and the immense rapidity of its rotatory motion.

Saturn.—This is probably the most interesting of all the planetary bodies. He has no less than seven moons revolving round him, and is moreover surrounded with two broad, flat, extremely thin rings, nearly of a circular form, both lying in one plane, and separated by a very narrow interval from each other throughout their whole circumference, but at a considerable distance from the body of the planet itself. An idea of them may be formed from the engraving on the first page, entitled Saturn. Round the outer edge the exterior ring measures one hundred and seventy-six thousand miles; the interval between the body of the planet and the interior ring is nineteen thousand miles; the interval between the two rings nearly eighteen hundred miles, while their thickness is about one hundred miles. The ring is known to be a solid opaque substance. Saturn exhibits the appearance of an atmosphere, with belts running parallel to the supposed equator. The rings have a revolution of their own around this planet, and with nearly the same rapidity as his daily revolution, and the adjustment of form and velocity must be nicely balanced, in order to preserve such comparatively thin and fragile bodies from falling in, and becoming part of the planet. It is evident that this catastrophe is prevented by their rapid motion producing a high degree of centrifugal force.

Uranus was discovered by Herschel the elder, in 1781. This planet presents only a uniformly illuminated disc, without spots, rings, or belts. It is attended by satellites, two of which are clearly distinguishable, and it would seem to have six.

Ceres, *Pallas*, *Juno*, and *Vesta*, the four very small planets discovered about the beginning of this century, are too small in dimensions, and too distant from us, to present any thing remarkable.

OF THE PLANETS IN GENERAL.

A glance at the tabular view which we have given of the solar system is sufficient to show us, that, as far as we may judge, by appearances from the different distances at which the bodies composing it are from their common centre, the sun, some of them must experience a scorching degree of heat, and others an extreme of cold, which would hermetically seal up the vital energies of man; and also, that what we call *weight* and *inertia* must exhibit, taking them collectively, as great varieties as temperature. That the power of gravity at the surface of any given planet will just be according to the mass of matter which the planet contains, there can be little reasonable doubt. Hence it has been calculated, that bodies weigh three times more on Jupiter than they do on the earth, and at the moon only one-sixth, while Saturn is supposed to consist of materials not much heavier than cork! But, with regard to temperature, various difficulties present themselves, which preclude us from drawing any satisfactory conclusions upon the subject. We may speculate, that the surface of this planet, from its proximity to the sun, endures a heat considerably above that of boiling water; and that the surface of another, in virtue of its enormous distance from the sun, must be bound up for ever in chains of "thick-ribbed ice." But the fact is, that the manner in which heat is excited upon our own globe is by no means a settled point. We know very well that heat and light *apparently* proceed from the sun; but, instead of supposing heat and light to be material bodies sent off from that luminary, may the effect not be produced by some peculiar action which it exercises upon an exceedingly rare ethereal medium, which fills the void betwixt the planets and sun, and probably exists throughout all space? This appears by far the most plausible conjecture that can be formed upon the subject. But even allowing that the sun is a body in a state of conflagration, there may be circumstances which modify extreme heat at the surface of those planets very near him, and compensate for the want of it in those far removed from his influence. With regard to their being inhabited, all we can say is, that, reasoning from analogy, there is every likelihood that they are so. If, upon the earth, there is not a withered leaf which the autumn blast strews upon the heath, but teems with animated existence, we carry reason along with us when we say, that the stars are the abodes of races of beings, whether similar to ourselves or not we cannot determine, and it would be of little moment although we could.

OF THE SATELLITES.

The earth, we have seen, is attended in her annual circuit round the sun by one satellite, the moon, which revolves round her as a centre. Strictly speaking, both move round a common centre of gravity in an elliptic orbit, the regularity of which is disturbed by their mutual attractions, so that it is undulated or waved, thus, ... The number of undulations in a whole revolution is, however, only thirteen, so that the deviation from the ellipse is exceedingly trifling. Jupiter, Saturn, and Uranus, are all attended by satellites, as we have seen; and they form, as it were, each of the primaries with its attendant moons, a sort of miniature system, entirely similar in the laws by which they are governed to the great system to which they all belong, where the sun may be termed the primary planet, and the primary planets the satellites. Their orbits are circles or ellipses of small eccentricity, the primary occupying one focus. Of these systems, that of which Jupiter forms the head, has been studied with the greatest attention. The discovery of Jupiter's satellites by "the starry Galileo," was one of the first fruits of the invention of the telescope, and forms a remarkable era in the history of astronomy. From it resulted a solution of the great problem of the longitude, and the grand discovery of the aberration of light, of which we have already spoken. It also established completely the Copernican system, and confirmed the laws of Kepler. The satellites of Jupiter revolve from west to east like the moon, but they are much less in comparison with their primary than it, whilst their orbits are of smaller dimensions, and less inclined to the ecliptic of their primary than that of our satellite. The largest of them is about 3377 miles, and the least about 2068 miles in diameter. The satellites of Saturn have been much less studied, and have fewer peculiarities. Those of Uranus, however, are remarkable, inasmuch as their orbits are nearly perpendicular to the ecliptic, and in these orbits they have a retrograde motion—that is, from *east* to *west*, instead of from *west* to *east*, like the other planetary bodies. No satisfactory cause for this departure from the general rule can be given. It is by accurate observation of the satellites that the densities of the planets, or their weight as proportioned to their bulks, have been ascertained; as also, by watching their frequent eclipses, that the velocity with which light travels from the heavenly bodies to the earth has been brought within our calculation.

COMETS.

All the bodies which we have hitherto noticed are seen from the earth in every part of their orbits, and they all move in ellipses which deviate comparatively little from the circular form. But there are others, which occasionally make their appearance in the sky, whose motions and nature, as far as is known, entirely differ from these. They are called comets (*coma*, hair), from the stream of faint light or nebulosity which frequently attends them. Shooting down from the remote regions of space with inconceivable velocity, and suddenly appearing amongst the more steady and regular bodies of our system, accompanied sometimes, too, with a luminous tail which flames over many degrees of the heavens, they are calculated to excite both terror and dismay. Accordingly, in superstitious ages, their sudden and unexpected apparition was more than once mistaken for the announcement of that catastrophe which, we are led to believe, is to consummate the destinies of all terrestrial things. At first, their appearance is small, and their light feeble; as they approach the sun, their magnitudes and brilliancy increase, and frequently present a magnificent spectacle. Having reached the point of their orbits nearest the sun, they again recede to enormous distances, and disappearing gradually, at last vanish altogether. With respect to their motions, instead of being confined to a particular zone, and moving from west to east like the planets, they range the sky indifferently in all directions. The ellipses in which most of them move are so eccentric or elongated as to approach the form of the parabola. They are visible only in a small part of their orbit, which, being that nearest the sun, is passed over with prodigious rapidity. They seldom continue visible longer than six months. Their number is entirely unknown; but, during the last two centuries, upwards of 150 have been observed, and their orbits computed.

Comets, for the most part, consist of the head, which is a large and brilliant, but ill-defined body of light. The centre is usually bright, and has the appearance of a vivid *nucleus*, like a star. Opposite to the direction in which the sun is situated from the comet, shoots off the tail, a magnificent appendage, though not an invariable one, consisting of two streams of light, which sometimes unite at a little distance behind the head, sometimes continuing distinct for a great part of their course. The matter of which comets are composed must be extremely light and filmy, as stars are visible through them. For a more particular account of comets, see Chambers's Journal, Nos. 31 and 33.

PERTURBATIONS.

The name of perturbations has been applied to those inequalities in the lunar and planetary motions, which arise from the universality of attraction. Thus, not only does the sun attract the earth, and the earth the moon, but the latter attracts the preceding, and both are again influenced in their movements by the great centre of the system to which they belong. Not only is this the case, but every individual planet in the system attracts, and is attracted by, all the rest, although certainly in a very trifling degree, when compared with that exercised by the sun over the whole of them. But in those miniature systems, such as the moon and earth, Jupiter and his satellites, &c., the perturbations thus arising, though insensible in short intervals, become apparent when accumulated, and derange the elliptic motions and relations. The calculation of the effects of these disturbing forces is famous in the history of analysis, under the name of *The Problem of the Three Bodies*. It is so worded, because the Sun, Moon, and Earth, and the Sun, Jupiter, and Saturn, form each separately a system little influenced by the rest. Any thing like an attempt to exhibit the method by which these nice calculations are made, is impossible in this place; of its difficulty, some idea may be formed, when we consider, what is apparent to every one, that the situations of the bodies under investigation are continually shifting their relative distances from each other, and altering the intensity of the disturbing force, which evidently must materially increase the abstruseness of the calculation. One of the principal effects produced on our globe by this play of gravitation is called

THE PRECESSION OF THE EQUINOXES.

The equinoctial points we have already explained, are, Aries and Libra, where the ecliptic cuts the equator. They are also termed nodes, and the line which joins the two is called the line of the nodes. The longitudes of the stars, as has been also observed, are counted on the ecliptic from the vernal equinox Aries Now, if the line of the nodes is invariable, the longitude of the stars will of course remain the same from age to age. But, on comparing the actual state of the heavens with the recorded observations of ancient astronomers, it is perceived that the longitudes of the stars have considerably increased; so that, to explain the circumstance, we must either suppose that the whole firmament has moved in the order of the zodiacal signs, or else that the equinoctial points have gone backwards, or retrograded westward; since these points depend entirely upon the motion of the earth, which was far more likely to be disturbed by some cause or other, than that the countless multitude of stars should have a motion relative to these points. Accordingly, the phenomenon has been explained, by attributing to them a retrograde motion from *east* to *west*, in consequence of which the sun arrives at them sooner than if they had remained at rest. Hence the equinoxes, spring and autumn, and the other seasons, happen before he has completed an entire circuit. This motion, however, is extremely slow, amounting only to a degree in about seventy-six years; so that the equinoctial points will take nearly 26,000 years to make an entire revolution of the heavens. This motion was known in very ancient times, and its discovery is ascribed to Hipparchus, who lived about 140 years before Christ. The consequence of this retrograde movement is, that the sun's place amongst the zodiacal signs, at any season of the year, is greatly different from what it formerly was. The vernal equinox now happens in the constellation Pisces; the summer solstice in Gemini; the autumn equinox in Virgo; and the winter solstice in Sagittarius. Astronomers, however, still count the signs from the vernal equinox, which always corresponds to the intersection of the ecliptic with the equator; and on this account it is necessary carefully to distinguish between them.

The cause of precession is to be found in the combined action of the sun and moon upon the protuberant mass of matter accumulated at the earth's equator, the attraction of the planets being scarcely sensible. The attracting force of the sun and moon upon this shell of matter, is of a twofold character; one is parallel to the equator, and the other perpendicular to it. The tendency of the latter force is to diminish the angle which the plane of the equator makes with the ecliptic; and were it not for the rotatory motion of the earth, the planes would soon coincide; but by this motion the planes remain constant to each other. The effect produced by the action of the force in question, is, however, that the plane of the equator is constantly, though slowly, shifting its place in the manner we have described.

NUTATION.

The action of the sun and moon in producing precession is various, at different periods of the year, according to the relative distance of the earth from them. Twice a-year, the effect of the sun in producing it is nothing; and twice a-year, namely, at the solstices, it is at maximum. On no two successive days is it alike, and, consequently, the precession of the equinoctial points must be unequal, and the obliquity of the ecliptic subject to a half-yearly variation; for the sun's force, which changes the obliquity, is variable, while the rotation of the earth, which counteracts it, is constant. By this means, the plane of the equator is subject to an irregular motion, which is technically called the *solar nutation*. Its amount, however, is so exceedingly small, as not to be appreciable by observation. That resulting from the moon's action, however, is sufficiently so, as to have been discovered by Bradly before theory had indicated its existence. Its period depends upon the revolution of the moon's nodes, which is performed in 18½ years, and in about that period of time the axis of the world describes a small circle in the heavens, about eighteen seconds in diameter, contrary to the order of the signs. This apparent vibratory motion is denominated the nutation of the earth's axis. The two phenomena of precession and nutation are intimately connected, or rather are constituent parts of the same phenomenon, and dependent upon the same cause, as noticed above under Precession. It is impossible here to enter more minutely into the subject, or explain it more in detail. For an admirable account of it, we refer the reader to Herschel's Treatise on Astronomy, p. 333. We also to the same admirable work would direct the inquirer for further information upon the subject of perturbations, comprising all the complicated varieties of motion. In general, they may be said to arise from the play of attractions kept up by the whole of the planets amongst themselves; they with the sun, and the sun with them; the distances of the bodies from each other, which are always varying; and the masses of matter, and the shape of the bodies, which are invariable. In concluding this part of our subject, we may remark, that it is by means of the perturbations of those planets which have no satellites, that astronomers have arrived at a knowledge of their masses. Every planet produces an amount of perturbation in the motions of any other, proportioned to its *mass*, and to the degree of advantage or *purchase* which its situation in the system gives it over their movements.

OF THE FIXED STARS.

We have now passed in review before us the bodies belonging to our own system, and, being much nearer us than the other luminaries which stud the ethereal vault, are more within the range of correct observation. They, however, form but a very minute portion of the starry multitude, which people space to an extent far beyond the most powerful telescope to embrace, or even the imagination to conceive of. The fixed stars, we have already observed, have been divided into various constellations or clusters. These, again, are separated into classes, according to their brilliancy, and so on. The brightest are called stars of the first magnitude, those inferior to them of the second magnitude, and so on, to the sixth or seventh magnitude, which are the smallest visible to the naked eye. By the aid of powerful telescopes, however, others a great deal smaller can be detected, and astronomers are familiar with those whose magnitudes are as low as the sixteenth; indeed, no reasonable limit can be assigned to the progression. The classification is wholly a matter of convenience, and the lines of demarcation are exceedingly equivocal. Sir William Herschel, from experiment, concluded the light given by the stars of each of the classes to be comparatively as follows:—The first magnitude was equal to a hundred, the second to twenty-five, the third to twelve, the fourth to six, and fifth to two, and the sixth to one. The son of that eminent astronomer, heir to his genius as well as his name, found that the light of Sirius, the brightest of all the fixed stars, was 324 times that of an average star of the sixth magnitude.

CONSTELLATIONS.

The science of the constellations is called *astrognosy*. The division of the stars into groups was begun in the earliest ages, and, with regard to the whole of them, it is sufficient to mention, that their names are entirely arbitrary, and that any resemblance which they bear to the terrene realities after which they have been called, is entirely imaginary. For instance, the best known of the constellations, the Great Bear, might with equal propriety have been denominated the great tree, Charles's Wain a steamboat, and the plough a cart or horse. However, these fanciful appellations answer the purpose very well, and any portion of the heavens, when referred to, can, by this means, be turned up at once like a book that is paged and paragraphed. Constellations have been formed from age to age, and some of the old ones have been cut up to form new ones. Thus, Orion was curtailed of his fair proportions to form a Napoleon.

There is something very remarkable in the local distribution of the stars over the heavens. "If we confine ourselves," says Sir J. Herschel, "to the three or four brightest classes, we shall find them distributed, with tolerable impartiality, over the sphere; but if we take in the whole amount visible to the naked eye, we shall perceive a great and rapid increase of number as we approach the borders of the milky way. And when we come to telescopic magnitudes, we find them crowded, beyond imagination, along the extent of that circle, and of the branch which it sends off from it; so that, in fact, its whole light is composed of nothing but stars, whose average magnitude may be stated at about the tenth or eleventh." The remarkable natural region of the heavens here mentioned demands a separate description.

THE MILKY WAY.

The milky way, or galaxy, is a long luminous zone, or band, which encompasses the heavens every evening, forming a great and complete circle of the celestial sphere. It is inclined to the plane of the ecliptic, at an angle of about 60°, and cuts it nearly at the solstitial (sun-standing) points. It is divided in one part of its course, sending off a kind of branch, which remains separate from the principal body for about 150°, and then unites with it. The ancients had many singular notions respecting this phenomenon, and from the accounts of it which they have left us, it would appear still to maintain exactly the same relative situation among the stars. When powerful telescopes are brought to bear upon this radiant belt, it is found to be entirely composed of stars, which, as they pass the aperture of the instrument, are counted off at the rate of nearly half a million per hour! Sir William Herschel informs us, that, in the most crowded part of the milky way, he has had fields of view that contained no less than 588 stars, which were continued for many minutes. The same eminent astronomer supposes that it is a nebula, of which the sun forms one of the component stars; and hence, it appears immensely greater than other nebulæ which are scattered over the firmament. Taking this in connection with the fact, that, notwithstanding the apparent contiguity of the stars which compose the milky way, their distances from each other cannot be less than 100,000 times the radius of the earth's orbit, how are our views of the extent and magnificence of the universe enlarged! Imagination wanders over the general heavens, in the quaint but graphic language of Milton, "powdered with stars"—glittering like a desert of sand beneath a tropical sun, and seeks for some boundary where it might rest, and again renew its flight in search of a termination; but it seeks in vain. Clusters of stars, each a separate universe, stretch out before it in numberless array, and seem to lengthen as it flies.

NEBULÆ.

Clusters of stars, for the most part imperceptible to the naked eye, are so called from their confused luminous, or rather *cloudy* appearance. Much ingenuity has been expended in conjectures respecting their nature. They are very numerous and of different kinds. In some of them, stars are clearly distinguishable; in a second class, their existence is only faintly indicated, and in a third there is no appearance of stars whatever. In some instances, the nebula presents the phenomenon of a faint luminous atmosphere of a circular form, and of large extent, surrounding a star of considerable brilliancy. There is a remarkable nebula in the constellation Andromeda, which, from its being visible to the naked eye, has been known from the earliest ages. It is described as having the appearance of a candle seen through horn, that is, a diluted light, increasing in density towards the centre. A class of nebulæ, which, from presenting the appearance of planets, are called planetary nebulæ, are very extraordinary objects. Their discs are round, or slightly oval; and some have bright parts equal in vividness to actual planets. Sir William Herschel, who devoted much of his attention to this subject, gives a catalogue of 2000 nebulæ. He ingeniously conjectured that they are the matter out of which nature elaborates the suns and systems of the universe; and those who wish a full account of his views and reasoning upon the point, will find them explained in the Philosophical Transactions for 1811. "What," says the distinguished son of the above-named astronomer, "What, we ask, is the nature and distinction of this nebulous matter? Is it absorbed by the stars in whose neighbourhood it is found, to furnish by its condensation their supply of light and heat? Or, is it progressively concentrating itself by the effect of its own gravity into masses, and so laying the foundation of new sideral systems, or of insulated stars?"

PERIODICAL AND VARIABLE STARS.

Some of the fixed stars undergo periodical variations of brilliancy, a phenomenon which may be reckoned one of the most remarkable connected with these bodies. Several stars, again, formerly remarkable by their splendour, have entirely disappeared; others are conspicuous which do not appear to have been formerly visible; and there are some which entirely vanish and re-appear, or, as we have observed, where light undergoes great periodic changes. One of the most remarkable of these periodic stars is that called *Omicron*, which appears about twelve times in eleven years. There are on record several striking instances of stars suddenly blazing forth with extraordinary lustre, remaining for a short while, and then dying away,

> "Leaving in yonder silent sky
> No vestige where they flew."

MULTIPLE AND COLOURED STARS.

Many of the stars, which to the naked eye appear single, are, when examined with the telescope, found to consist of two, and occasionally three individuals, placed near each other. Sir W. Herschel has enumerated upwards of 500 double stars, in which the individuals are within half a minute of each other. The number of double stars in general has been greatly added to since his day; and they now amount to several thousands. The most remarkable circumstance connected with them, is the regular motions which some of them possess. There is a double star, called *Ursa Majoris*, in which the two stars perform a regular revolution round each other in sixty years. Others accomplish it in a much shorter period; and some again are calculated to take 1200 years! Their orbits are eccentric, like our own. Quadruple and quintuple stars have likewise been observed, which also appear to revolve round a common centre of gravity, like the planets of the solar system round the sun.

Some of the double stars present the remarkable aspect of contrasted colours, "communicating male and female light," as spoken of by Milton, and floating before the eye of the observer like atoms of the rainbow. They generally assume the complementary tints, the yellow being opposed to blue or green, and so on. Sir J. Herschel endeavours ingenuously to make out a case of beautiful provision in nature with respect to these coloured stars.

DISTANCES, MAGNITUDES, AND MOTIONS OF THE STARS.

Sirius, the brightest of the fixed stars, and whose parallax has been guessed at, is supposed to be twenty billions of English miles distant from the earth. Imagination can scarcely conceive of an object placed at such a distance; but it may derive assistance from the statement that a ray of light, which darts from the sun to our globe in eight minutes seven seconds, would take three years and three-quarters to reach us from the star. A spider's thread before the eye of a spectator at that distance would conceal the orbit of the earth, and the breadth of a hair blot out the whole planetary system! The distances of the greater number of the fixed stars are, however, beyond all computation. With regard to their magnitudes, astronomers are equally at a loss. Sir W. Herschel calculated the volume of one of them to be twenty millions of times that of the sun. With regard to their number, no satisfactory conjecture can be formed. It is supposed that the eye, through a good telescope, can take in at once seventy-five millions of them; the number of sands on the sea-shore afford us, therefore, scarcely an adequate object of comparison. The science of astronomy is not yet matured enough to allow of its professors forming any sure conclusions as to the motions of the stars. It may, however, be stated generally, that their apparent directions are various, and seem to have no marked tendency to one point more than another of the heavens. The sun, for instance, and his system, have a proper motion in some direction; but whither he is tending with his shining train, it is needless to conjecture. The same may be said of the other bodies of stars, in whom proper motion has been observed.

CONCLUDING REMARKS.

It is usually the case in treatises upon astronomy, to give an outline of its history; but we have considered it of more importance to present to the reader, as far as was compatible with our limits, a picture of what the science *is* at present, in preference to exhibiting the successive steps by which perfection has been attained. The *plan* of a temple is sufficient for the great majority of those who wish to examine the fabric; the architect alone requires to see it in *section*, and know the quarry from whence the materials have been brought. An account of astronomical instruments, also, generally forms a part of such works as the present; but, to continue our metaphor, the introduction of the trowel and the plumb-line into the foreground of the building, would not increase its effect; and the methods by which they are employed in elaborating the rude and stubborn blocks into beauty and symmetry, can only be of material importance to those who are engaged in such occupations.

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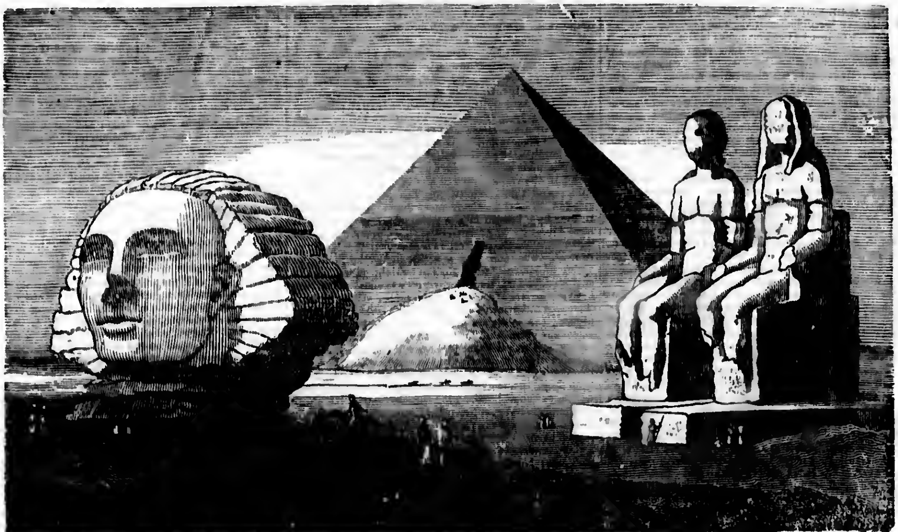
EGYPT.



In the centre of the above engraving is a representation of one of the Pyramids of Egypt. The Head on the left side is that of the celebrated Sphinx. On the right are two gigantic Statues vulgarly called Shamy and Damy, one of which is supposed to be the Vocal Memnon. For a particular account of these extraordinary remains of antiquity, see pages 172 and 173.

EGYPT is an extensive and important kingdom of Northern Africa, alike remarkable for its ancient history and present state. In arts, learning, and civilization, it preceded Greece and Italy by many ages, and there is no country whose laws and institutions can be traced to a remoter antiquity. One circumstance above all others attracts our attention to modern Egypt; that is, the stupendous monuments of ancient grandeur with which it is literally covered. The sites of Babylon and other magnificent capitals, once the glory of Asia, are now only to be identified with heaps of ruins, the magnitude of the cities being estimated by that of the piles of rubbish which are now all that represent them. The sculpture and architecture of Greece and Rome have come down to us shattered and impaired, but the edifices of Egypt, which go back far beyond the records of authentic history, bear scarcely any traces of the lapse of time which has had such a destructive influence over the other memorials of the mechanical skill of mankind. They do not exhibit, indeed, that perfection of taste and skill which was reached in succeeding ages by Greece and other nations, but they are probably more interesting, as they display to us entire the arts and the power of the first generations of men. They are also remarkable, inasmuch as their magnitude is commensurate with their antiquity. In both respects the remains of ancient Egypt far excel those of every other country.

The name by which we recognise this country comes to us from the Greeks, by whom we are informed that a certain king called Ægyptus gave his name to his dominions, which previously were called Aëria, which signifies the land of heat and blackness. In the Hebrew Scriptures it is entitled Mizraim; Mizr, evidently the singular of that word, being the appellation by which it is recognised amongst the Arabs at the present day. By its ancient inhabitants it was called Chemia, a name which it still retains amongst the Copts, and which has probably some connection with Cham, the son of Noah. The word Egypt itself is of very doubtful origin; this, however, has been ascertained as certain, that amongst the ancient Greeks, Ægyptus was employed in reference to the land, to the river Nile, and to an ancient sovereign. The etymology of the word shares the obscurity which veils the source of the river and the ancient history of the country, so that it is unnecessary to occupy the time of the reader with conjectures upon the subject, which at best can only be probable.

In physical aspect, Egypt may be called an immense valley or longitudinal basin about 600 miles in length and of various breadth, the mean of which is supposed to be about nine miles. On either side it is enclosed by two mountain ridges and a barren expanse of desert. Egypt, it has been said, is the gift of the Nile, which traverses it from south to north. From Syene, the highest-up town in Egypt, and which borders upon Nubia, down as far as the straits called Djebel Silsili, a distance of about forty miles, the river occupies the middle of the valley, having very little arable land on its banks; but there are some islands, which, from their low level, easily admit of irrigation. Beyond the mouth of the Djebel Silsili, the Nile runs along the right side of the valley, which in several places has the appearance of a steep line of rocks, cut into peaks, while the ridge of hills on the left side is always accessible by a slope of various degrees of declivity. These western mountains begin near Siout, above 200 miles below Syene, and, gradually diverging to the west, extend to Fayoum, a distance of above 150 miles, so that between them and the cultivated valley there is a desert space gradually becoming wider, and bordered in several places on the valley side by a line of sandy downs, lying nearly north and south. The mountains which confine the upper part of the basin are intersected by defiles, leading, on the one side, to the Red Sea, and, on the other, to the Oasis. The strip of desert land, which generally extends along each side of the valley, parallel to the course of the Nile, and which must not be confounded with the ocean of barren sand lying on each side of Egypt, now contains two very distinct kinds of land. The one immediately at the bottom of the mountains consists of sand and round pebbles; the other, composed of light drifting sand, covers an extent of ground formerly arable. The surface on both sides declines from the margin of the river to the foot of the hills—a circumstance remarked also on the banks of the Mississippi, and some other rivers. Near Beni Souef, which is sixty miles south of Cairo, the valley, much widened on the west, has on that side an opening through which is obtained a view of the fertile plains of Fayoum. These plains are, properly speaking, a sort of table land, separated from the mountains on the north and west by a wide valley, a part of which, being always laid under water, forms what the inhabitants call Birket-el-Karroon. Near Cairo, the capital of the country, the mountains diverge on both sides; the one ridge, under the name of Djebel-el-Nairon, running in a north-westerly direction to the Mediterranean; the other, called Djebel-el-Attaker, running due east to Suez. In front of these chains extends a vast plain composed of sands, covered with the mud of the Nile. At the place called Bahr-el-Bakara, the river divides into two branches; the one flowing to Rosetta, the other to Damietta, and containing between them the present Delta. We here see the river Nile occupying so important a place in the physical economy of Egypt, that, before proceeding farther in our description of the country, we shall introduce an account of it.

THE NILE.

The source of this magnificent stream is still concealed from the eager gaze of mankind. The origin of its name is also a matter of learned doubt, with which, however, we shall not interfere. Amongst the Greeks and Romans, it excited the greatest interest—from its being the largest known to them—from its inundation, of which they had no other examples, and

were ignorant of the cause—and from its unknown origin. The true Nile is formed by the confluence of the Bahr-el-Abiad (white river), and the Bahr-el-Azrek (blue river), in lat. 15° 40′ north. The former, rising in Abyssinia, to the south-west of lake Dembea, comes from the south-east, and was considered by Bruce as the Nile. The latter, however, which comes from the south-west, and is supposed to rise in the Mountains of the Moon, in the centre of Africa, brings down the greatest mass of water, and is considered by Calliaud as the true Nile. In lat. 17° 40′ it receives the Tacazze from the east; enters Egypt in 24°, following nearly a northern course; and below Cairo (30° 15′ north) divides into the two main arms, as we have already mentioned. There were anciently reckoned seven principal mouths, by which its waters were poured into the Mediterranean: only those of Damietta and Rosetta are at present navigable; the others have been choked up. The distance from the confluence of its two head branches to the sea, is about 1500 miles; from its highest sources probably not far from 2500 miles. The Cataracts, so much celebrated by the ancients, modern discoveries have shown to be insignificant, hardly any thing more than what are called rapids in America. In Upper Egypt, it is confined, as we have seen, between two ranges of mountains, which leave only a narrow strip on each side of the river. Near Cairo, the river valley widens, and the level nature of the country below allows it to spread itself over a broad plain.

The depth and rapidity of the Nile vary in different parts, and at different seasons. In its ordinary state, no vessel exceeding sixty tons can ascend as high as the Cataracts. The mouth of Damietta is between seven and eight feet deep when the waters are low: that of Rosetta does not exceed four or five; but when the waters are high, each has forty-one feet more, and carevels of 24 guns can sail up to Cairo.

The grand phenomenon connected with the Nile, is its annual overflow of the banks which border it—an event looked for with as much certainty as the daily rising of the sun. These inundations of the Nile are owing to the periodical rains which fall between the tropics. They begin in March, but have no effect upon the river until three months later. Towards the end of June it begins to rise, and continues rising at the rate of about four inches a-day, until the end of September, when it falls for about the same period of time. Herodotus informs us, that, in his time, a rise of sixteen cubits was sufficient to water the country. At present, twenty-two cubits are considered a good rise. A rise of twenty-six cubits in 1829 destroyed a great many villages, with their inhabitants. After the waters of the Nile have subsided, the earth is found covered with mud, which has been left there by the river. This mud, which is principally composed of argillaceous earth and carbonate of lime, serves to fertilise the overflowed land, and is used for manure for such places as are not sufficiently saturated by the river; it is also formed into bricks and various vessels for domestic use. When the French invaded Egypt, the *savans* attached to the army undertook to measure the depth of alluvial soil which had been deposited by the river, by digging pits at different intervals. It was also attempted to ascertain the annual rate at which this substance is deposited, and by this means ascertain the antiquity of the monuments of art in the neighbourhood of the river. No reliance, however, can be placed upon the conclusions indicated by this species of chronometer. Dr Shaw informs us that Egypt has gained forty-one feet eight inches of new soil since the deluge. In Upper and Middle Egypt, there are immense numbers of canals on the left bank of the river. Mehemmed Ali, the present pacha, has opened many of the old canals, which had been closed for centuries, and dug new ones; among the latter, the canal of Mahmoud, connecting the harbour of Alexandria with the Nile, near Fouah, forty-eight miles long, ninety broad, and eighteen deep, is a magnificent work. The Delta is bordered by a number of maritime lakes, or lagoons, which at different periods have undergone considerable changes; some of them had been dried up, when, from various causes, their connection with the ocean, which had been interrupted, was again resumed, and the exhausted basins replenished with water. In the ancient Egyptian mythology, the Nile was revered as the tutelary deity of the country. In the city of Nilopolis the temple was erected. His attributes are the crocodile, the sphinx, the hippopotamus, and the dolphin. The Nile has been personified in several statues, particularly in a very noble one of black marble now in the Vatican.

TERRITORIAL DIVISION.

Egypt seems naturally divided into two parts, Upper and Lower, the latitude of Cairo forming the line of demarcation. Besides this division, there is another, of great antiquity, by which it was separated into three parts; the first of these was called the Delta, and occupied the Mediterranean coast. The third, called the Thebaid, corresponded to the narrow valley of Upper Egypt; whilst to the second, called the Heptanomis, was allotted the intermediate space. In modern times, the Arabs have changed the classical appellation of Thebaid into Said, or Upper Egypt, and the Heptanomis into Vostani, or Middle Egypt, and the Delta into Bahari, or Lower Egypt.

THE DELTA.

The Delta of the Nile is that tract of land at the bottom of the river formed by the mud which is deposited by the latter. It owes its name to its shape, which somewhat resembles the Greek letter Δ, or delta, answering to our D. The base of this triangle, which is washed by the Mediterranean Sea, is about 150 miles long; and the two angles, which, proceeding from the extremities of the base, converge till they meet at a point, are each about 1[illegible]0 miles in extent. This piece of insulated land was in former times much larger—being bounded on the east by the Pelusian branch, which is now choked up with sand, or converted into marshy pools. On the west, it was bounded by the Canopic branch, which is now partly confounded with the canal of Alexandria, and partly lost in lake Etho. The correspondence of the level of the surface to that of the present Delta, and its depression as compared with the level of the adjoining desert, together with its greater verdure and fertility, still mark the limits of the ancient Delta; although irregular encroachments are made by shifting banks of drifting sand, which are on the increase. The tract comprehended in the Bahr-Bilama, more properly Bahr-bela-mach, and the basin of the Natron Lakes, is one of the most remarkable features in the geography of the country. It lies on the western side of the Delta, fifteen miles distant from it at the nearest. These two vallies are separated by a low ridge, and run parallel to each other for about sixty miles. The mountain of Natron skirts the whole length of the valley of the same name. It contains none of the rocks which are found scattered about in the vallies, such as quartz, jasper, and petrosilex; and this circumstance has given rise to the opinion that the stones must have been conveyed thither by a branch of the Nile, which is supposed to have found its way formerly in this direction through what is called the Waterless Valley, to the Mediterranean. There is now a series of six lakes in the valley of Natron, the banks of which, as well as the surface of the waters, are covered with crystallizations both of muriate of soda and carbonate of soda or natron. The vegetation in these vallies has a wild and dreary aspect; the palms are mere bushes, and bear no fruit. Caravans occasionally visit it in quest of natron. The valley of Barh-bela-mach has, for the most part, a breadth of eight miles. In the sand, with which the surface is every where covered, trunks of trees have been found in a state of complete petrifaction, together with a vertebral bone. That these countries have undergone violent revolutions, is certain; but at what period or periods the changes took place, can only be conjectured. With regard to the extent of the modern encroachments of the desert, authorities are much at variance; but it appears evident that the Delta has been reduced by them. Almost the whole productive soil of Egypt consists of mud deposited by the Nile, and the Delta is entirely composed of it and sand.

Middle and Upper Egypt may be described as a narrow belt of land stretching from Syene to Cairo, a distance of 500 miles, and hemmed in on each side by two ridges of grey sandstone mountains, approaching sometimes within five or six miles of each other; and down this extended valley the majestic Nile rolls the waters which it had drawn from the Mountains of the Moon, to the Mediterranean Sea. Egypt contains about 200,000 square miles, of which only about 16,000 miles in the valley of the Nile are susceptible of cultivation. In round numbers, this is 10,000,000 of acres, or nearly one-half that of Ireland.

The total population of Egypt is estimated at about 2,500,000, which would give about 156 to every square mile. Its relative population, therefore, though not equal to that of Ireland, almost comes up to that of France, and far exceeds that of Austria, Russia, or Spain. Nearly one-half of this territory, it is supposed, is either periodically inundated, or capable of artificial irrigation. The remaining part requires a more laborious cultivation, and yields a more scanty produce. The inundated lands, though they have successively borne one crop, and frequently two, yearly, without intermission, for more than 3000 years, still retain their ancient fertility without requiring any tillage. Where the inundation does not reach, the crops are, however, very poor; but for maise and millet, the soil is particularly adapted. Taking, then, into consideration the quantity of land once arable, which is now covered with sand, the double harvest, and, of some productions, more than semi-annual crops, the smaller quantity of food which is requisite to sustain life in southern latitudes, and the extent to which the more barren soil was formerly rendered available by the cultivation of the olive, the fig-tree, the vine, and the date-palm, we shall no longer be at a loss to account for the immense fertility and populousness of ancient Egypt.

PRODUCTIONS.

The following are the principal productions of the country:—Wheat, barley, rice, millet, maize, flax, anise, sisamum, mustard, beans, lupins, lentils, vetches, Egyptian trefoil, the sugar-cane, indigo, saffron, hinneh, and tobacco. Melons and cucumbers grow "almost visibly;" they gain an inch in bulk every hour. A few pot-herbs are cultivated in the neighbourhood of the towns. Fayoum is distinguished for the cultivation of rose-bushes, from which is obtained the rose-water, which is in so great request all over the East. There are also some olive plantations in this province, and some Christians manufacture an indifferent wine. The vine is no longer cultivated in any other part of Egypt, except for the sake of its shade and its grapes, and the olive-tree is only to be met with in gardens.

The almond, the walnut, and the cherry, will not grow in Egypt; and neither the pear, the apple, the peach, nor the plum, comes to any perfection; but the citron, the lemon, and the pomegranate, the apricot, and the banana or plantain, flourish luxuriantly. The sycamore or Pharoah's fig-tree (less valued for its fruit than for its deep broad shade), the carob-tree, the jujube, the tamarind, and other trees, are also found here. But, in point of usefulness, as well as number, the date-palm is pre-eminent. It is cultivated both in the inundated and the irrigated lands, and groves of it are to be seen, consisting sometimes of several thousands, valued at a piaster each.

Another celebrated production of Egypt is the lotus. The plant usually so denominated is a species of water-lily, which, on the disappearance of the inundation, covers all the canals and pools with its broad round leaves, amid which the flowers, in the form of cups of bright white or azure, expand on the surface, and have a most elegant appearance. The roots of this vegetable were used as food by the ancient Egyptians. There is also the papyrus, not less celebrated in ancient times than the lotus. The colocasium is still cultivated in Egypt for its large esculent roots. The banks of the river and of the canals sometimes present coppices of acacia and mimosa; and there are groves of rose-laurel, willow, cassia, and other shrubs. Fayoum contains impenetrable hedges of cactus or Indian fig. But though so rich in plants, Egypt is destitute of timber, and all the fire-wood used is imported from Caramania.

CLIMATE AND SEASONS.

The soil of Egypt is never at rest, and the harvests are very rich. They follow each other at the distance of about six or eight weeks, according to the different kinds of grain, leaving time in most cases for a succession of crops wherever there is a full command of water. The cold season commences with December, and continues for about two months. Early in February, spring appears, when the atmosphere acquires a delightful warmth, and the trees put forth their blossoms. The period of summer may be said to commence in June, and to end at the close of September. The transition from the one season to the other is so imperceptible, that it is scarcely possible to say when the one begins and the other ends. During these four months, the heat is intense; the fields to which the swelling river has not attained, are parched like a desert, and no green leaf is seen but such as are produced by artificial irrigation. Autumn, which is only marked by a slight diminution of temperature, commences about the middle of October, when the leaves fall, and the Nile retires within its channel; and till the approach of that season, which can only be called winter from its situation in the calendar, the face of the country resembles a beautiful and variegated meadow. Volney's description is thus a matter of fact, that Egypt assumes in succession the appearance of an ocean of fresh water, of a miry morass, of a green level plain, and of a parched desert of sand.

From the nature of the surface, and the universal aridity of the surrounding desert, Egypt is much hotter than most other countries under the same parallel. From March to November, the atmosphere is inflamed by a scorching sun and a cloudless sky, the average height of the thermometer being about 90°; during the other six months, it is about 60°. At sunset, the winds fall, and the nights are generally cool, and the dews heavy. Except along the sea-shores, rain is a phenomenon in Egypt. At Cairo, there are on an average four or five showers in the year; in Upper Egypt, one or two at most: nor are they considered as beneficial to the agriculture of the country. Thunder and lightning are still more uncommon, and are likewise completely divested of their terrific qualities. Showers of hail, sweeping from the hills of Syria, are sometimes known to reach the confines of Egypt; but ice is a commodity so extremely rare, that instances have occurred of its being sold at a high price.

The winds are almost strictly periodical on the banks of the Nile. The northerly breezes predominate, blowing nine months in the year. Those from the south are the most changeable, as well as the most unhealthy. At their approach, the sky becomes black, the air is darkened with clouds of impalpable sand, so that it is sometimes necessary to use candles at noon-day. The effects thus produced upon the animal and vegetable creation are most pernicious; and when the simoom continues longer than three days, it becomes quite insupportable. It is remarkable that the southerly breeze, which in the spring of the year is attended with an intolerable heat, is during the winter noted above all others for an intense and penetrating cold. In the latter season, the rays of the sun fall more obliquely on the desert, and the current of air which descends on Egypt is chilled by the snowy mountains of Abyssinia.

NATURAL HISTORY.

In its geological features, Egypt presents great variety, including specimens of almost every formation, from the earliest to the most recent. Several granitic chains of hills stretch to a considerable extent. These contain vast quarries of syenite, from which the ancients drew the stupendous masses required for their colossal statues and obelisks. Between Assoun and Esna lies the sandstone, or middle district, which supplied slabs for the temples; and beyond it, the northern or calcareous district stretches to the southern angle of the Delta. This last chain supplied materials for the Pyramids, and many public buildings. The limestone extends from Syene to the Mediterranean, and, in Lower Egypt, from Alexandria to the Red Sea, in the vicinity of Suez. Other valuable rocks are abundant in Egypt, and various precious minerals are found. In zoology, the camel, so emphatically named the ship of the desert, has long been domesticated in the country. The giraffe, or cameleopard, has been occasionally seen. A quadruped, called virrera ichneumon, is one of the most celebrated animals in the country. Amongst the ancients, it was venerated with a species of worship. Ichneumons are domesticated in Egypt, where they perform the duties of our domestic cat, in ridding the houses of the smaller animals. The names of the crocodile and hippopotamus are familiarly associated with Egypt and the Nile. The number of the latter animal is now declined, and he is seldom seen below the Cataracts. A species of lizard, called the monitor of the Nile; the common cameleon; the lizard; the sorex, or shrew; and, of the marmot tribe, a particular genus called the dipus, or jerboa; the goat, sheep, and the animals which figure in the Egyptian mythology, such as the dog, ape, buffalo, &c.; still belong to the zoology of the country. Of birds, the ostrich, the ibis, of which there are several species, and the Egyptian vulture, are most famous. With respect to fishes, the country presents nothing remarkable.

INHABITANTS OF EGYPT.

The present natives of Egypt consist of—1. The Copts, the supposed descendants of the ancient Egyptians, and more certainly the feeble remnant of a once numerous Christian population. 2. The Fellahs, who compose the bulk of the labouring class, and who are supposed to be a mixture of ancient Egyptians, Arabians, and Syrians; they are rigid Moslems. 3. The Bedouin Arabs, the same in character, manners, and customs that they are every where, and apparently ever have been since the days of the patriarchs, regarding with disdain and proud independence all other classes of mankind, but more especially those of their own nation who have degraded themselves by taking up their abodes within walls. 4. Arabian Greeks; that is, the descendants of ancient Greek colonists, who have lost their ancient language, and speak a kind of Arabic. Many of them are mariners, but, in general, they pursue the inferior and handicraft trades. 5. Jews. To these must be added, as inhabitants of Egypt—6. Syrian-Greeks and Maronites, who have, within the last century, greatly increased in numbers, and have proved successful rivals of the Copts and Jews as merchants and agents. 7. Armenians. 8. Turks. 9. Franks. 10. Mameluke. 11. Moggrelins, or Western Arabs. 12. Ethiopians and other Africans. The following is as near an approximation as can be obtained of the relative numbers of the different divisions of this motley crew:—Copts 160,000; Arab Fellahs 2,250,000; Bedouin Arabs 150,000; Arabian Greeks 25,000; Jews 20,000; Syrians 20,000; Armenians 10,000; Turks and Albanians 20,000; Franks or Levantines 4000; Mamelukes 500; Ethiopians, &c. 7500; which amount in all to 2,667,000.

The Arabs have been divided into three classes; first, the wild independent Bedouins who occupy the desert; second, the pastoral tribes, who feed their flocks upon the borders of Egypt, and occasionally enter the cultivated provinces; and, lastly, the peasants, or Fellahs, who are devoted to agriculture and the arts. The latter, who form the bulk of the population, are described as a fine race of men in their persons, active in agricultural employments, and possessed of many good qualities. In their dress, and household economy in general, though not strangers to comfort, they are so to every thing like luxury. Their food is very plain, and none but the higher orders, or those of dissolute lives, ever taste wine. The Arabs carry on the common trades of civilised life, but in a very unskilful and imperfect manner. We shall have occasion afterwards to speak of the general state of trade and manufactures in Egypt.

The Arabs have seldom more than two wives; in general only one. The women for the most part can neither read nor write; but the better sorts are taught embroidery and ornamental needle-work, in which they mostly pass their time. The features of the Arab-Egyptian women are by no means regular. They are taller in general than our European women. Their hair is black and long, their skin of a disagreeable mulatto colour, and they stain various parts of their body with colouring matter. The tented Arabs still maintain their ancient character of proud independence, and in manners and customs are the same people they were three thousand years ago.

COPTS.

This singular and equivocal race of people, the supposed representatives of the ancient Egyptians, have been very variously described. Volney and Malte Brun say they have exactly the countenance of a mulatto. Dr Hume differs from them materially in his description; and Dr Richardson remarks, that "neither in their features nor in their complexion have the Copts the smallest resemblance to the figures of the ancient Egyptians represented in the tombs at Thebes, or in any other part of Egypt." He with much probability supposes them to be a mixed race, bearing traces of an alliance to the great Circassian family, and distinct from the aboriginal Egyptians. On the other hand, the Nubians found on the island of Elephantina are described by him as black, and possessing features similar to those found pourtrayed upon the ancient Egyptian tombs. A third and distinct race is also mentioned by the learned traveller; and, upon the whole, it may be concluded that the Copts are a mixed race, and not the pure descendants of the original inhabitants, who were, as regards colour, black, but without any mixture of the negro physiognomy. The conclusion seems to be, that they are Egyptian Greeks, with not less Grecian blood perhaps than the modern Albanian of the Morea.

Compared with other languages, the Coptic is said to exhibit some feeble indications of an ancient connection with the Hebrew and the Ethiopian, while it has received a mixture of modern Arabic. Arabic is now the language of Egypt, while the Italian is much used both by Franks and Copts. The Coptic is for the most part a dead language, being understood by few, though used in the service of the church. The Copts and the Jews are the general shopkeepers in Egypt. The Turks have grave features, an indolent habit of body, and in every thing an air of weight, which they associate with the idea of nobleness. The Greeks, who are now reckoned foreigners, present the regular features and the delicacy of their ancestors. There are said to be about 5000 descendants of the ancient Greek colonists, who form quite a distinct race from the modern Greeks. They have lost their original tongue, and speak a kind of Arabic.

Something still remains to be stated with regard to the present inhabitants of Egypt; but it is necessary that we should advert, in the first place, to its ancient history, and also to present such a picture of the ancient inhabitants as is to be gathered from the written records of the past, but more particularly from those ample and splendid memorials which they have left to all future ages—their works of art and mechanical skill.

HISTORY OF EGYPT.

The history of Egypt carries us far back "into the depth of ages past." An obscurity, however, envelopes it on every side, and the inquirer receives but little illumination upon this subject, by being told that the first king was called Menes, and that he reigned, according to Dr Hales, 2412 years before the birth of Christ. This monarch is said to have greatly improved Egypt by works of extensive utility. He was succeeded by a race of native princes, who, with their founder, reigned 253 years. The country was then invaded by the Shepherds (supposed to be the progenitors of the Philistines), who established a new dynasty, which lasted 260 years. During their sway, it is supposed that Abraham visited Egypt, and the first pyramid was begun. After their expulsion, we find a third dynasty of native sovereigns, from the commencement of whose rule, and the exode of the Israelites, 251 years elapsed. Then a fourth dynasty began to rule, which lasted to the death of Mœris, embracing a period of 340 years, and bringing us to the year 1308 before the Christian era. We come now to the renowned conqueror Sesostris, the son of the last-named king. This monarch, the first Alexander, if the name of the Macedonian may be used as the generic appellation of conquerors, spread the terror of his arms over Asia. He, however, devoted himself to the arts of peace as well as those of war; and the erection of many magnificent temples and public works, of great extent and utility, has been ascribed to him. The reigns of the successors of this monarch are not characterised by any thing remarkable. Up to the year 679 before Christ, when the annals of Egypt begin to be divested of fable, the names of Amasis or Ammosis, Cetes, Cheops, Sabacon, Sethon, and others, fill up the void of history. This period embraces the fifth and sixth dynasties, and a period of 635 years. The seventh dynasty commences with twelve contemporary kings, to whom succeed the famous names of Psammetichus, Necho, Psammis, Apries or Pharaoh Hophra, Amasis, and Psammenitus. Between the reigns of the two latter monarchs, Egypt was conquered by Cyrus; but that famous warrior exercised a liberal policy towards the inhabitants, and allowed them a degree of national independence, which it is supposed they abused so much, as to draw down upon their heads the vengeance of his successor Cambyses, who reduced the country, at the same time blotting his triumphs with the most wanton cruelties. The government of Persia lasted 112 years; then came a dynasty of Egyptian kings, who reigned 81 years, when the name of Alexander the Great is added to the list of Egypt's subjugators. Upon the division of the Macedonian empire, Egypt fell to the share of Ptolemy Lagus, one of Alexander's generals, and in every respect worthy of the throne of the Pharoahs. To this prince literature and philosophy owe many obligations, of which our limits will not permit us to speak. It may be mentioned, however, that he was the founder of the celebrated Alexandrian library. The period embraced by his successors, the renowned Ptolemies, is one of the brightest in the annals of the country. With one of the last of these princes, we find the name of Cleopatra associated in the government, the administration of which, however, was in a great measure in the hands of the Romans. The joint rule of Ptolemy Dionysius and Cleopatra was of short continuance, and a civil war consummating the dissension, the latter was compelled to seek refuge in Syria. Soon after this, the fate of Rome and the world came to be decided upon the plains of Pharsalia. The exiled sovereign was protected by the situation of affairs, and succeeded in obtaining, through the instrumentality of Cæsar, the share of power which she had lost. This gave rise to a war, in which Ptolemy, and the last remains of Egyptian independence, perished together. Cleopatra was indeed nominally the sovereign of the country, conjointly with her brother, a mere child. He, however, soon after fell a victim to the furious passions which at that period dishonoured the descendants of the great Ptolemy, and the beautiful and accomplished, but abandoned Cleopatra, became at once the mistress of Egypt and of Cæsar. After the victory of Octavius at Actium, she committed suicide, and Egypt became a Roman province. This took place 30 years before Christ, and remained 670 years in the hands of the Romans. The Christian religion, during this period, gained footing in this country, and was accompanied by the same enthusiasm, sectarianism, and mental gloom, which, in the earlier history of Egypt, had accompanied the pagan mysteries. Anchorites and monks had their origin here. After the division of the great Roman empire, in the time of Theodosius, into the western and eastern empires, Egypt became a province of the latter, and sunk deeper and deeper in barbarism and weakness. It was the prey of the Saracens; Amru, their general, under the Caliph Omar, taking Alexandria, the capital, by assault. This happened A.D. 640, when Heraclius was the emperor of the East. As a province of the caliphs, it was under the government of the celebrated Abbasides (Haroun-al-Raschid and Al-Mamon), and that of the heroic sultan Saladin. The last dynasty was, however, overthrown by the Mamelukes (1250), and under these formidable despots the last shadow of former greatness and civilisation disappeared. Selim, sultan of the Turks, eventually (1516, 1517) conquered the last Mameluke sultan, Tumanial, and Egypt became altogether a Turkish province, governed by a pacha. It has since been the theatre of continual internal wars of the Mameluke beys against the Turkish dominion, which has been several times, especially under Ali Bey (1766), nearly extinguished in this country.

Before giving a sketch of the more recent history of Egypt, we shall here present a view of its ancient literature, science, and civil and religious institutions.

ANCIENT EGYPTIAN CHARACTER.

If we contemplate the ancient Egyptians in their private life and political character, taking into view their manners, customs, and laws, we shall find a solution for many perplexities respecting this peculiar people. The gloomy religion of the Egyptians banished gaiety from their private circles. They were serious, devout, and superstitious; songs, dances, and sports, they disliked; but they nevertheless possessed good temper and politeness. The government of the state was mostly in the hands of females. Every priest might have at least one wife; to the laity the number was not limited by law. The Egyptian was distinguished for temperance in eating and drinking, and his dress was very simple. The sovereign, however, and those who immediately surrounded him, glittered in oriental pomp and magnificence. The power of the Pharoahs (the general name of the earlier kings of Egypt) was unlimited; but the will of the ruler was subject to the control of the priests. Justice was administered by an efficient police, who took care that criminals should be constantly employed. As early as the time of Joseph, there was a workhouse for imprisoned slaves. Written laws were handed down by Menes, Tnephactus, Bocchoris, and Amasis. All causes were tried before a supreme court of justice. The parties themselves were obliged to conduct them in writing without the aid of advocates. The children were brought up to the trade of their father, and instructed by the priests. Few were taught reading and writing, although the Egyptians were the first people who could write, that history mentions, after the Babylonians and Phœnicians. The people were divided into seven castes—priests, soldiers, shepherds, swineherds, mechanics, interpreters, and fishermen. At the head of them all stood the priests, the first and most influential caste. They maintained this rank as teachers of the people and patrons of science; from them all the offices of state were filled; they were the physicians, judges, architects, astronomers, astrologers, &c. The religion and philosophy of the Egyptians differed at different periods of their civil history. The former was wholly founded upon astronomy. Osiris and Isis, the sun and moon, who were revered as beings of unlimited power, were the two principal deities; and the Nile was supposed to be very nearly related to them. The period of 360 days, computed from the regular inundation of the river at the summer solstice, constituted the religious year; the natural solar year consisted of 365 days and 6 hours. The planets and the signs of the zodiac were reverenced as deities and rulers of the several seasons of the day and year. To each divinity was assigned a particular order of priests. Pilgrimages and sacrifices were a part of their religious system, and till the time of Amasis, even human victims were offered. Besides the heavenly bodies, some kinds of animals were worshipped, not as mere symbols, but as actual gods, like the Apis and Mnevis. The most singular part of the Egyptian creed was the doctrine of the transmigration of souls, in which they believed.

COMMERCE AND PHILOSOPHY

The first important impulse received by the Egyptians in intellectual culture, was subsequent to the subjugation of the country by foreign nations. Previously to this, however, there were astronomers in the country. The Egyptian solar year contained twelve months and five supplementary days, like the republican calendar of the French. The form of the earth was known to Egyptian scholars. Solar and lunar eclipses were calculated. The moon they regarded as another earth, the fixed stars as flaming torches. Sun-dials and water-clocks were known to them; the immense ring of Osymandyas seems to have been used for this purpose; and they would appear to have been acquainted with the quadrant. Their progress in arithmetic must therefore have been considerable. Their acquaintance with geometry and mathematics is certain; and, from their water-screws, canals, sluices, &c., they must also have possessed a knowledge of mechanics, hydraulics, and hydrostatics. The Egyptian music is the basis of the Hebrew, Greek, and Roman. The first musical instrument, the three-stringed lyre, was invented amongst them by Hermes. They had also other instruments, but musical notation does not seem to have been known to them. Their knowledge of natural history was confined to their native country and its productions, and their natural philosophy was mystical. They penetrated a good way into chemistry and mineralogy; and the art of mining was carried on amongst them upon a grand scale. They probably made considerable progress in the art of healing. The gods of health were Osiris, Isis, and Hermes. Particular diseases had a particular class of physicians, who were priests. The king, as well as the lowest peasant, was subjected to the regimen prescribed by them. Their dietetics became celebrated in other countries. Care of the skin, a thorough cleanliness, preserved by frequent bathing, and the practice of circumcision, were their principal prescriptions. From their skill in embalming the dead, we may judge of the anatomical knowledge of the Egyptians. Their acquaintance with navigation they owed to the great Sesostris, by whom commerce was established. It prospered most under the Ptolemies. Alexandria became the first emporium; the famous Pharos was erected; and the canal, 1000 stadia in length, joined the Red Sea with the Mediterranean. When Egypt became a Roman province, it lost its previous commercial distinction. The Egyptians were particularly devoted to agriculture, and their measures for promoting it were bold, both in contrivance and execution. Their trade was confined for a long time to the sale of their own productions to foreigners who visited Egypt to purchase them. In the time of Psammetichus they began to export for themselves. Measures, weights, and money, they were acquainted with; and their skill in weaving and colouring supplied them with articles of exchange.

LITERATURE.

The ancient literature of Egypt does not call forth our admiration, like that of Greece or Rome. No splendid specimens of composition have survived the vicissitudes of time, and come down to us; but that they had made considerable progress, is beyond a doubt. Tatian informs us that the Greeks learned how to write history from perusing the Egyptian annals. Their chronicles seem to have been originally written in verse, which were inscribed on stones in pictorial characters, of which we shall shortly speak. From various ancient authorities, we learn that historical treatises were numerous in Egypt. Strabo even praises the simplicity of their style. As early as the reign of Osymandyas, 1308 years before the commencement of our era, a library was established at Thebes, and another at Memphis, the two capitals of the country. Indeed, much of the admiration which the Greeks call forth from us, belongs in some respect to the Egyptians; for there is every reason to believe that most of the scientific and literary acquirements which distinguished the Greeks, while the rest of Europe was in a state of barbarism, were derived from their intercourse with the scholars of Thebes and Memphis. The Egyptians had a peculiar method of notation, an inquiry into which has lately engaged much attention, but the subject is too extensive to be here entered upon. As to the poetry, eloquence, and polite literature of that remarkable people, we are still too ignorant of the Coptic language to form any judgment upon. Their progress in the arts will be seen when we come to examine the gigantic remains which they have left us. We may only here remark, that the architects of Thebes, the pyramids, &c., must have had considerable knowledge both of mechanics and chemistry.

HIEROGLYPHICS.

The method employed by the ancient Egyptians for expressing their ideas was that of pictorial writing, the original expedient of mankind in every age and country for giving permanency to his conceptions. When America was first discovered, it was found to be in use amongst the natives, and it is the vehicle of thought with the Chinese of the present day. The term hieroglyphic literally signifies sacred writing, but it has been extended to the emblematical style in general, of which there were three kinds, named according to the characters of the individuals by whom each was used. These distinctions are recognised by Clemens Alexandrinus in a passage of his works, a paraphrastic translation of which we shall give by the learned author of "A View of Ancient and Modern Egypt."

"Those who are educated among the Egyptians," says he, "learn first of all the method of writing called the Epistolographic; secondly, the Hieratic, which the sacred scribes employ; and, lastly, the most mysterious description, the Hieroglyphic, of which there are two kinds; the one denoting objects in a direct manner, by means of the initial sounds of words, the other symbolical. Of the symbolical signs, one class represents objects by exhibiting a likeness or picture; another, by a metaphorical or less complete resemblance; and a third, by means of certain allegorical enigmas. Thus, to give an example of the three methods in the symbolical division, when they wish to represent an object by the first, they fix upon a distinct resemblance, such as a circle when they want to indicate the sun, and a crescent when their purpose is to denote the moon. The second, or metaphorical, allow a considerable freedom in selecting the emblem, and may be such as only suggests the object by analogous qualities. For instance, when they record the praises of kings in their theological fables, they exhibit them in connection with figurative allusions which shadow forth their good actions and benign disposition. In this case the representation is not direct, but metaphorical. Of the third method of symbolical writing, the following will serve as an example: they assimilate the oblique course of the planets to the body of a serpent, and that of the sun to the figure of a scarabæus." In the above extract there is mention made of that species of hieroglyphics which express objects by the initial letters, a remark that is now perfectly intelligible, but which, till the year 1814, presented a most perplexing enigma to the ablest scholars in Europe. For this discovery we are indebted to Dr Young, whose investigation, with those of Champollion and others, have thrown considerable light upon this mystical subject. But notwithstanding all the discoveries which have been made, our knowledge of ancient Egyptian literature is still very limited, and we must not, therefore, estimate the extent of their acquirements by the scanty remains of their labours which have survived the wasting hand of time and the violence of man. Diodorus Siculus informs us that in the tomb of Osymandyas 20,000 volumes were deposited.* These works were unquestionably of high antiquity, for which, as well as for the importance of their subjects, they were ascribed to Thoth or Hermes, an individual of extraordinary intelligence. In conclusion, we may remark, that, from the Egyptian hieroglyphics sprung the regular alphabet, and that Cadmus conveyed his gift of sixteen letters across the Mediterranean from Egypt. This invention contributed in a great measure to the improvement of the Greeks, and laid the foundation of their literary fame—perhaps their future glory in all respects. The arrival of the renowned adventurer above named, from the banks of the Nile, continues to be recognised as the epoch when civilisation and a knowledge of the fine arts were first received by the barbarians of eastern Europe.

Before proceeding with the topographical details, it may be proper in this place to introduce a description of some of those magnificent remains of art and mechanical ingenuity which they have left us. By this means we will obtain a more complete view of the progress which they had made in civilisation, and how much other countries have been anticipated in their discoveries by that remarkable people who inhabited Egypt three thousand years ago. We shall here only bring forward those which are the most remarkable, and with the names of which the reader is probably most familiar, leaving the remainder to be noticed as they occur in their local order.

PYRAMIDS.

Amongst the extraordinary remains of mechanical ingenuity and art which the ancient Egyptians have bequeathed to the admiration of all future times, the pyramids are conspicuous. Their number scattered over Egypt is very great, and in magnitude and antiquity are alike remarkable. They are of a quadrangular shape, having a broad base, gradually contracting towards the top, generally built of large limestones, of different heights, usually having a base equal to the height, with their four sides facing the cardinal points. During several thousand years they have attracted the curiosity of the traveller, and exercised the ingenuity of the learned. By far the most magnificent are those of Djizeh, Sakhara, and Dashour, in the neighbourhood of Grand Cairo, the capital of the country.

The pyramids of Djizeh, the largest and most remarkable of these stupendous remnants of the past, stand upon a bed of rock 170 feet above the desert, and 163 feet above the river, which contributes to their being seen from a very great distance. The largest of these, which has been ascribed to Cheops, a tyrannical and profligate sovereign, is a square of 746 feet, and its perpendicular height is 461 feet, being 24 feet higher than St Peter's at Rome, and 117 feet higher than St Paul's at London. The effect which it produces upon the mind from a distance is very fine. From the purity of the atmosphere, the upper gradations of the pyramid are as distinctly visible as the upper layers of a pile of bricks, which materially increases the illusion of the vast dimensions of the structure, and accounts for the discrepancy that prevails amongst travellers as to their actual height. From there being no neighbouring object with which to compare the fabric, no adequate idea is formed of its real magnitude until the traveller arrives at its base, and finds the first tier of stones on a level with his chest; of these there are 206, which vary from one to four feet in height, the square of each tier being smaller than the one below, so as to leave the space of two or three feet all around, forming what are called the steps. Each step is from a foot to a foot and a half in breadth, and the average height is about two feet and a quarter, so that the ascent is comparatively easy; and about the middle the steps are much broken, but at the angles they are perfectly entire. On the summit is an area, about thirty feet square, consisting of six square blocks of stone irregularly disposed. These measurements of the great pyramid are those of Davison, who was very careful in making them, and are probably a very near approximation to the truth. Six millions of tons of stones are supposed to have been consumed, and 100,000 men for twenty years are said to have been employed in the erection of this the most stupendous sepulchre that ever contained the ashes of men. The view from the summit, though limited, is, from association, impressive. The internal aspect of this wonderful structure is not less astonishing than its gigantic exterior; upon the sixteenth step, and nearly in the centre of the side which faces the north, an entrance is obtained. A small narrow passage descends into the interior for about ninety-two feet. After various circuitous windings, the traveller arrives at an apartment, called the queen's chamber, which is 17 feet long, 14 high, and 12 wide; immediately above it, is another, called the king's chamber; it is nearly twice the size of the former. In this room stands a sarcophagus of red granite, which, however, contains nothing but granite and dust. Above this, is a third apartment, called Davison's chamber, and named in honour of the discoverer. To the same individual we are indebted for the first examination of the well, which is referred to by Pliny as being eighty-six cubits in depth. This achievement was accomplished by Mr Davison after great labour and skill, and even personal danger. It was afterwards explored by Mr Caviglia, a traveller who has now been familiarly associated with Egyptian antiquities, but he added little to the information previously given by the individual who preceded him. We are indebted to him, however, for the latest and most complete survey of the caverns in the pyramid of Cheops. In prosecution of his indefatigable labours to penetrate these mystical labyrinths, after having discovered a new passage, and succeeded in ventilating the interior, he arrived at a chamber sixty feet long, and twenty-seven broad, with a flat roof, and nearly filled with large stones and rubbish. It has the appearance of an unfinished excavation, and was probably employed for the performance or solemnization of sacred mysteries. Other passages were found, but their discovery led to no results of importance.

To the celebrated Belzoni we are indebted for a knowledge of the interior of the pyramid of Cephrenes, brother and successor of Cheops, but any detail of his labours would carry us far beyond our limits. Suffice it to say, that they were directed with remarkable skill, and a perseverance which no obstruction could arrest. It stands upon a rather higher elevation than that of Cheops, and is built of the same species of limestone, and joined with the same kind of cement. Its base is 684 feet, and its height 456. The steps are much splintered and broken, but it can be ascended to a certain extent on the southern side without great difficulty. The opening of this pyramid presents to us a striking instance of discrimination and tact. Herodotus had declared that it contained no chambers, and modern travellers had taken this as *dit* for granted. The practised eye of Belzoni, however, detected certain indications of an entrance, and, after many days of labour upon the hard stone, he found himself at last in a chamber hewn out of the solid rock, from the floor to the roof, which last is of the same stone as the pyramid itself. In the sarcophagus were the bones of an animal, very generally supposed to be those of a sacred bull, an object of veneration among the ancient Egyptians. On the wall at the west end of the chamber he perceived an Arabic inscription, from which it has been inferred that the two larger pyramids had been explored, at the distance of many years, by some of the caliphs. The third large pyramid is that of Mycerinus; but it is a good deal less, and not so important an object as the others. There is also a fourth large pyramid, although travellers are in the habit of speaking of the pyramids of Djezeh as only three in number. Those of Sakhara, or Dashour, appear to be a continuation of the great cemetery to which those of Djezeh belong. Two of them only are very large, and they are all more dilapidated than those we have described; hence, a higher antiquity has been ascribed to them. With regard to the other pyramids, they are, in their leading characters, nearly similar to those described, and the end for which they were constructed we infer was the same; but what was the primary object of the ancient Egyptians erecting these immense fabrics? Upon this point we have nothing satisfactory to say, except that, whatever might have been their use at first, they became receptacles for the dead at last. Some maintain that they were consecrated to the sun, others that they were used for astronomical observations, others for transmitting historical information, and so on. With regard to their antiquity, the most probable conjecture is, that they were erected at a

* Manetho reduces the number to between three and four thousand.

period between 1000 and 800 years before the Christian era.

SPHINX AND TUMULI AROUND THE PYRAMIDS.

Numerous ruined edifices and tumuli lie scattered about at random among the other pyramids, like graves in a churchyard, and extend north and south along the left bank of the Nile as far as the eye can reach. The stone buildings, supposed to be mausoleums, are generally of an oblong form, having their walls slightly inclined from the perpendicular inwards, the peculiar characteristic of ancient Egyptian architecture; flat-roofed, with a sort of parapet round the outside, formed of stones; rounded at the top, and rising about a foot above the level of the terrace. The walls are constructed of large masses of stone, of irregular shape. The various chambers of these edifices were found to be profusely embellished with sculptures and bas-relief paintings, many of which were spirited and beautiful. In one of them were found the remains of several mummies, and in another the fragments of a figure as large as life. An important circumstance remains to be noticed: In each of these edifices there was discovered a well, from the bottom of which a passage led to a subterranean chamber. Caviglia cleared out one of these shafts, which was sixty feet deep; and in the chamber he found a plain but highly-finished sarcophagus, nearly of similar dimensions with that in the pyramid of Cheops. This supplies a strong argument in favour of the hypothesis, that the pyramids are tombs.

By far the most brilliant of Mr Caviglia's discoveries, are those to which he was led in the laborious task of uncovering the great sphinx in front of the pyramid of Cephrenes. On the stone platform on the foreground, and centrally between the outstretched paws of the sphinx, was discovered a large block of granite, which fronted the east, and was highly embellished with sculpture in bas-relief. Two other tablets of calcareous stone, similarly ornamented, were supposed, with that of granite, to have constituted part of a temple, by being placed one on each side of the latter, and at right angles to it. One of them in fact was still remaining in its place. Of the other, which was thrown down and broken, the fragments are now in the British Museum. A small lion couchant, in front of this edifice, had its eyes directed towards the sphinx. There were, besides, several fragments of other lions, rudely carved, and the forepart of a sphinx, of tolerable workmanship. In front of the temple was a granite altar, with one of the four "horns" still retaining its place at the angle. From the effects of fire evident on the stone, this altar, it would seem, had been used for burnt-offerings. Inscriptions were found upon the digits of the paws, but of no moment.

Like every thing else in Egypt, this singular monument has been the subject of very opposite representation. The general accuracy of Dr Richardson induces us to lay his account of it before the reader. "The breast, shoulders, and neck, which are those of a human being, remain uncovered; as also the back, which is that of a lion. The neck is very much eroded, and, to a person near the head, seems as if it were too heavy for its support. The head-dress has the appearance of an old-fashioned wig, projecting out about the ears like the hair of the Berberi Arabs; the ears project considerably; the nose is broken; the whole face has been painted red, which is the colour assigned to the ancient inhabitants of Egypt, and to all the deities of the country except Osiris. The features are Nubian, or what from ancient representation may be called ancient Egyptian, which is quite different from the negro feature. The expression is particularly placid and benign, so much so that the worshipper of the sphinx might hold up his god as superior to all the other gods of wood and stone which the blinded nations worshipped." As to the dimensions, the same author informs us that the stretch of the back is about 120 feet, and the elevation of the head above the sand from thirty to thirty-five. The head of this sphinx is supposed to be that of a man, a *beard* which was found between the paws being considered as decisive of the point. With respect to its antiquity, Dr Richardson thinks, that, although it is not mentioned by Herodotus, it must have been in existence in his time.

RUINS OF MEMPHIS.

The very site of this once famous city of Egypt has been a subject of learned dispute. According to Herodotus, its foundation was ascribed to Menes, the first king of Egypt. It was a large, rich, and splendid city, and the second capital of Egypt. Among its buildings were a number of remarkable temples and palaces of astonishing grandeur and magnitude. In Strabo's time (A.D. 20), it was in population and size next to Alexandria. Edresi, in the twelfth century, describes its remains as extant in his day, and of a magnificence which no language could convey any idea of. Its ruins then extended nine miles in every direction; but the destruction has since been so great, that, although Pocock and Bruce fixed upon Matrahenny as the site, a village which lies a few miles above the pyramids, it was not accurately ascertained until the French expedition to Egypt, when the discoveries of numerous heaps of rubbish, of blocks of granite covered with hieroglyphics and sculpture, and of colossal fragments scattered over a space three leagues in circumference, seem to have decided the point. And this is all that remains of the once lofty city.

RUINS OF THEBES.

The glory of Thebes, once the capital of the Thebaid or Upper Egypt, must now be traced in four petty villages, Luxor, Karnac, Medinet Abou, and Gornoo, situated about 400 miles above Cairo. Thebes is famous as "the city of a hundred gates," the theme and admiration of ancient poets and historians, the wonder of travellers, "that venerable city," as Pocock eloquently remarks, "the date of whose destruction is older than the foundation of other cities, and the extent of whose ruins, and the immensity of whose colossal fragments, still offer so many astonishing objects, that one is rivetted to the spot, unable to decide whither to direct the step or fix the attention." These ruins extend about eight miles along the Nile, from each bank to the sides of the enclosing mountain, and describe a circuit of twenty-seven miles. The most remarkable objects on the eastern side are the temples of Karnac and Luxor; and on the western are the Memnonium, or palace of Memnon, two colossal statues, the sepulchres of the kings, and the temple of Medinet Abou. Almost the whole extent of eight miles along the river is covered with magnificent portals, obelisks decorated with the most beautiful sculpture, forests of columns, and long avenues of colossal statues. The largest of these temples, and of any in Egypt, is that at Karnac, on the site of the ancient Diospolis.

In respect to the magnificence and beauty of its several parts, this temple has been pronounced as having no parallel in the whole world. It has twelve principal entrances, each of which is composed of several propyla and colossal gateways, besides other buildings attached to them, in themselves larger than most other temples. The sides of some of these are equal to the bases of the greater number of the pyramids in Middle Egypt. One of the propyla is entirely of granite, adorned with the most finished hieroglyphics, and many of them have been furnished with colossal statues. The avenues of sphinxes that lead in several directions to the propyla, one of which was continued the whole way across the plain to the temple at Luxor, nearly two miles distant, correspond to the magnificence of the principal structure; and the body of the temple, which is preceded by a large court, consists of a prodigious hall or portico, the roof of which is supported by one hundred and thirty-four columns, some twenty-six, others thirty-four feet in circumference; four beautiful obelisks then mark the entrance to the shrine, which consists of three apartments, built entirely of granite. The dimensions of this great edifice are about 1200 feet in length and 420 in width. But the principal fane, grand and imposing as it is, sinks into nothing when compared with the extent and number of the buildings which surround it; the prodigious gateways of polished granite, covered with sculpture and adorned with colossal statues; the subordinate temples which any where else would be esteemed magnificent piles; and the avenues, which approach it from almost every point of the compass, miles in length, and guarded by rows of sphinxes of vast size, cut out of single blocks of syenite. The field of ruins at Karnac is about a mile in diameter. Probably the whole of the space was once, in the prouder days of Thebes, consecrated entirely to the use of the temple.

About a mile and a quarter above Karnac are the village and temple of Luxor. This temple, though not of such vast dimensions as that of Karnac, is in a superior style of architecture, and in more complete preservation. The entrance is thought to surpass every thing else that Egypt presents, and the two obelisks are considered the finest in the world. But the objects which most attract attention are the sculptures which cover the east wing of the northern front. They contain, on a great scale, a representation of a victory gained by one of the ancient kings of Egypt over their Asiatic enemies. The number of human figures introduced amounts to 1500, 500 on foot and 1000 in chariots.

The disposition of the figures, and the execution of the whole picture, are equally remarkable, and far surpass all preconceived ideas of the state of art at the remote era to which we must attribute them. After passing several gateways, we enter what is conjectured to be the palace of the great Osymandyas. These ruins of Luxor and Karnac represent only one-half of ancient Thebes. The temples of Medinet Abu are also splendid, and upon a grand scale. It was so placed as to be exactly opposite to that of Luxor, on the other side of the Nile, while the magnificent structure at Karnac was fronted by the Memnonium or temple of Dair; and hence all these grand objects formed so many stages or prominent points in the religious processions of the priests. Though the tabernacle of Jupiter dwelt at Karnac, the proper Dicopolis, yet it was carried over the river every year, and remained a few days in Libya; and we find, from a general estimate, that there was a space of between nine and ten miles over which they might exhibit the pomp and parade of their superstition both going and returning. Almost every part of the road through this immense theatre was lined with sphinxes, statues, prepylas, and other objects calculated to inflame the ardour of devotion.

MEMNONIUM AND STATUE OF MEMNON.

This celebrated relic of antiquity, the palace of King Memnon, faces the east, and is fronted with a stupendous propylon, of which 234 feet of its length are still remaining. To the minute Dr Richardson we are indebted for the most elaborate account of it, only a small portion of which, however, we can afford space for. The temple is in a rather dilapidated condition. Every stone in the propylon appears to have been shaken and loosened, as if from the concussion of an earthquake. The passages which conduct to the chambers are so broken and filled up, as hardly to admit of examination. The walls are in various parts ornamented with sculptures, and other pictorial devices. One of the most striking is a battle scene. The various situations of victors and vanquished are represented in a very lively manner, and the whole sculpture, though but roughly executed, is full of fire. In the Memnonium there is still to be seen the statue of Osymandyas, or Sesostris, which is allowed to be the finest relic of art which the place contains, although shattered and broken. It is about twenty-six feet broad between the shoulders, fifty-four feet round the chest, and thirteen feet from the shoulder to the elbow. There are on the back hieroglyphical tablets, extremely well executed, which identify this enormous statue with the hero whose achievements were sculptured on the walls of the temple.

The above figure has sometimes been confounded with that of Memnon, so long celebrated for its vocal qualities. The latter, however, is one of the two statues vulgarly called Shamy and Damy, which stand at a little distance from Midenet Abou, in the direction of the Nile. These, we are told, are about fifty-two feet in height. They rest on thrones, which are respectively thirty feet long, eighteen broad, and between seven and eight high. They are placed about forty feet asunder, are in a line with each other, and look towards the east, directly opposite to the temple of Luxor. The southern one appears to be of one entire stone. The face, arms, and front of the body, have suffered so much, that not a feature of the countenance remains. The head-dress is beautifully wrought, as also the shoulders, which, with the back, are uninjured. The massy hair projects from behind the ears like that of the sphinx. The sides of the throne are highly ornamented with elegant devices. The colossus is in a sitting posture, with the hands resting upon the knees. On the outside of each of the limbs there is a small statue, and another between the feet.

The gigantic statue which stands on the north side, would appear, from various circumstances, to be that of the vocal Memnon, who was said to play a lively strain when the sun rose, and a melancholy one when he set. It presents the same attitude as its companion, with a similar figure between the feet and on each side of the legs. It has, however, been broken over at the waist, and half of it taken away; but the figure has been again completed by courses of common sandstone. It is entirely fashioned like the upper part of the other, having several hieroglyphics, and other emblems, sculptured between the shoulders, but they are not of so elegant a character. These statues stand on either side of an avenue leading to a place of worship, and evidently were followed by a series of other colossal figures, as the remains of some of them are still visible. Belzoni here found a handsome statue of black granite, which is now within the precincts of the British Museum. Dr Richardson is of opinion that this ruined temple is the Memnonium, and not that where the broken statue of Osymandyas is to be met with.

SEPULCHRES.

Nothing about the ancient Egyptians appears to our European ideas more remarkable than their magnificence in adorning their places of sepulture. With them the abodes of the dead were as carefully constructed, and as lavishly decorated, as those of the living. The number of caves, and grottoes, and suits of catacombs, not only for the reception of human bodies, but those of the lower animals, as we shall afterwards see, is prodigiously great. Some of the most remarkable of these tombs are in the vicinity of Thebes. The mountains on the western side of that once gorgeous metropolis, have been nearly hollowed out as tombs for the inhabitants; and a solitary valley in the neighbourhood is also full of these gloomy receptacles for the dead. Those farther up the river, at Eleithias, though less splendid than the Theban sepulchres, contain more illustrations of the private life of the Egyptians. The Egyptian sepulchral chambers are in general entirely covered with fresco paintings and bas-reliefs, and frequently contain statues, vases, &c. Some of them, the royal sepulchres for instance, consist of suits of spacious halls and long galleries of magnificent workmanship. Those of private individuals vary according to the wealth of the deceased, but they are often very richly ornamented. Mr Belzoni, who possessed an infallible instinct for detecting the secret accesses to these gloomy abodes, discovered several vaults of a most splendid description. The chambers were of ample dimensions, and lavishly adorned with paintings and sculptures. In one of them was found a sarcophagus of beautiful workmanship, and in all respects superior to any thing of the kind ever brought to Europe.

Dr Young discovered among the drawings copied from this tomb, the names of Necho and Psammis, kings of Egypt, the former of whom conquered Jerusalem and Babylon, and the latter warred with the Ethiopians. Hence, it appears evident that these tombs contained the ashes of the two Pharaohs above named, who flourished nearly 2500 years ago.

Every one must be familiar with those tombs of the ancient Egyptians, called catacombs. Those of Alexandria are the most celebrated, but in spaciousness, general arrangement, and embellishment, they are inferior to the sepulchres already described.

The ancient Egyptians embalmed all their dead, and deposited them in subterraneous vaults, such as we have described. An immense number of them has been found in the plain of Saccava, near Memphis; hence called the Plain of the Mummies, consisting not only of human bodies, but of various animals. Many of the mummies are two or three thousand years old, and are all in a state of wonderful preservation. We may also observe, that some of the lower animals had like honours paid to them, and that catacombs set apart for their reception had been discovered.

RUINS OF DENDERA, OR TENTYRA.

This scene of ruins is about half an hour's ride from the river, and about 140 miles below Syene. They are more than a mile in length, and half a mile in breadth. The grand object of interest here is the temple, a very celebrated ruin. This magnificent building presents one of the most striking examples of that sumptuous architecture and profuse ornament which the Egyptians lavished upon their sacred edifices. Some idea of its grandeur may be gathered from the circumstance recorded of the French army during its campaign in Egypt. When the soldiers first beheld the ruins, they were so overpowered with their gigantic size and extraordinary beauty, that they exclaimed, as with the heart and voice of one man, such a sight more than repaid them for all the sufferings and dangers of the war. It is supposed to have been consecrated to the worship of Isis, who was the principal deity in the Egyptian Pantheon. The temple itself still retains all its original magnificence. Time has only rendered it more venerable and imposing in appearance. The gateway which leads to the temple has in particular excited universal attention, on account of its magnificence. On the corners of the roof are several apartments, in one of which is the circular zodiac.

Denon, who is extravagant in his praise of this celebrated place, copied the zodiac, and the celestial planisphere. These have excited much discussion amongst philosophers, as they are supposed to indicate an antiquity inconsistent with the chronology of Scripture. But nothing satisfactory has resulted from this learned inquiry.

LAKE MŒRIS AND CANALS.

Amongst the great works of the ancient Egyptians, lake Mœris is worthy of a place, both for its vast extent and for its patriotic object. It is situated in Middle Egypt, about 48 miles above Cairo. Herodotus informs us that the circumference of this vast sheet of water was 450 miles, and that it had two pyramids of great height in the centre. He adds, that it was entirely the product of human industry. At present, the lake is between thirty and forty miles long, and six miles broad at the greatest. The details collected by Herodotus and other writers must therefore have applied to the works which were necessary not only to connect the Nile with the lake, but also to regulate the ebb and flow of the inundation. The canal called Joseph's River is about 120 miles in length.

The most remarkable of the many Egyptian canals is that which connected the Nile, near Bubastis, with the Red Sea, near Arsinöe, in the vicinity of the modern Suez. The length of it was about ninety-two miles, of which it appears that sixty-five were accomplished by human labour; and of that portion about one-half yet exists in a state more or less perfect. Its breadth varied from 100 to 200 feet, according to the character of the country which it traversed. Its depth has not been so accurately determined, but it also must have varied according to circumstances; in some parts it was ten and in others probably thirty feet. Some have ascribed the execution of this great work to Sesostris, and others to Nechos; but the settling of the point is a matter of small moment.

The Labyrinth is mentioned by Herodotus as one of the greatest wonders of Egypt, and a most surprising effort of human ingenuity and perseverance. It exceeded, he says, all that can be said of it, and far surpassed the temples of Greece. Considerable doubt rests as to the situation and remains of this extraordinary fabric. The Greek historian places it beyond the lake Mœris, near the city of Crocodiles, now known as Arsinöe, or the Arabian name of Medinet-el-Fayoum; and here, accordingly, it has been diligently sought for by various modern travellers. Pliny places it at the west end of the lake Mœris, in the neighbourhood of Terna; and here Belzoni, the sagacious and indefatigable, found some beautiful marble and granite remains, which induced him to adopt the opinion of the Roman naturalist. Its use is also a matter of learned doubt, and so we must still let it remain. After what we have already seen of the remains of Egyptian art, he would be a bold theorist who would decide, from its size or splendour, that it was a palace for the living any more than a sepulchre for the dead.

The general physical characteristics of Egypt we have already given, as well as the remains of ancient art; and we have only now to notice the places of note, and any local peculiarities of moment, situated in each of its three divisions, which may not previously have been mentioned.

LOWER EGYPT—ALEXANDRIA.

One traveller has cleverly remarked, that, in the new city of Alexandria, the capital of Lower Egypt, we find a poor orphan, whose only inheritance has been the venerable name of its father. From the most flattering accounts of this city, it would appear to be but a miserable apology for that built by Alexander the Great, and destined by him to be the centre of his empire and the commerce of the world. According to Pliny, it was fifteen miles in circuit, and contained a population of 300,000 individuals. It shone in all the pomp of architectural magnificence, and contained streets of immense breadth, which intersect it from end to end. Its public edifices were of the most splendid description, and its library contained 400,000 volumes, including all the Greek and Latin literature, of which we only possess but single fragments. This treasure has been irreparably lost to the world. An order of Theodosius the Great, that all the heathen temples throughout the Roman empire should be overthrown, was the cause of it. A crowd of fanatical Christians stormed and destroyed the temple of Jupiter Serapis, where the library was, and the volumes were either burned or dispersed, and, like the lost tribes of the Jews, they have never been found. When Alexandria succumbed to the caliph Omar, it contained 4000 palaces, 4000 baths, 400 theatres or public edifices, and 12,000 shops, and a population which may be estimated by its including 40,000 Jews. Its appearance now is most melancholy and wretched, resembling, at a distance, according to one traveller, with its ruins grey, and flat-roofed houses, a town newly laid desolate by an enemy. The streets are narrow, dirty, and irregular, and usually crowded with "half-fed, half-clad, half-sarkit" human beings. The very climate of the place has been cursed. From having been once salubrious, it is now very unhealthy. "Still Alexandria," says Sir Robert Wilson, "must be pronounced the key of Egypt, although insulated by water and desert from the surrounding country, since in its harbour alone security can be found for shipping of any burden throughout the year." The modern town does not occupy the site of the old one, which lies to the south, and presents an immense field of confused ruins. Over a space of from six to seven miles in circuit, is spread an assemblage of broken columns, obelisks, and shapeless masses of architecture, which are interspersed with some more modern buildings, such as churches, mosques, and monasteries. Amid this scene of widespread devastation, a few objects rise conspicuous, the most remarkable of which is "Pompey's Pillar;" it is about ninety feet high, and consists of a pedestal, a very fine shaft, and a Corinthian capital, each being composed of one entire piece of granite. Vulgar belief ascribes the erection of this pillar to Cæsar, in commemoration of his triumph over Pompey, but this is now generally considered as erroneous. The most plausible conjecture is, that it was reared by a governor of Egypt, named Pompey, in honour of the Emperor Dioclesian. The next remarkable objects are the two obelisks vulgarly called Cleopatra's Needles, one standing erect, and the other laid prostrate. They are composed each of a single block of granite, nearly sixty feet high, and entirely covered with hieroglyphics. This circumstance indicates an Egyptian origin, and it is conjectured that they were conveyed thither from Memphis. The ancient canal between Cairo and Alexandria has lately been restored by Mehemmed Ali, and the commerce of the place by this means greatly improved. We cannot leave Alexandria without noticing that spot the most interesting to a Briton, where the French were defeated by our troops under the gallant Abercrombie, who fell in the action. The field of conflict lies three or four miles from the town, on the road to Rosetta. Of the maritime tract which lies between this place and Alexandria, our topographical knowledge is limited, and the sites of several ancient cities is doubtful.

ROSETTA.

This place is situated on the western bank of the Bolbitinic branch of the Nile, about four miles from its mouth. Its proper name is Raschid, and here, say the natives, the renowned Al Raschid was born. Rosetta is rather a handsomely built town, and is nearly surrounded with gardens. The great mosque is very large, and its roof is supported by a number of columns. The French found in this place a stone covered with hieroglyphics, which has since become celebrated under the name of the Rosetta stone. The town, however, is not of high antiquity, having been built, it is supposed, by the caliphs in the ninth century. The population is about 9000, and its trade rather good, but on the decline; and, besides its gardens, there is no object of curiosity to retain the traveller from proceeding to

DAMIETTA.

On the road thither, besides several towns, is the village of Sa-el-hajar (Sa of the Stone), near which are found the supposed ruins of Sais, the ancient metropolis of the Delta, and the mother city of the Athenians. The ruins are very interesting, including fragments of ancient columns, statues, and stones, with hieroglyphical inscriptions. Farther on are the towns of Menouf, Semennood, the ruins of Beybalt, Mansourah, and Menzaleh, besides several lakes and immense canals. Damietta is a town of considerable size, situated on the eastern bank of the Delta. It does not appear to occupy the site of any ancient town of note, nor did it rise to consideration till after the destruction of the more easterly mouths had attracted the maritime commerce of Egypt to its port. About the twelfth century it was considered of vast importance, and was fixed upon by the leaders of the sixth crusade as the principal object of their expedition. It was taken by assault; and of a population of 70,000, 3000 were the only remaining relics. At present the number of inhabitants is supposed to amount to between 25,000 and 30,000. Damietta is the grand emporium for rice, of which great quantities are here stored in immense magazines. Of the country lying between Rosetta and the Damietta arms, we have no detailed description. Between Damietta and lake Burulice is an extensive tract of desert or morass, supposed to be the Elearchia or Bucolia of the ancients, the country of marshes and buffalo herds. The lake we have named extends across a considerable portion of the basis of the present Delta. It takes its name from the ancient Paraloe (or Paralion), situated on the western side of the Sebennytic mouth. On the southern side of the lake was the ancient Buto, Pheneto, or Phthenothes, which possessed several splendid temples, now to be traced to a few scattered ruins. Nearly in the centre of the Delta, in a fertile tract, is situated Tantah, or Tandeta, a populous town. It owes its prosperity chiefly to the crowds of pilgrims who at the vernal and summer solstice come to visit the tomb of a Moslem saint who lies buried here. On the southern bank of lake Menzaleh are the remains of the ancient Tanis (probably the Zoan of the Hebrew scriptures). The place is now called Saun, and the French found here fragments of seven obelisks, remains of a colossus, monolithic temples, and other edifices of vast dimensions scattered over a great extent of ground. Upon the Syrian frontier are the remains of the ancient Pelusium, which are a few fragments of granite. On our way to Cairo, besides several less important places, we meet with Bubastes, once famous for its temple and other magnificent buildings, of which a few scattered fragments remain.

GRAND CAIRO.

The whole way from the coast to this place is strewed with ruined sites and decayed towns, interspersed with wretched villages, at once indicative of extinct grandeur and present misery and oppression. New Cairo, the present capital of Egypt, or as the orientals call it, by way of eminence, Grand Cairo, was built about A. D. 971, by Almanzor, the first of the Fatimite dynasty who reigned over Egypt. It is situated about a mile and a half from the Nile, and extends eastward nearly two miles to the mountains, being, according to Pocock, seven miles in circumference. It is surrounded with a stone wall, surmounted by five battlements, and fortified with numerous lofty towers. There are three or four beautiful gates, which unite simplicity with grandeur and magnificence. It is traversed by the canal which enters on the south, and goes out at the north. It is from fifteen to twenty feet broad, and is kept in bad repair. When the waters of the Nile begin to increase, the mouth of the canal is closed with earth, and a mark placed upon it to indicate the time for opening this and all the other canals in the kingdom. This is when the inundation has reached its height, and the opening is celebrated with great festivities and rejoicing. Like every other Mahommedan capital, Cairo, of course, contains a great number of mosques, some of which are very splendid, being adorned with the plunder of Heliopolis and Memphis. The largest mosque is that of Azhar, which stands in the middle of the city; on the east of the town is the castle, situated on a projecting point of Mount Mokattem. It completely commands the city, but is itself commanded by a mountain ridge behind, where a fort has been erected by the present pacha. The interior of the castle is spacious, and contains the pacha's palace, the mint, and, in the middle, the famous well of the famous Saladin. It is 45 feet in circumference at the orifice, and descends through a calcareous rock to 270 feet, where it opens a spring on a level with the Nile. The water is raised by machinery. There is in Cairo another celebrated well, which is named after Joseph, but it has nothing to recommend it but its great size. The new and the old citadel cover an immense extent of ground; they were formerly separated, but the French united them. All the splendid remains of antiquity are in the new citadel. Old Cairo, now called Fostat and Misr, is supposed to occupy the site of the Egyptian Babylon, which was said to have been built by the followers of "the great Persian conqueror, Cambyses." It is now about two miles in circumference, although, in the twelfth century, its length and breadth were nine miles each. Here there is a Coptic church, in which it is said Joseph and Mary dwelt with the infant Jesus. Adjoining to it is the castle of Babylon, in which resides the Greek patriarch of Alexandria. According to Mr Mengin, Cairo contains 240 principal streets, 46 public places, 11 bazaars, 140 schools, 300 public cisterns, 1166 coffee-houses, 65 public baths, 400 mosques, and 1 hospital, a wretched affair. The population is supposed to exceed 250,000. Amongst the remarkable places near Cairo, are the ruins of the city of On, the Heliopolis of the Greeks. They are a mile and a half in circumference, and consist of shattered obelisks, statues, and the other remains which characterise an ancient Egyptian city. The pyramids we have already described, and also the numerous tumuli which surround them. The whole intermediate space between the borders of lake Mœris and Djizeh is so completely occupied with catacombs, temples, pyramids, and mausoleums, as to render the supposition probable, that it was one vast cemetery, in the centre of which stood the far-famed city of Memphis. Of these we have already given as detailed an account as our limits will permit of. Except these, and some other remnants of antiquity, of no particular importance, together with a few insignificant modern towns, there is nothing to detain us from entering upon a description of

MIDDLE EGYPT.

The seven governments into which Middle Egypt was divided, are now comprised in the five provinces of Djizeyeh, Attafieh, Fayoum, Beni Souef, or Behnesawiyeh, and Oshmunein or Minyet. The first of these presents nothing of importance. The second is an island which divides the Nile at the most southern pyramid of the Dashour group. Attafieh, the capital, is said to be a place of some consideration; but it has been seldom visited by travellers, so that we are but very imperfectly acquainted with it. The others we shall notice as they occur in our peregrinations up the Nile. Next to Cairo, the most considerable place in this part of the country is Beni Souef, the capital of a beydom of the same name under the Mamelukes. It is situated at about 114 miles above Cairo, in one of the richest and most extensive tracts of corn land in Egypt. Penetrating a pass of the sylvan chain of mountains, at about fifteen miles west-south-west of this town, we enter the district of Fayoum. Medinet-el-Fayoum, the capital, is situated in lat. 29° 20′ north, long. 31° 1′ 30″ east, built from the materials and partly on the site of the ancient Crocodilopolis, the name of which was changed to Arsinöe, by Ptolemy Philadelphus, in honour of his sister. It contains about 5000 inhabitants, chiefly Moslems, with the usual proportion of mosques and baths. A canal from the Bahr Yousuf divides it into two parts, which are connected by five bridges. The principal remains of the ancient city lie to the north of the present town, occupying an area nearly two miles and a half from north to south, and two miles from east to west. Amongst the ruins are numerous fragments of statues, obelisks, &c. The name of Arsinöe was one of the most celebrated in Egypt, and so late as the time of the Romans contained a flourishing population. Fayoum is still reckoned the most productive part of Egypt, and all the country as far as lake Mœris is well cultivated. This celebrated lake, and the interesting ruins on its banks, we have already adverted to. The next place of any consideration is Mincet or Minyeh, which is reckoned forty-seven leagues from Cairo. It is the principal town in the province of Oshmunein, and is large and handsome. About three leagues higher up on the other side of the river, near a ruined village called Beni Hassan, are some remarkable caves and grottoes, formerly the abodes of eremites. About eight miles to the south-east, are the ruins of the Roman city Antinöe. They are extensive, and exhibit the remains of considerable architectural magnificence. Nearly opposite them, on the western side of the river, is a considerable village called Al Rairamoun, where Ali Pacha has established a sugar-manufactory and a distillery. In the environs are extensive sugar-plantations, and there is a saltpetre-manufactory in the neighbourhood. About six miles to the south-west of this place are the remains of Hermopolis, an ancient town, whose representative is a large village called Oshmunein. About a league to the south of it is the large and well-built town of Mellane; and ten leagues farther on, and near the western shore, that of Manfaloot, anciently a place of great trade. It is a sort of capital, and the see of a Coptic bishop. The adjacent country is very fertile, particularly in fruits. About two leagues farther up, on the eastern side of the river, are several pits in which are deposited the mummies of crocodiles. But we have now entered the Said, or Upper Egypt, which properly begins with Manfaloot, which is a sort of frontier town. The valley of the Nile is in this part about eight miles from mountain to mountain, and, above Manfaloot, a cultivated place, commences on the eastern side of the river. For many miles the left bank of the river is perforated with excavations, which, however, have not been explained.

UPPER EGYPT.

Upper Egypt, or the Thebaid, is now divided into the three provinces of Siout, Djirdjeh or Ikhmim, and Kenneh or Thebes, comprising a native population of rather more than 600,000 souls. This estimate includes Maufelatiyeh.

Siout, or Suyut, situated in lat. 27° 10′ N., long. 31° 13′ E., may now be considered as the capital, being the residence of Ahmed Pacha, the son of Mehemmed. Under the Mamelukes, the capital of the Said was Djirzeh. Siout is well situated, about a mile and a half from the western bank of the Nile, an amphitheatre of hills rising behind it.

This town, which would appear to be barely respectable in appearance, contains about 20,000 inhabitants. It is supposed to occupy the site of the ancient Lycopolis, which derived its name from the worship of the jackall. The only vestiges of this ancient city are some mounds of rubbish outside the town, and some sepulchral excavations in a neighbouring mountain. They are adorned in the same manner as the other Egyptian tombs which we have already described. About thirty-four miles to the south of Siout, on the opposite shores of the river, are the villages which bear the names of the eastern and western Kau or Gaw, the Tkôu (Tulonoo) of the Copts. The vestibule of a temple, large quarries, and numerous sepulchres, attest the ancient consequence of the place, but the name is unknown. Between this place and Ikhmim, which is about eight or nine miles farther up, are several villages and ruins, none, however, of any great moment. This interesting country is well cultivated, although some parts of it suffer a great deal from the inundation. In this portion of the country, the traveller meets with, for the first time, the Thebaid palm-tree, which differs materially from the common palm.

Ikhmim, the capital of a province of the same name, and one of the most ancient places in Egypt, is situated about a mile and a half from the river. It contains about 10,000 inhabitants. Opposite this town, on the western bank, is Menshich, or Munshyet, supposed to be the ancient Ptolemais Hermii, of which, except the ruins of a quarry, no vestige remains. The modern town is a place of some trade. In the neighbourhood of Ikhmim, one traveller counted upwards of thirty villages on both sides of this river, but none of them require particular mention. About fifteen miles to the south-east of Menshich, on the western bank of the river, stands the former capital of Upper Egypt, Djirzeh. It is situated in a fertile territory, enjoys some trade, but contains no antiquities. Above this place is the province of Farshut, where the greatest quantity of sugar is made. A few miles to the south of Djirzeh, and about six miles inland, is Arabat Matfooner, or Afra Madfrun, the ancient Abydos. Here, in 1818, a valuable hieroglyphic tablet was discovered, which was found to be a genealogy of the immediate predecessors of Sesostris. This place is supposed, by Strabo, to have been the residence of Memnon, and the remains of a magnificent structure seem to justify the conclusion; the latter is supposed to be the Memnonium, or royal residence of Memnon.

The next place of importance that we meet with is Dendera, the ruins of which we have already described. A little above Dendera, on the opposite shore, stands Kennet, the ancient Cainopolis, a place of considerable trade, and remarkable for its potteries. About thirty miles farther up the river, stand the ruins of Thebes, also described, together with the grottoes of Eleithaca. Farther up lies Emeh, the ancient Salopolis, whose only remains is a ruined temple in the middle of the town, which is a respectable place. A few miles onward lies Edfou, a town containing about 2000 inhabitants. This is the ancient Appolonias Magna, the principal remains of which are the ruins of a temple at the north-western corner of the village. It is a magnificent building, and, though inferior in size, does not yield in effect to either that of Dendera or Karnec. It is decorated with sculpture within and without: near it is another small temple; but the emblems seem to indicate that it was dedicated to the genius of population, rather than to the destroyer Typhon, whose dreadful image frowns down upon the beholder from several parts of the building. A short distance above Edfou, are some ancient quarries, of considerable size, which have been fashioned into dwellings and shrines, and covered with sculpture and hieroglyphics. Dr Richardson observed in one part a sphinx, half cut out in another, stones merely outlined, and in other instances blocks nearly disengaged, and the splinters lying about with so fresh an appearance, that it seemed as if the labourer had left his work only the evening before, and might be expected to return to resume it. But that yesterday was 2000 years ago, and the morrow never came. Along the banks of the river are numerous tablets, devices, and excavations, resembling tombs or temples cut in the perpendicular face of the rock.

After passing a strait, and entering upon a well-cultivated soil, the noble ruin of the temple of Ombos presents itself to view. It stands upon the western bank of the river, and fronts the *west*, rather a singular circumstance, as all the other temples face the *east*. The Ombites seem to have worshipped the crocodile as an emblem of Osiris, as the serpent, the ibis, and the hawk, were symbolical of other deities.

SYENE.

The next town of any consequence is that of Syene, or, as it is now called, Assoun, the upper frontier town of Egypt. It is situated in lat. 24° 5′ 23″ north, long. 32° 54′ 49″ east. Its natural position, so well adapted for a frontier town, has rendered it at all times a place of importance. It was formerly a bishopric, but no Christians are now found here. Ruined churches and convents strike the eye of the traveller, but the Christian faith is unknown. Not only is it the last town in Egypt, but it is the last place in this direction in which the Arabic is spoken as the vernacular tongue.

The present town of Assoun has been built a little to the north of a former town of Saracenic origin, the ruins of which are seen above it, and which was itself built upon the ruins of a Roman city. The whole town is encompassed with vestiges of buildings; the most interesting are about the old town, which occupies a strong and commanding position; the walls still remain, and, though slight and of sun-dried brick, are very entire. They are flanked with towers at unequal distances. Many of the walls of the houses are also standing, but they are all unroofed. From the interior of many of them, passages lead down to the chambers of houses belonging to the ancient city, which are now under ground; of the old town a few insignificant ruins are all the remains.

ISLAND OF ELEPHANTINA.

This island is now called Djeziret-sel-sahir, the flowery island, and is about 2000 feet in length, and 600 feet in breadth. The northern end is low and alluvial, well cultivated, and shaded with palm-trees. Here are the ruins of Roman fortifications, opposite to which, on the eastern bank of the Nile, are remains of Arabian works. There is an ancient quarry, from which large columns have been excavated; the marks of the workman's chisel and wedge are as fresh as if they were of yesterday. Some are lying blocked out and partly wrought, and a large sarcophagus is two-thirds cut out of the rock. There are a number of architectural remains, sculptures, and hieroglyphical tablets. This beautiful island is inhabited by Nubians, who are perfectly black, without having any resemblance in their features to the negro.

BERENICE.

In the most southerly part of the vast desert of the Thebaid, which lies between the valley of the Nile and the Red Sea, is the site of the ancient city of Berenice, delightfully situated in an extensive plain almost surrounded with mountains. Its ruins are still perceptible even to the arrangement of the streets, and in the centre is a small Egyptian temple, adorned in the usual manner: it is nearly covered with sand. Opposite to the town is a very fine natural harbour, open towards the north, the entrance of which has been deep enough for small vessels, but the bar is now impassable at low water. Belzoni supposes this city may have contained 2000 houses and 10,000 inhabitants.

THE OASES.

Oasis is a Coptic word, and means an inhabited place. The Oases of Egypt are those spots of fertile land which are found at intervals "few and far between," in the middle of that vast plain of arid sand called the Lybian Desert. There are several of them, and are named, according to their size or situation, the Great, Little, Western, Northern, &c.

The Northern or Oasis of Siwah.—This place, which is about 300 miles distant from Cairo, and about 100 from the Nile, is peculiarly interesting, from its being supposed to enclose the far-famed temple of Jupiter Ammon. The Oasis is about six miles long, and from four to five broad. It is pretty fertile, and contains about 8000 inhabitants. The capital is called Siwah. Besides the splendid remains of the temple, supposed to be that of Jupiter Ammon, are the ruins of other sacred places, and a number of sepulchral excavations.

Great Oasis.—This Oasis is formed of a number of fertile isolated spots, which lie in a line parallel to the course of the Nile, and to the mountains which bound the valley of Egypt on the west. It is about two days' journey from the nearest part of the valley of the Nile. The patches of firm land are separated from one another by deserts of twelve or fourteen hours' walk—so that the whole extent of this Oasis is nearly 100 miles, the greater proportion consisting of a desert. It contains many gardens watered with rivulets, and its palm groves exhibit a perpetual verdure. According to a more recent account, it contains Egyptian ruins covered with hieroglyphic inscriptions. The principal town is called El-Kargeh. Here are the remains of a temple beautifully situated in the midst of a rich grove of palm trees. Near El-Kargeh there is also a regular Necropolis or cemetery, containing 200 or 300 buildings of unburned brick, chiefly of a square shape, and each surmounted by a dome similar to the small mosques erected over the graves of sheiks. At distances of a few miles, some other remains of ancient temples are found. This whole oasis has always been and still is dependent on Egypt. None of the other oases of the desert present us with any object worthy of being dwelt upon.

RECENT HISTORY AND PRESENT STATE OF EGYPT.

The civil and political aspect of modern Egypt, involves in it the history of Mehemmed Ali, the present pacha. On the landing of the French in Egypt, he had a contingent of 300 men placed under his command, with the title of *Bin-Boushi*. In the first battle in which he engaged, against a division of the French, he lost the greater part of his men; but his spirited conduct attracted the notice of the Capitan Pacha, who selected him to head an attack upon the fort in which the French had posted themselves, in which he was successful. The next military enterprise was against the Mamelukes, for the unfortunate issue of which, whether guilty or not, he was severely censured by the viceroy Kusrouf Pacha. The latter, having been apprised that Ali was in correspondence with his enemy Taher Pacha and his Albanians, desisted from some designs which he had formed against Ali. The viceroy was soon after expelled from his capital by the troops of Ali and Taher, the latter of whom assumed the reins of government, and invited the Mamelukes to Cairo. He was, however, soon after assassinated by the Turks. From this moment the career of Ali was rapid He commenced an intrigue with the Turk, the Mameluke, and the Albanian, either as an ally or enemy, according to the ends which he contemplated. The new viceroy became very unpopular, and the people called out for Ali to assume the supreme authority; and the wishes of the people were very soon acceded to by the Porte, which constituted him a pacha of three tails, with the government of Egypt. His elevation was signalised by a victory obtained over the English before Rosetta. By the liberal policy which he adopted, the prosperity of the country advanced with extraordinary rapidity. He was guilty, however, of an atrocity, which not a little stains his character. In 1811, he invited the Mamelukes to Cairo, with a show of friendship, whilst he had laid plans for basely assassinating them. He effected his purpose, but not without creating a dreadful tumult, and being nearly blown up himself in the train he had fired. He next carried the terror of his arms into Arabia, from whence, however, he was recalled by the news of Napoleon's escape from Elba. The victory of Waterloo, however, soon left his mind easy regarding the designs which his great contemporary might have upon Egypt. He next directed his attention to the army, which he attempted to organise upon European rules; but, owing to the resistance which he met with, his efforts were for the present in vain. At a subsequent period, however, he completely effected his purpose; and his motley army of Turks, Mamelukes, &c., were taught the military art by European officers. The war against the Wahabis, in Arabia, was prosecuted by his son, with considerable spirit, till 1818, when the capture of the stronghold of the enemy put an end to it. In 1820, an army was fitted out for Sennaar, in Africa, which was finally brought under subjection to the yoke of Mahommed. In 1824, he conceived the idea of forming a camp for the instruction of officers destined for the command of the new levies required for the war. He began by sending his own Mamelukes or body-guards and attendants, with those of the principal officers of the state. Colonel Seve, formerly aid-de-camp to Marshal Ney, was engaged as instructor, who, after displaying great firmness and skill, succeeded in breaking in the wild Turks to regular discipline.

In a country like Egypt, where the administration of government depends almost exclusively on the individual nominated to the supreme authority, the mere form is of little consequence. But in nothing is the sagacity of the present Pacha more manifest by innovating less in the external structure of the constitution, than in those internal regulations, by means of which he has created for himself an influence incalculably great, and which is diffused to the very verge of the vast province over which he presides. Virtually independent, he has hitherto continued formally to acknowledge the Ottoman superiority, whilst, at the same time, he wields the sceptre with as little restraint as the most arbitrary of oriental despots. The administration is in the hands of the following officers:—The Keaya Bey, who may be styled prime minister; the Aga of the Janissaries, who is at the head of the war department; the Ouali, or head of the military police; the Mohtesib, or superintendant of the markets; and the Bash-aga, or master of the civil police. In every district a headsman is appointed to determine differences by arbitration, and to watch over the peace and good order of his neighbourhood. The civil officers have no fees, but are allowed fixed salaries, and so effectually are the duties of police performed, that the streets of Cairo are as safe as those of London. Criminal prosecutions are settled by a Cadi or judge, sent annually from Constantinople, and assisted by a certain number of sheiks learned in the law. The cost of a civil process is about four per cent. on the value litigated, of which the cadi receives four-fifths and his assistants the remainder. Besides the public officers above mentioned, there are many subordinate functionaries in the civil and military departments. The domestic establishment of the Pacha alone comprehends no fewer than fifteen hundred individuals.

Before the accession of Ali, the representative of the sultan was satisfied with a *miri*, or a land-tax. The present viceroy, however, has taken the greater part of the territorial possessions into his own hands, and granted a yearly pension, in name of compensation, to the former proprietors; and those who still hold possession of the land cannot dispose of any part of the crops until the government agents take away as much as they think fit at their own price. In place of the established *miri*, the retainers of the court are served with agricultural produce at one-half its current value, and the Pacha himself regulates the price of what can be spared for exportation. No wonder then that travellers should view with astonishment the richness of the harvests, contrasted with the wretched state of the villages. The fellahs or agricultural labourers are liable to be called from their mud hovels to the camp in case of emergency, but the improvement in food and clothing seems no adequate compensation for the precarious liberty of which they are thus for a time deprived.

The revenue of Egypt is estimated at L.2,249,379, arising from land-tax, customs, the resumed lands amounting to almost the whole of the cultivated soil, the conquered territories of Darfur, Sennaar, Nubia, and a large part of Arabia, a monopoly of nearly all the Egyptian commerce, together with an excise on manufactures and raw productions. The annual expenditure is calculated at L.1,757,500: of this, one-half is required for the army; L.90,000 remitted by way of tribute to Constantinople; L.14,000 to the support of the church and the law; nearly an equal sum expended on the pilgrimage to Mecca; and about L.200,000 on the Pacha's own household.

The improvement in manufactures, in arts, and sciences, effected by this wonderful personage, are truly astonishing. Having experienced much difficulty and disappointment, so long as he had to employ foreigners in his different undertakings, he has persevered in the scheme which he adopted some years ago, in sending young men of talent to Italy, France, and England, to study the respective arts of these enlightened countries. Many of the Egyptian pupils have visited London, and other parts of Great Britain, where they have made themselves acquainted with every philosophical discovery or ingenious mechanical invention likely to contribute to the pleasure of their sovereign, or the benefit of their country. Schools have been instituted, where young persons of all ranks, and especially the Arabs, are instructed in mathematics, fortification, gunnery, foreign languages, and the best European tactics. The latest inventions are imported from France and England; the most expensive apparatus and instruments procured; in a word, all the mysteries of gas, steam, and lithography, are not only known, but are topics of familiar conversation in the Egyptian capital. We cannot here omit mentioning one of his most magnificent undertakings, a canal which connects the harbour of Alexandria with the Nile, near Fouah; a work forty-eight miles in length, ninety feet broad, and eighteen in depth, and which supplies the means of bringing the whole produce of the country to the best place of exportation, without danger or delay. For his indefatigable exertions in forwarding this grand undertaking, he has received universal praise. The whole excavation was completed in little more than six weeks, and the canal was opened with great pomp on 7th December 1819. The great increase of trade at the port of Alexandria has already compensated the Pacha for his exertions, and evinced the wisdom of his plan. Accident, however, has conferred upon him, as upon many others, in the cultivation of the cotton-tree, a boon far greater than could have been derived from even the previous wise arrangement of his gifted mind. The discovery of the plant by M. Jumel, in the garden of a Turk, he propagated afterwards with so much success and skill, as almost to have changed the commerce and statistics of Egypt. Near Cairo, a most superb establishment, equal if not superior to the finest European manufactory, has been erected, for the spinning, weaving, dyeing, and printing of cotton goods. Here, also, are the latest improvements in machinery—steam, the moving power—gas, the artificial light. And so great is the achievement of the Pacha, notwithstanding the infancy of the manufacture, and many disadvantages, at this moment he is able to compete with the European manufacturer in every market to which he is admitted, and can even undersell the merchants of India in their own ports. Besides cotton, similar attention has been bestowed on silk, flax, and the sugar-cane. As an additional proof that Egypt is keeping pace with the progress of the age, we may add that a newspaper is published under the auspices of this enterprising monarch. In fine, nothing seems wanting but a more enlightened experience, and the enjoyment of greater freedom on the part of the cultivator, to render the dominion of Mehemmed Ali the richest country on the face of the globe.

SYRIAN CAMPAIGN.

The origin of the quarrels of the Pacha of Acre with Mehemmed Ali—into which we cannot now particularly enter—in a great measure justifies the hostile pretensions of the latter. In 1822, Abdallah Pacha had rendered himself obnoxious by his extortions, and took it into his head also to seize Damascus. The neighbouring Pacha formed a league against him, and laid siege to his capitol, when Mahommed Ali negociated his pardon for a sum of 60,000 purses, which the people readily paid. Interest soon prevailed over gratitude; for the Pacha of Acre, conceiving there was far more to be gained from Constantinople than from Cairo, sought every opportunity of separating himself from Mehemmed Ali, and exciting the jealousy of the Porte against him. Some Egyptian fellahs having taken refuge under the guns of Abdallah Pacha, offered an admirable opportunity to Ali. He demanded the men, but the governor of Acre refused to deliver them up, at the same time referring the arbitration to the Porte, who, with a singular expression of humanity, bewailed the condition of the Egyptian peasantry. Hence the origin of the war. This was at the close of the year 1831. The moment was favourable for the viceroy's great and ambitious designs. The exactions of the Ottoman government had extended to every object of production and industry in Syria, whilst the military conscription decimated the most industrious part of the population; and, therefore, it is not at all surprising that the Egyptians should be hailed as their deliverers. Ibrahim Pacha, the stepson of Ali, was placed at the head of the Egyptian army; and associated with him was Solyman Bey, formerly an officer in the staff of Marshal Grouchy; and to him may be chiefly ascribed the success of the Egyptian arms. At the head of 32,000 regular troops and 4000 Bedouin Arabs, Ibrahim took the same route as Bonaparte, and advanced rapidly against St Jean d'Acre. Of Jaffa, Caipha, Jerusalem, and Naplousia, he made himself master without firing a shot. Taboneh and all the country between Gaza and Acre submitted at his approach. On the 27th Nov. 1831, he planted himself before St Jean d'Acre. The defence of this place by Abdallah Pacha was obstinate, and the siege was carried on with various success for nearly six months, when, on the 27th May 1832, a general assault was made at day-break, which lasted twelve hours, and was finally successful. The capture of this place insured to Ibrahim the possession of Lower Syria, and enabled him to continue his progress with perfect security. Whilst Ibrahim thus actively pushed on the campaign, the Porte organised an army of twice the strength, and placed it under the command of Mahommed Pacha, who displayed culpable negligence upon the occasion. She also fulminated her bull of excommunication, and at the same time proclaimed to the great powers of Europe that Egypt was in a state of blockade. Nicholas of Russia recalled his consul from Alexandria, and even proffered a fleet with an auxiliary corps d'armée; Austria, alike hostile to revolution as improvement, threatened also the viceroy; England preserved the strictest neutrality; while France was employing all her influence strenuously for an accommodation, but in vain. The Divan, having refused to listen to Ali's demands, the matter was referred to Hussein Pacha, the field-marshal, who by his formal delays retarded the advance of the army. The news of the fall of Acre having reached Hussein, he found it imperative to occupy the passes of Syria, and march immediately to Antioch, in order to cover Beylew. Before this movement was effected, Ibrahim had descended into the valley of the Orontes, and entered the town of Damascus, after an unimportant skirmish. All the operations of the Turkish army were marked, as usual, with the most unaccountable inertness; and it was not till July that Hussein was able to effect any progressive movement. The march at last commenced; but neglecting to issue rations to the troops, when they reached Horn (a place he should have marched upon immediately after leaving Antioch) they were almost lifeless with hunger and defeat. At the gates of the city was encamped the Seraskier of Aleppo, with his irregular troops; but without deigning even to think of the enemy, or issue rations to their starving troops, they spent their time in vain and useless ceremonies. Intelligence at length arrived, that the Egyptian army was within two hours' march of them. Dreadful was the disorder that ensued. The half-famished soldiers dragged themselves in masses to meet the Arabs. It is unnecessary to enter into details which must be familiar to every reader of the newspapers. The whole Turkish army was disgracefully put to flight, and pursued by the enemy's cavalry, till the approach of night alone saved the Turks from utter destruction. The loss of the Sultan's forces amounted to 2000 killed, and 2500 prisoners. Meanwhile, Ibrahim still advanced, recalling his garrisons, and making new levies in the mountains. As he prosecuted his march, the whole country declared in his favour, and the castle of Aleppo was delivered up to him. On the 5th of August, the Egyptians made themselves masters of Antioch, after an action of only two hours. The route continued more like an easy march than a conquest; and it has been asserted, that at one time the viceroy had the idea of attacking, in person, the Turkish capital by sea, whilst Ibrahim should threaten to invade it from Scutari. It was well that Mehemmed abstained from this attempt, as most assuredly Russia would have interfered. An armistice for five months took place, when Ali, finding that the Porte would agree to no equitable terms, commenced another campaign, and almost annihilated the second army of the grand seignior; and Redsched Pacha, the field-marshal, after performing prodigies of valour, fell severely wounded into the hands of the Egyptians. This was a decisive stroke, and nothing but the timely intervention of Russia saved the empire of Mahommed.

Mehemmed Ali is now an independent sovereign, and it is to the manner in which he appreciated the military genius of Europe he owes his glory. He now lays claim to Syria, and that part of Caramania which lies between Taurus and the sea, a territory where she will find those resources she most requires—materials for ship-building, &c.; but, above all, a Christian population, among whom, it is to be hoped, the seeds of European civilisation will be soon implanted. If not prematurely exhausted by that system of monopoly too rigidly enforced at present, Egypt will realise her ancient glory, and become an empire powerful in all that is great, and virtuous, and good. In contemplating this grand consummation, however, one reflection forces itself upon us. It is, that, although Egypt under Mehemmed Ali has made rapid and extraordinary strides in the march of civilisation, yet she has to push forward many a long day's journey before she can bring herself in a line with even the rear ranks of European states. Indeed, it is impossible, that, during the life of the present ruler, the modern innovations will have had time to take root in the soil, so as to propagate themselves spontaneously, independently of the individual who may be the supreme head of government.

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LIFE OF BENJAMIN FRANKLIN.

PARENTAGE AND BOYHOOD.

BENJAMIN FRANKLIN was born at Boston, in New England, North America, on the 17th January 1706, and was the youngest but two of a family of seventeen children, two daughters being born after him. His ancestors, as far as they can be traced back (at least three hundred years), were petty freeholders at Eaton, in Northamptonshire; but if we may judge by the surname of the family—the ancient Norman appellative for a country gentleman—we may conclude they had originally been of some consequence. After the Reformation, the immediate progenitors of Benjamin continued zealously attached to the church of England till towards the close of the reign of Charles the Second, when his father Josias, along with his uncle Benjamin, became dissenters. These men were both bred to the trade of silk-dyeing. Josias married early in life; and about the year 1682 he emigrated, with his wife and three children, to America, on account of the persecutions to which he was exposed for his dissenting principles. On arriving in New England, he embraced the occupations of soap-boiler and tallow-chandler, of which businesses he previously knew nothing, but only from their being at the time the likeliest to provide maintenance for his increasing family. He appears to have been a man of great penetration and solid judgment; prudent, active, and frugal; and although kept in comparative poverty by the expenses of his numerous family, was held in great esteem by his townsmen. In no respect was his practical good sense more conspicuous than in the education of his children; and his illustrious son frequently alludes, in terms of thankfulness and gratitude, to the many exemplary precepts and sound moral lessons he received while under the paternal roof. The following passage may be read with no little instruction by the heads and members of all families similarly circumstanced:—"He was fond of having at his table, as often as possible, some friends, or well-informed neighbours, capable of rational conversation; and he was always careful to introduce useful or ingenious topics of discourse, which might tend to form the minds of his children. By this means, he early attracted our attention to what was just, prudent, and beneficial in the conduct of life. He never talked of the meats which appeared on the table; never discussed whether they were well or ill dressed, of a good or bad flavour, high-seasoned or otherwise, preferable or inferior to this or that dish of a similar kind. Thus accustomed, from my infancy, to the utmost inattention as to these objects, I have since been perfectly regardless of what kind of food was before me; and I pay so little attention to it even now, that it would be a hard matter for me to recollect, a few hours after I had dined, of what my dinner had consisted. When travelling, I have particularly experienced the benefit of this habit; for it has often happened to me to be in company with persons, who, having a more delicate, because a more exercised taste, have suffered in many cases considerable inconvenience; while, as to myself, I have had nothing to desire." Benjamin was at first designed to be a clergyman, and at eight years of age was put to the grammar-school with that view, having previously been taught to read. His uncle Benjamin, who had likewise emigrated, encouraged this project. This individual appears to have been an equally eccentric and ingenious man. He cultivated the Muses with a success that gave himself, at least, entire satisfaction. But what he was most proud of was a species of short-hand of his own invention, wherewith he had carried off from the conventicles in England several volumes of sermons whole and entire; and these he designed for his nephew's stock-in-trade, when he should set up as preacher. But young Franklin had not been a year at school when his father perceived that his circumstances were quite inadequate to the expenses necessary to complete his son's education for the clerical profession. He accordingly removed him from the more learned seminary, and placed

PORTRAIT OF FRANKLIN.

him under a humble teacher of reading and writing for another twelvemonth, preparatory to binding him to some handicraft trade.

APPRENTICESHIP.

When his term at school was expired, being then ten years of age, he was taken home to assist his father in his business; but he soon testified such repugnance to the cutting of wicks for candles, running errands, waiting in the shop, with other drudgery of the same nature, that, after a tedious and ill-borne trial of two years, his father became afraid of his running off to sea (for which he confesses to have had a predilection), as an elder brother had done, and resolved to put him to some other occupation. After much deliberation, therefore, he was sent on trial for a few days to his cousin (a son of Benjamin), who was a cutler; but that relative being desirous of a larger apprentice-fee than his uncle could spare, he was recalled. His brother James, a short time previous to this period, had returned from England, whither he had been sent to learn the printing business, and set up a press and types on his own account at Boston. To him, therefore, after no little persuasion, Benjamin at last agreed to become apprentice, and he was indentured accordingly for the term of nine years; that is, until he should reach the age of twenty-one.

The choice of this profession, as it turned out, was a lucky one; and it was made after much careful and correct observation on the part of the parent. He had watched his son's increasing fondness for books, and thirst for information, and that, too, of a solid and instructive sort; and he therefore judiciously resolved to place him in a favourable situation for gratifying this propensity in the youthful mind; while he would, at the same time, be instructed in a profession by which he could always independently maintain himself, wherever almost his fortunes might lead him, within the bounds of the civilised world. Franklin thus speaks of his early and insatiable craving after knowledge:—

"From my earliest years I had been passionately fond of reading, and I laid out in books all the money I could procure. I was particularly pleased with accounts of voyages. My first acquisition was Bunyan's collection, in small separate volumes. These I afterwards sold in order to buy an historical collection by R. Burton, which consisted of small cheap volumes, amounting in all to about forty or fifty. My father's little library was principally made up of books of practical and polemical theology. I read the greatest part of them. There was also among my father's books, Plutarch's Lives, in which I read continually, and I still regard as advantageously employed the time devoted to them. I found, besides, a work of De Foe's, entitled, An Essay on Projects, from which, perhaps, I derived impressions that have since influenced some of the principal events of my life." It seems to have been lucky for himself and mankind that the last named author's most celebrated work, Robinson Crusoe, did not fall into his hands at this period.

By his assiduity Franklin soon attained great proficiency in his business, and became very serviceable to his brother. At the same time, he formed acquaintance with various booksellers' apprentices, by whose furtive assistance he was enabled to extend the sphere of his reading. This gratification, however, was for the most part enjoyed at the expense of his natural rest. "How often," says he, "has it happened to me to pass the greater part of the night in reading by my bed-side, when the book had been lent me in the evening, and was to be returned the next morning, lest it might be missed or wanted!" His studious habits and intelligent conversation also attracted the notice of a wealthy merchant who was in the habit of coming about the office, who invited him to his house, and gave him the use of an excellent library.

It is a singular peculiarity of all minds of an active and aspiring character, that they uniformly endeavour to do whatever others have done, and from which they themselves have derived enjoyment or benefit. Franklin, from the delight he took in the perusal of books, at last bethought him of trying his own hand at composition; and as has happened, we believe, with a great proportion of literary men of all ages, his first efforts were of a poetical nature. His brother having come to the knowledge of his attempts, encouraged him to proceed, thinking such a talent might prove useful in the establishment. At the suggestion of the latter, therefore, he finished two ballads, which, after being printed, he was sent round the town to sell; and one of them, the subject of which was a recent affecting shipwreck, had, he says, a prodigious run. But his father having heard of the circumstance, soon let down the pegs of the young poet's vanity, by analysing his verses before him in a most unmerciful style, and demonstrating, as Franklin says, what "wretched stuff they really were." This sharp lesson, which concluded with a warning that versifiers were almost uniformly beggars, effectually weaned him from his rhyming propensities.

Franklin immediately afterwards betook himself to the composition of prose, and the first opportunity of exercising his pen and his faculties in this way occurred in the following manner:—He had a young acquaintance of the name of Collins, who was, like himself, passionately fond of books, and with whom he had frequent and long arguments on various subjects. In narrating this circumstance, Franklin comments, in passing, on the dangerous consequences of acquiring a disputatious habit, as tending to generate acrimony and discord in society, and often hatred betwixt the best of friends. He dismisses the subject with the following singular enough observation:—"I have since remarked, that men of sense seldom fall into this error; lawyers, fellows of universities, and *persons of every profession educated at Edinburgh*, excepted!" But to proceed: Franklin and his companion having as usual got into an argument one day, which was maintained on both sides with equal pertinacity, they parted without bringing it to a termination; and as they were to be separated for some time, an agreement was made that they should carry on their dispute by letter. This was accordingly done; when, after the interchange of several epistles, the whole correspondence happened to fall into the hands of Franklin's father. After perusing it with much interest, his natural acuteness and good sense enabled him to point out to his son how inferior he was to his adversary in elegance of expression, arrangement, and perspicuity. Feeling the justice of his parent's remarks, he forthwith studied most anxiously to improve his style; and the plan he adopted for this purpose is equally interesting and instructive.

"Amidst these resolves," he says, "an odd volume of the Spectator fell into my hands. This was a publication I had never seen. I bought the volume, and read it again and again. I was enchanted with it, thought the style excellent, and wished it were in my power to imitate it. With this view I selected some of the papers, made short summaries of the sense of each period, and put them for a few days aside. I then, without looking at the book, endeavoured to restore the essays to their due form, and to express each thought at length, as it was in the original, employing the most appropriate words that occurred to my mind. I afterwards compared my Spectator with the original. I perceived some faults, which I corrected; but I found that I chiefly wanted a fund of words, if I may so express myself, and a facility of recollecting and employing them, which I thought I should by that time have acquired, had I continued to make verses. The continual need of words of the same meaning, but of different lengths for the measure, and of different sounds for the rhyme, would have obliged me to seek for a variety of synonymes, and have rendered me master of them. From this belief, I took some of the tales of the Spectator, and turned them into verse; and after a time, when I had sufficiently forgotten them, I again converted them into prose. Sometimes, also, I mingled my summaries together; and, a few weeks afterwards, endeavoured to arrange them in the best order, before I attempted to form the periods and complete the essays. This I did, with a view of acquiring method in the arrangement of my thoughts. On comparing afterwards my performance with the original, many faults were apparent, which I corrected; but I had sometimes the satisfaction to think, that, in certain particulars of little importance, I had been fortunate enough to improve the order of the thought or style; and this encouraged me to hope that I should succeed in time in writing decently in the English language, which was one of the greatest objects of my ambition."

But it was not only by such rigorous self-imposed tasks that this extraordinary man, even at so early an age, endeavoured to chasten his mind, and make every animal propensity subservient to his sense of duty. He also began to exercise those acts of personal self-denial which the heyday of youth, the season for animal enjoyment, feels as the most intolerable of all restrictions. Having met with a work recommending a vegetable diet, he determined to adopt it. Finding, after some days' trial, that he was ridiculed by his fellow-boarders for his singularity, he proposed to his brother to take the half of what was now paid by that relative for his board, and therewith to maintain himself. No objection was, of course, made to such an arrangement; and he soon found that of what he received he was able to save one-half. "This," says he, "was a new fund for the purchase of books, and other advantages resulted to me from the plan. When my brother and his workmen left the printing-house to go to dinner, I remained behind; and dispatching my frugal meal, which frequently consisted of a biscuit only, or a slice of bread and a bunch of raisins, or a bun from the pastry-cook's, with a glass of water, I had the rest of the time till their return for study; and my progress therein was proportioned to that clearness of ideas and quickness of conception which are the fruits of temperance in eating and drinking."

Another remarkable instance of the resolute way in which he set about making himself master of whatever acquirement he found more immediately necessary to him at the moment, is the following:—Having been put to the blush one day for his ignorance in the art of calculation, which he had twice failed to learn while at school, he procured a copy of Cocker's Arithmetic, and went through it all, making himself completely master of it, before turning his mind to any thing else! He soon after, also, gained some little acquaintance with geometry, by perusing a work on navigation. He mentions, likewise, his reading about this time Locke's Essay on the Understanding, and the Art of Thinking, by Messrs du Port Royal. Having found, in some essay on rhetoric and logic, a model of disputation after the manner of Socrates, which consists in drawing on your opponent, by insidious questions, into making admissions which militate against himself, he became excessively fond of it, he says, and practised it for some years with great success, but ultimately abandoned it, perceiving that it could be made as available to the cause of wrong as that of right, while the prime end of all argument was to convince or inform.

About three years after Franklin went to his apprenticeship, that is to say, in 1721, his brother began to print a newspaper, the second that was established in America, which he called the New England Courant; the one previously established was the Boston News Letter. The new publication brought the most of the *literati* of Boston about the printing-office, many of whom were contributors; and Franklin frequently overheard them conversing about the various articles that appeared in its columns, and the approbation with which particular ones were received. He became ambitious to participate in this sort of fame; and having written out a paper, in a disguised hand, he slipped it under the door of the printing-office, where it was found next morning, and submitted, as usual, to the critics when they assembled. "They read it," he says; "commented on it in my hearing; and I had the exquisite pleasure to find that it met with their approbation; and that in the various conjectures they made respecting the author, no one was mentioned who did not enjoy a high reputation in the country for talent and genius. I now supposed myself fortunate in my judges, and began to suspect that they were not such excellent writers as I had hitherto supposed them. Be this as it may, encouraged by this little adventure, I wrote and sent to press, in the same way, many other pieces which were equally approved—keeping the secret till my slender stock of information and knowledge for such performances was pretty completely exhausted." He then discovered himself, and had the satisfaction of finding he was treated with much more respect by his brother and his friends than heretofore.

The two brothers, however, lived together on very disagreeable terms, in consequence of the hasty and overbearing temper of the elder; and Benjamin anxiously longed for an opportunity of separating from him. This at last occurred. His brother was apprehended and imprisoned for some political article which offended the local government, and, upon his liberation, was prohibited from ever printing his newspaper again. It was therefore determined that it should be published in Benjamin's name, who had managed it during his brother's confinement with great spirit and ability. To avoid having it said that the elder brother was only screening himself behind one of his apprentices, Benjamin's indenture was delivered up to him discharged, and private indentures entered into for the remainder of his time. This underhand arrangement was proceeded in for several months, the paper continuing to be printed in Benjamin's name; but his brother having one day again broke out into one of his violent fits of passion, and struck him, he availed himself of his discharged indentures, well knowing that the others would never be produced against him, and gave up his employment. Franklin afterwards regretted his having taken so unfair an advantage of his brother's situation, and regarded it as one of the first *errata* of his life. His brother felt so exasperated on the occasion, that he went round all the printing-houses, and represented Benjamin in such a light that they all refused his services.

PROCEEDS TO PHILADELPHIA.

Finding he could get no employment at Boston, as well as that he was regarded with dislike by the government, he resolved to proceed to New York, the nearest town in which there was a printing-office. To raise sufficient funds for this purpose, he sold part of his library; and having eluded the vigilance of his parents, who were opposed to his intention, he secretly got on board of a vessel, and landed at New York on the third day after sailing.

Thus, at the age of seventeen, Franklin found himself three hundred miles from his native place, to which he was in some sort a runaway, without a friend or recommendation to any one, and with very little money in his pocket. To complete his dilemma, he found, on applying, that the only printer then in the town could give him no employment. That person, however, recommended him to go to Philadelphia, where he had a son, who, he thought, would give him work; and he accordingly set off for that place. His journey was a most disastrous one both by water and land, and he frequently regretted leaving home so rashly. He reached his destination at last, however, and in a plight which certainly did not bode over-auspiciously for his future fortunes. His own graphic description of his condition and appearance, on his first entrance into Philadelphia, is at once interesting and amusing:—

"I have entered into the particulars of my voyage, and shall in like manner describe my first entrance into this place, that you may be able to compare beginnings so unlikely with the figure I have since made. I was in my working dress, my best clothes being to come by sea. I was covered with dirt; my pockets were filled with shirts and stockings; I was unacquainted with a single soul in the place, and knew not where to seek a lodging. Fatigued with walking, rowing, and having passed the night without sleep, I was extremely hungry, and all my money consisted of a Dutch dollar, and about a shilling's worth of coppers, which I gave to the boatmen for my passage. At first they refused it, because I had rowed, but I insisted on them taking it. A man is sometimes more generous when he has little than when he has much money, probably because he is, in the first place, desirous of concealing his poverty.

"I walked towards the top of the street, looking eagerly on both sides, till I came to Market Street, where I met a child with a loaf of bread. I inquired where he had bought it, and went straight to the baker's shop which he pointed out to me. I asked for some biscuits, expecting to find such as we had at Boston; but they made, it seems, none of that sort at Philadelphia. I then asked for a threepenny loaf; they made no loaves of that price. I then desired him to let me have threepence worth of bread, of some kind or other. He gave me three large rolls. I was surprised at receiving so much. I took them, however, and having no room in my pockets, I walked on, with a roll under each arm, eating the third. In this manner I went through Market Street to Fourth Street, and passed the house of Mr Read, the father of my future wife. She was standing at the door, observed me, and thought with reason that I made a very singular and grotesque appearance. I then turned the corner, and went through Chestnut Street, eating my roll all the way; and, having made this round, I found myself again on Market Street wharf, near the boat in which I arrived. I stepped into it to take a draught of the river water; and finding myself satisfied with my first roll, I gave the other two to a woman and her child who had come down the river with us in the boat, and was waiting to continue her journey. Thus refreshed, I regained the street, which was now full of well-dressed people all going the same way. I joined them, and was thus led to a Quakers' meeting-house, near the market place. I sat down with the rest, and, after looking round me for some time, hearing nothing said, and being drowsy from my last night's labour and want of rest, I fell into a sound sleep. In this state I continued till the assembly dispersed, when one of the congregation had the goodness to wake me. This was consequently the first house I entered, or in which I slept, in Philadelphia."

Having with some difficulty procured a lodging for the night, he next morning waited on Mr Bradford, the printer to whom he had been directed. That individual said he had no work for him at present, but directed him to a brother in trade of the name of Keimer, who, upon application, made him the same answer; but, after considering a little, set him to put an old press to rights, being the only one indeed he possessed; and in a few days gave him regular work. Upon this, Franklin took a lodging in the house of Mr Read, his future father-in-law.

Franklin had been some months at Philadelphia, without either writing to or hearing from home, and, as he says, trying to forget Boston as much as possible, when a brother-in-law of his, a master of a vessel, having accidentally heard where he was, wrote to him, pressing his return home in the most urgent terms. Franklin's reply, declining compliance with the request, happened to reach his brother-in-law when the latter was in the company of Sir William Keith, governor of the province, and the composition and penmanship struck him as so much superior to the ordinary style of letter-writing, that he showed it to his excellency. The governor was no less pleased with it, and expressed the utmost surprise when told the age of the writer. He observed, that he must be a young man of promising talents, and said that if he would set up business on his own account at Philadelphia, he would procure him the printing of all the public papers, and do him every other service in his power. Franklin heard nothing of this from his brother-in-law at the time; but one day, while he and Keimer were at work in the office, they observed through the window the governor and another gentleman (who proved to be Colonel French of Newcastle, in the province of Delaware), finely dressed, cross the street, and come directly for the office, where they knocked at the door. Keimer ran down, in high expectation of this being a visit to himself; "but the governor (says Franklin) inquired for me, came up stairs, and with a politeness to which I had not at all been accustomed, paid me many compliments, desired to be acquainted with me, obligingly reproached me for not having made myself known to him on my arrival in town, and wished me to accompany him to a tavern, where he and Colonel French were going to taste some excellent Madeira wine! I was, I confess, somewhat surprised, and Keimer was thunderstruck. I went, however, with the governor and Colonel French to a tavern at the corner of Third Street, where, while we were drinking the Madeira, he proposed to me to establish a printing-house. He set forth the probabilities of success, and himself and Colonel French assured me that I should have their protection and influence in obtaining the printing of the public papers for both governments; and as I appeared to doubt whether my father would assist me in this enterprise, Sir William said that he would give me a letter to him, in which he would recommend the advantages of the scheme in a light which he had no doubt would determine him to agree to do so. It was thus concluded that I should return to Boston by the first vessel, with the letter of recommendation from the governor to my father. Meanwhile, the project was to be kept secret, and I continued to work to Keimer as before. The governor subsequently sent for me every now and then to dine with him. I considered this as a very great honour; and I was the more sensible of it, as he conversed with me in the most affable, friendly, and familiar manner imaginable."

In pursuance of the above arrangement, Franklin set out on his return homewards, in the end of April 1724, having been absent about seven months, during which time his parents and relations had heard nothing of him whatever, his brother-in-law never having written to inform them where he was. All the family, with the exception of his brother James, were delighted to see him; and not the less so, perhaps, that he was apparelled in a complete new suit of clothes, had an excellent silver watch, and about five pounds sterling in his pocket. His father was exceedingly surprised when informed of the object of his visit, and still more at the contents of Governor Keith's epistle. After long deliberation, he came to the resolution of refusing compliance with the request, on account of his son being too young to undertake the management of such a speculation; adding, that he thought the governor a man of little discretion in proposing it. He promised, however, when his son should attain his twenty-first year, that he would supply him with what money he required to set him up in business, praising him highly, at the same time, for his industry and good conduct. Franklin, accordingly, was necessitated to return to Philadelphia with the news of his bad success, but left Boston on this occasion accompanied by the blessings of his parents. When he arrived at Philadelphia, he immediately waited upon the governor, and communicated the result of his journey. Sir William observed that his father was "too prudent;" but added, "since he will not do it, I will do it myself." It was ultimately arranged, therefore, that Franklin should proceed personally to London to purchase every thing necessary for the proposed establishment, for the expense of which the governor promised him a letter of credit to the extent of L.100, with recommendations to various people of influence.

SAILS FOR ENGLAND.

It had been arranged that Franklin was to go to England in the regular packet-ship; and as the time of her sailing drew near, he became importunate for the governor's letters of credit and recommendation, but the latter always put him off under various pretences. At last, when the vessel was on the point of departing, he was sent on board, under the assurance that Colonel French would bring the letters to him immediately. That gentleman accordingly came on board with a packet of dispatches tied together, which were put into the captain's bag, and Franklin was informed that those intended for him were tied up with the rest, and would be delivered to him before landing in England. When they arrived in the Thames, accordingly, the captain allowed him to search the bag, but Franklin could find no letters directed either to himself or addressed as to his care; but he selected six or seven, which from the directions on them he conceived to be those intended for his service. One of these was to the king's printer, and Franklin accordingly waited upon that gentleman with it; but the latter had no sooner opened it, than he exclaimed, "Oh, this is from Riddlesden!—(a well-known rascally attorney at Philadelphia); I have lately discovered him to be an arrant knave, and wish to have nothing to do either with him or his letters." So saying, he turned on his heel, and resumed his occupation. In short, it turned out that none of the letters were from the governor; and he soon learned from a gentleman of the name of Denham, who had been a fellow-passenger with him, and to whom he explained his awkward situation, that the governor was a complete cheat, deceiving people, from vanity and a love of self-consequence, with promises which he neither intended nor was able to fulfil; and laughed at the idea of a man giving a letter of credit for L.100 who had no credit for himself.

Franklin's situation was now even more desolate than when set ashore, ragged, hungry, and almost penniless, at Philadelphia, little more than a twelvemonth before. But the heart, at eighteen, is not naturally inclined to despond, and never was one less so than that of Franklin. He immediately applied for and obtained employment in the office of the celebrated Mr Palmer. Amongst other works on which he was set to work here, was a second edition of Wollaston's Religion of Nature. Conceiving some of the positions assumed in it to be weak or erroneous, he composed and published a small metaphysical treatise in refutation of them. This pamphlet acquired him considerable credit with his master as a man of talent; but that gentleman reprobated, with the utmost abhorrence, the doctrines maintained in his publication, which, truth compels us to say, were completely irreligious, so far as regarded the Christian faith, or any other acknowledged system of belief. Free-thinking, however, was then in fashion among the higher and more learned classes, and his pamphlet procured him the countenance of various eminent individuals; amongst the rest, of Dr Mandeville, author of the Fable of the Bees, and Dr Pemberton, Sir Isaac Newton's friend. He was likewise waited upon by Sir Hans Sloane, who had been informed of his bringing some curiosities with him from America; amongst others, a purse of asbestos—a natural substance which resists the action of fire, and then very little known—for which he paid Franklin a high price. From Mr Palmer's office he removed to Mr Watt's, for the consideration of a higher wage. Here he gave a striking proof of that resolute adherence to temperance, industry, and frugality, which were amongst the leading features of his character. Whilst Mr Watt's other workmen spent generally five or six shillings a-week on beer, which was brought into the office to them during the day, he drunk nothing but water; and they were surprised to see that he was much stronger than any of them, while he himself had the additional comfort and satisfaction of being always clear-headed. At first they ridiculed his abstinence, and conferred on him the soubriquet of the *American Aquatic*; but as his character rose amongst them, his example, he says, "prevailed with several of them to renounce their abominable breakfast of bread and cheese, with beer; and they procured, like me, from a neighbouring house, a good basin of warm gruel, in which was a small slice of butter, with toasted bread and nutmeg. This was a much better breakfast, which did not cost more than a pint of beer, namely, three halfpence, and at the same time preserved the head clearer." His assiduous application to business, at the same time, together with remarkable quickness in *composing* (setting up the types), recommended him to his employer, and procured him all the most urgent and best-paid work; so that, with his frugal mode of living, he quickly laid past money.

RETURNS TO AMERICA.

After having been about eighteen months in London, much to his advantage in every respect—for, besides becoming more proficient in his business, he had stuck to his books as sedulously as ever, even although he frequently went to the play, made little pleasure excursions, and mingled a good deal in society—he was about to set out on a tour through Europe, with a young intelligent fellow-workman (designing to maintain themselves during their pilgrimage by means of their calling), when he accidentally met with Mr Denham, before noticed as being his fellow-passenger from America. That gentleman was on the eve of returning to Philadelphia, to open a merchant's store, and offered Franklin the situation of his clerk, with a salary of L.50 per annum. This sum was less than he was making as a compositor; but an anxious desire to revisit his native country induced him to accept of it. They set sail accordingly—Franklin now supposing he had relinquished the composing-stick for ever—and arrived at Philadelphia on the 11th of October 1726. Franklin had just entered his twenty-first year at this time; and he mentions having drawn up for himself in writing, during the voyage, a plan for the regulation of his future conduct. This interesting document was afterwards unfortunately lost; but he tells us himself that he pretty faithfully adhered to the rules thus early laid down, even into old age. Upon his arrival, he found his old acquaintance, the governor, had been supplanted in his office, and was held in general contempt. They met several times, but no allusion was ever made by Franklin to the disgraceful imposture the other had practised on him.

Franklin's new employer had only been in business for a few months, when both were seized at the same time with a violent disorder, which carried off the master in a few days, and brought the clerk to the brink of the grave. On his recovery, being thus once more left destitute, he was fain to accept employment as a printer from his old master Keimer, who was now somewhat better off in the world, but still utterly ignorant of his profession. The whole charge of the office, with that of instructing four or five ignorant apprentices, devolved on Franklin. "I also," says he, "upon occasion, engraved various ornaments, made ink, gave an eye to the shop—in short, I was, in every respect, the *factotum*." But he likewise, at this time, gave another remarkable instance of his versatile ingenuity.

"Our press," says he, "was frequently in want of the necessary quantity of letter, and there was no such trade as that of letter-founder in America. I had seen the practice of this art at the house of James, in London, but had at the time paid it very little attention. I, however, contrived to fabricate a mould. I made use of such letters as we had for punches, founded new letters of lead in matrices of clay; and thus supplied, in a tolerable manner, the wants that were most pressing." Franklin's inventive mind would seem here to have obtained a distant glimpse of the principle of *stereotyping*, which has since been carried to such a height of usefulness and perfection, as exemplified in the various publications of the editors of this miscellany.

Keimer having engaged Franklin solely with the view of having his apprentices so far initiated in the art as that he could dispense with their instructor's services, took the first occasion to quarrel with him when he thought he had sufficiently attained his object. Upon their separation, one of Keimer's apprentices, named Meredith, who, like all the others, had conceived a great veneration for Franklin, proposed that they should enter into partnership together—Meredith's friends undertaking to furnish the capital necessary for purchasing the materials, &c. This offer was too advantageous to be refused; and types, press, &c., were forthwith commissioned from London; but while preparing to put their plan into execution, Franklin was induced, during the interval, to return again to Keimer, at the urgent solicitation of the latter. The motive for this humble entreaty was that individual's having taken a contract for the printing of some paper-money for the state of New Jersey, requiring a variety of new cuts and types, which he knew well nobody in that place but Franklin could supply. This also presents us with a very striking instance of Franklin's remarkable gift of invention.

"To execute the order," says he, "I constructed a copperplate printing-press! the first that had been seen in the country. I engraved various ornaments and vignettes for the bills, and we repaired to Burlington together, where I executed the whole to the general satisfaction, and he (Keimer) received a sum of money for this work, which enabled him to keep his head above water for a considerable time longer."

At Burlington, Franklin formed acquaintance with all the principal personages of the province, who were attracted by his superior abilities and intelligence. Amongst these was the inspector-general, Isaac Decon, "who," says Franklin, "was a shrewd and subtle old man. He told me that his first employment had been that of carrying clay to the brickmakers; that he did not learn to write till he was somewhat advanced in life; that he was afterwards employed as underling to a surveyor, who taught him his trade; and that, by industry, he had at last acquired a competent fortune. 'I foresee,' said he, 'that you will soon supplant this man (speaking of Keimer), and get a fortune in the business at Philadelphia.' He was wholly ignorant at the time of my intention of establishing myself there, or any where else."

ENTERS INTO BUSINESS.

Franklin had scarcely returned from Burlington, when the types commissioned for himself and Meredith, from London, arrived; and having settled matters with Keimer, the partners immediately took a house, and commenced business. They were in the act of opening up their packages, when a countryman came in to have a job done; and as all their cash had been expended in their various purchases, "this countryman's five shillings," says Franklin, "being our first fruits, and coming so seasonably, gave me more pleasure than any crown I have since earned." A number of young men having, during the preceding year, formed themselves, at Franklin's suggestion, into a weekly club for the purpose of mutual improvement, they were so well pleased with the beneficial results they experienced from their meetings, that, when the originator of their society set up in business, every one exerted himself more than another to procure him employment. One of them obtained from the Quakers the printing of forty sheets of a history of that sect, then preparing at the expense of the body. "Upon these," says Franklin, "we worked exceeding hard, for the price was very low. It was in folio, upon *pro patria* paper, and in the *pica* letter, with heavy notes in the smallest type. I composed a sheet a-day, and Meredith put it to press. It was frequently eleven o'clock at night, sometimes later, before I had finished my distribution for the next day's task; for the other little jobs that came in kept us back in this work; but I was so determined to compose a sheet a-day, that one evening, when my form was imposed, and my day's work, as I thought, at an end, an accident broke the form, and deranged two complete folio pages. I immediately distributed and composed them anew before I went to bed." This unwearied industry, which soon became known, acquired Franklin great reputation and credit amongst his townsmen, and business began rapidly to flow in upon them.

STARTS A NEWSPAPER.

The establishment and management of a newspaper seems to have all along been a favourite project with Franklin; probably because, from his former experience in it, and the consciousness of his powers of writing, he felt himself so well adapted for the task. The partners soon found themselves in circumstances to enable them to make the trial; but Franklin having incautiously divulged their intention to a third person, that individual informed their old master Keimer of the fact, who immediately took steps to anticipate them, and issued a prospectus of a paper of his own. The manner in which Franklin met and defeated this treachery is exceedingly characteristic. There was another paper published in Philadelphia by Mr Bradford, which had been in existence for some years, but was such a miserable affair, that it only preserved its vitality because no other arose to knock it on the head. In order to keep down Keimer's publication, however, Franklin saw the policy of supporting the old one, until prepared to start his own. He thereupon set about writing a series of amusing articles for it, which the publisher, Bradford, was of course very glad to insert. "By this means," says Franklin, "the attention of the public was kept fixed on that paper, and Keimer's proposals, which we burlesqued and ridiculed, were disregarded. He began his paper, however; and, after continuing it for nine months, having at most not more than ninety subscribers, he offered it to me for a mere trifle. I had for some time been prepared for it; I therefore instantly took it upon myself, and in a few years it proved very profitable to me." In fact, it obtained notoriety and applause at the very first number, in consequence of some observations therein by Franklin, on an important colonial question; and various members of Assembly exerted themselves so well in his behalf, that the printing of the House was speedily transferred from Bradford to his two young rivals. In the management of his newspaper, Franklin pursued a system of unflinching integrity. He steadfastly refused to give admission into his columns of any article containing personal abuse of particular individuals. Whenever he was requested to publish any thing of this sort, his answer was, that he would print the piece by itself, and give the author as many copies for his own distribution as he wished. He very wisely considered that his subscribers expected him to furnish them with useful and entertaining information, and not with personal slander or private discussions with which they had no concern.

COMMENCES BUSINESS BY HIMSELF.

Luckily for Franklin, almost at the commencement of the newspaper, an opportunity occurred of getting rid of his partner Meredith, who had become an idle drunken fellow, and had all along been of comparatively little use in the concern. Meredith's father failed to implement the bargain for advancing the necessary capital to pay the demands of the paper merchant, and other expenses necessarily attending their speculation, when they became due. A suit was accordingly instituted against the partners, and as Meredith's father declared his inability to pay the amount of the claims upon them, the son offered to relinquish the whole concern into Franklin's hands, on condition that the latter would take upon him the debts of the company, repay his father what he had already advanced, settle his own little personal debts, and give him thirty pounds—and a *new saddle!* By the kindness of two friends, who, unknown to each other, came forward simultaneously and unasked to his assistance, Franklin was enabled to accept the offer. The agreement was carried into effect, and thus do we find this extraordinary man, at the age of twenty-four, and in the place where he had arrived penniless only seven years before, settled down in business, with a thriving trade; proprietor of an extensively circulated newspaper, and a firmly established reputation of no ordinary kind. All this success, however, the result of his own good conduct, perseverance, and frugality, had no undue effect on his well-regulated mind, or could induce him to assume those airs of arrogant superiority and pretension, which have but too frequently blemished the character of those who have praiseworthily achieved their own elevation in society. On the contrary, he dressed more plainly, and deported himself more humbly, than ever; and to show that he was not above his business, he sometimes wheeled home on a barrow, with his own hands, the paper which he purchased at the stores.

Although we are, in a manner, only arrived at the commencement of that long career of usefulness as a citizen, a statesman, and a philosopher, which has rendered his name so illustrious, and, to use the expressive language of the poet,

> "Made him loved at home—revered abroad,"

we have undoubtedly got through the most interesting part of his biography. We have noted by what means—by what patient exertion, self-control, industry, frugality, temperance, and integrity, he overcame all obstacles, and attained the station at which we have seen him arrive; fitted himself for the discharge of those important duties to which the voice of his country called him; and acquired those fixed habits of study, observation, and inquisitive research, by which he afterwards penetrated so deep into the arcanum of nature's mysteries. It will be needless for us, therefore, to trace his private history so inquisitorially as we have hitherto done through the remainder of his eminently successful fortunes.

Soon after getting the whole printing and newspaper concern into his hands, there was an outcry among the people for a new emission of paper-money. Franklin took up the cause, and by his arguments in a pamphlet which he published on the subject, contributed so greatly to the success of the proposal, and obtained himself so much popularity, that upon its being resolved to issue the notes, Franklin was selected to print them. He then opened a stationer's shop, and from his success in business, began gradually to pay off his debts. He took care, he says, not only to be *really* industrious and frugal, but also to avoid every appearance to the contrary—was plainly dressed, and was never seen in any place of public amusement; never went a-fishing or hunting. A book, indeed, enticed him sometimes from his work, but even that indulgence was seldom, and by stealth. Meanwhile, his old master Keimer went fast to ruin, and, with the exception of old Mr Bradford, who was rich and did not care for business, he was the only printer in the place. He shortly afterwards married Miss Read, the lady named in a former part of this memoir. Franklin's behaviour to this young lady had not been altogether blameless. Previous to his sailing for England he had exchanged pledges of affection with her; yet, all the while he was away, he only sent her one letter. Her friends and herself concluding that he either never meant to return, or that he wished to drop connexion with her, she was induced to accept the hand of another suitor, and on his return to America Franklin found her married—an event that seems to have given him extremely little uneasiness. The lady's husband proved a great rogue, deserted her, and it was subsequently ascertained that he had still a former wife living. After being established in business, and rising in the world, the intimacy between Franklin and her family was renewed, and it was not long, ere, despite her dubious situation, they hazarded a fulfilment of their early vows. The lady was about Franklin's own age, and proved, according to his own testimony, "an honour and a blessing" to him.

In 1731, Franklin drew up proposals for a public subscription library at Philadelphia, being the first project of the sort that had been started in America. Fifty persons at first subscribed forty shillings each, and agreed to pay ten shillings annually; and the establishment was put under such judicious rules of management, that in the course of ten years it became so valuable and important as to induce the proprietors to get themselves incorporated by royal charter. This library afforded its founder facilities of improvement of which he did not fail to avail himself, setting apart, as he tells us, an hour or two every day for study, which was the only amusement he allowed himself.

In 1732, Franklin began to publish his Poor Richard's Almanack, so called from his giving it forth under the name of Richard Saunders. It was chiefly remarkable for the numerous and pithy maxims it contained, all tending to exhort to industry and frugality. It was continued annually for twenty-five years, and the proverbs and trite moral observations scattered throughout it were afterwards thrown together into a connected discourse, under the title of the "Way to Wealth." So highly esteemed is this production amongst his countrymen, that copies of it are to this day to be found framed and glazed in the houses even of the wealthiest people in Philadelphia, and indeed in every province of North America. As it is replete with that practical wisdom, drawn from experience, which is applicable to the every-day concerns of busy life, and which cannot be too constantly kept before the eye of mankind, it falls as appropriately as legitimately to be quoted in a work, the prime object of which is to farther popular instruction.

"*The Way to Wealth, a Preliminary Address to the Pennsylvania Almanac, entitled Poor Richard's Almanac, for the year* 1758.

I stopped my horse lately where a great number of people were collected at an auction of merchants' goods. The hour of sale not being come, they were conversing on the badness of the times; and one of the company called to a plain, clean, old man, with white locks, "Pray, father Abraham, what think ye of the times? Won't these heavy taxes quite ruin the country? How shall we ever be able to pay them? What would you advise us to?" Father Abraham stood up, and replied, "If you have my advice, I'll give it to you in short; 'for a word to the wise is enough; and many words won't fill a bushel,' as poor Richard says." They joined in desiring him to speak his mind; and, gathering round him, he proceeded as follows:—

"Friends (says he) and neighbours, the taxes are indeed very heavy; and if those laid on by the government were the only ones we had to pay, we might more easily discharge them; but we have many others, and much more grievous to some of us. We are taxed twice as much by our idleness, three times as much by our pride, and four times as much by our folly; and from these taxes the commissioners cannot ease or deliver us, by allowing an abatement. However, let us hearken to good advice, and something may be done for us; 'God helps them that help themselves,' as poor Richard says in his Almanac.

"It would be thought a hard government that should tax its people one tenth part of their time, to be employed in its service; but idleness taxes many of us much more, if we reckon all that is spent in absolute sloth, or doing of nothing, with that which is spent in idle employments, or amusements that amount to nothing. Sloth, by bringing on diseases, absolutely shortens life. 'Sloth, like rust, consumes faster than labour wears, while the key often used is always bright,' as poor Richard says. 'But dost thou love life? then do not squander time, for that's the stuff life is made of,' as poor Richard says. How much more than is necessary do we spend in sleep! forgetting that 'the sleeping fox catches no poultry, and that there will be sleeping enough in the grave,' as poor Richard says. 'If time be of all things the most precious, wasting time must be (as poor Richard says) the greatest prodigality;' since, as he elsewhere tells us, 'Lost time is never found again; and what we call time enough, always proves little enough.' Let us then up and be doing, and doing to the purpose; so by diligence shall we do more with less perplexity. 'Sloth makes all things difficult, but industry all easy,' as poor Richard says; and 'He that riseth late must trot all day, and shall scarce overtake his business at night; while laziness travels so slowly, that poverty soon overtakes him,' as we read in poor Richard; who adds, 'Drive thy business, let not that drive thee;' and,

> 'Early to bed, and early to rise,
> Makes a man healthy, wealthy, and wise.'

"So what signifies wishing and hoping for better times? We make these times better if we bestir ourselves. 'Industry needs not wish,' as poor Richard says; 'He that lives upon hope will die fasting.' 'There are no gains without pains; then help, hands, for I have no lands; or if I have, they are smartly taxed;' and (as poor Richard likewise observes) 'He that hath a trade hath an estate, and he that hath a calling hath an office of profit and honour;' but then the trade must be worked at, and the calling well followed, or neither the estate nor the office will enable us to pay our taxes. If we are industrious, we shall never starve; for, as poor Richard says, 'At the working-man's house hunger looks in, but dares not enter.' Nor will the bailiff or the constable enter; for 'Industry pays debts, but despair increaseth them,' says poor Richard. What though you have found no treasure, nor has any rich relation left you a legacy? 'Diligence is the mother of good luck,' as poor Richard says; and 'God gives all things to industry: then plough deep while sluggards sleep, and you will have corn to sell and to keep,' says poor Dick. Work while it is called to-day; for you know not how much you may be hindered to-morrow; which makes poor Richard say, 'One to-day is worth two to-morrows;' and, further, 'Have you somewhat to do to-morrow, do it to-day.' 'If you were a servant, would you not be ashamed that a good master should catch you idle? Are you, then, your own master? be ashamed to catch yourself idle,' as poor Dick says. When there is so much to be done for yourself, your family, and your gracious king, be up by peep of day: 'Let not the sun look down, and say, Inglorious here he lies!' Handle your tools without mittens; remember that 'The cat in gloves catches no mice,' as poor Richard says. It is true, there is much to be done, and perhaps you are weak-handed; but stick to it steadily, and you will see great effects; for continual dropping wears away stones, and by diligence and patience the mouse ate into the cable; and 'light strokes fell great oaks,' as poor Richard says in his Almanac, the year I cannot just now remember.

"Methinks I hear some of you say, 'Must a man afford himself no leisure?'—I will tell thee, my friend, what poor Richard says, 'Employ thy time well, if thou meanest to gain leisure; and since thou art not sure of a minute, throw not away an hour.' Leisure is time for doing something useful; this leisure the diligent man will obtain, but the lazy man never; so that, as poor Richard says, 'A life of leisure and a life of laziness are two things.' Do you imagine that sloth will afford you more comfort than labour? No; for, as poor Richard says, 'Troubles spring from idleness, and grievous toils from needless ease: many without labour would live by their own wits only; but they break for want of stock.' Whereas industry gives comfort, and plenty, and respect. 'Fly pleasures, and they'll follow you; the diligent spinner has a large shift; and now I have a sheep and a cow, every body bids me good-morrow;' all which is well said by poor Richard.

"But with our industry, we must likewise be steady, and settled, and careful, and oversee our own affairs with our own eyes, and not trust too much to others; for, as poor Richard says,

> 'I never saw an oft-removed tree,
> Nor yet an oft-removed family,
> That throve so well as one that settled be.'

"And again, 'Three removes are as bad as a fire;' and again, 'Keep thy shop, and thy shop will keep thee;' and again, 'If you would have your business done, go; if not, send.' And again,

> 'He that by the plough would thrive,
> Himself must either hold or drive.'

"And again, 'The eye of the master will do more work than both his hands;' and again, 'Want of care does us more damage than want of knowledge;' and again, 'Not to oversee workmen is to leave them your purse open.' Trusting too much to others' care is the ruin of many; for, as the Almanac says, 'In the affairs of the world, men are saved not by faith, but by the want of it; but a man's own care is profitable; for,' saith poor Dick, 'Learning is to the studious, and riches to the careful, as well as power to the bold, and heaven to the virtuous.' And, further, 'If you would have a faithful servant, and one that you like, serve yourself.' And again, he adviseth to circumspection and care, even in the smallest matters, because sometimes 'A little neglect may breed great mischief;' adding, 'For want of a nail the shoe was lost; for want of a shoe the horse was lost; and for want of a horse the rider was lost;' being overtaken and slain by the enemy, all for want of care about a horse-shoe nail.

"So much for industry, my friends, and attention to one's own business; but to these we must add frugality, if we would make our industry more certainly successful. A man may, if he knows not how to save as he gets, 'keep his nose all his life to the grindstone, and die not worth a groat at last.' 'A fat kitchen makes a lean will,' as poor Richard says; and,

> 'Many estates are spent in the getting;
> Since women for tea forsook spinning and knitting,
> And men for punch forsook hewing and splitting.'

"'If you would be wealthy (says he in another Almanac), think of saving, as well as of getting; the Indies have not made Spain rich, because her outgoes are greater than her incomes.'

"Away then with your expensive follies, and you will not have much cause to complain of hard times, heavy taxes, and chargeable families; for, as poor Dick says,

> 'Women and wine, game and deceit,
> Make the wealth small, and the want great.'

"And, further, 'What maintains one vice would bring up two children.' You may think, perhaps, that a little tea, or a little punch now and then, diet a little more costly, clothes a little finer, and a little entertainment now and then, can be no great matter; but remember what poor Richard says—'Many a little makes a mickle;' and farther, 'Beware of little expenses; a small leak will sink a great ship;' and again, 'Who dainties love shall beggars prove;' and moreover, 'Fools make feasts, and wise men eat them.'

"Here you are all got together at this sale of fineries and nick-nacks. You call them *goods*; but if you do not take care, they will prove *evils* to some of you. You expect they will be sold cheap, and perhaps they may for less than they cost; but if you have no occasion for them, they must be dear to you. Remember what poor Richard says—'Buy what thou hast no need of, and ere long thou shalt sell thy necessaries.' And again, 'At a great pennyworth pause awhile.' He means, that perhaps the cheapness is apparently only, or not real, or the bargain, by straitening thee in thy business, may do thee more harm than good. For in another place he says, 'Many have been ruined by buying good pennyworths.' Again, as poor Richard says, 'It is foolish to lay out money in a purchase of repentance;' and yet this folly is practised every day at auctions, for want of minding the Almanac. 'Wise men (as poor Dick says) learn by others' harms, fools scarcely by their own; but *Felix quem faciunt aliena pericula cautum.* Many a one, for the sake of finery on the back, have gone with a hungry belly, and half starved their families; 'Silk and satins, scarlet and velvets (as poor Richard says), put out the kitchen fire.' These are not the necessaries of life; they can scarcely be called the conveniences; and yet only because they look pretty, how many want to have them! The artificial wants of mankind thus become more numerous than the natural; and as poor Dick says, 'For one poor person there are a hundred indigent.' By these and other extravagances the genteel are reduced to poverty, and forced to borrow of those whom they formerly despised, but who, through industry and frugality, have maintained their standing; in which case it appears plainly, 'A ploughman on his legs is higher than a gentleman on his knees,' as poor Richard says. Perhaps they have had a small estate left them which they knew not the getting of; they think 'It is day, and will never be night;' that a little to be spent out of so much is not worth minding. 'A child and a fool (as poor Richard says) imagine twenty shillings and twenty years can never be spent; but always be taking out of the meal-tub, and never putting in, soon comes to the bottom;' then, as poor Dick says, 'When the well is dry, they know the worth of water.' But this they might have known before, if they had taken his advice: 'If you would know the value of money, go and try to borrow some; for he that goes a-borrowing goes a-sorrowing, and, indeed, so does he that lends to such people when he goes to get it in again.' Poor Dick further advises, and says,

'Fond pride of dress is sure a very curse;
Ere fancy you consult, consult your purse.'

And again, 'Pride is as loud a beggar as Want, and a great deal more saucy.' When you have bought one fine thing, you must buy ten more, that your appearance may be all of a piece; but poor Dick says, 'It is easier to suppress the first desire, than to satisfy all that follow it.' And it is as truly folly for the poor to ape the rich, as the frog to swell in order to equal the ox.

'Vessels large may venture more,
But little boats should keep near shore.'

'Tis, however, a folly soon punished; for 'Pride that dines on vanity, sups on contempt,' as poor Richard says. And in another place, 'Pride breakfasted with Plenty, dined with Poverty, and supped with Infamy.' And, after all, of what use is this pride of appearance, for which so much is risked, so much is suffered? It cannot promote health, or ease pain; it makes no increase of merit in the person; it hastens misfortune.

'What is a butterfly? At best
He's but a caterpillar drest;
The gaudy fop's his picture just,'

as poor Richard says.

But what madness must it be to run in debt for these superfluities! We are offered, by the terms of this sale, six months' credit, and that perhaps has induced some of us to attend it, because we cannot spare the ready money, and hope now to be fine without it. But, ah! think what you do when you run in debt. You give to another power over your liberty. If you cannot pay at the time, you will be ashamed to see your creditor; you will be in fear when you speak to him; you will make poor, pitiful, sneaking excuses, and by degrees come to lose your veracity, and sink into base downright lying; for, as poor Richard says, 'The second vice is lying; the first is running in debt.' And again, to the same purpose, 'Lying rides upon debt's back;' whereas, a freeborn Englishman ought not to be ashamed nor afraid to speak to any man living. But poverty often deprives a man of all spirit and virtue. 'It is hard for an empty bag to stand upright,' as poor Richard truly says. What would you think of that prince, or that government, who would issue an edict, forbidding you to dress like a gentleman or gentlewoman, on pain of imprisonment or servitude? Would you not say that you were free, have a right to dress as you please, and that such an edict would be a breach of your privileges, and such a government tyrannical? And yet you are about to put yourself under that tyranny when you run in debt for such dress! Your creditor has authority, at his pleasure, to deprive you of your liberty, by confining you in jail for life, or by selling you for a servant, if you should not be able to pay him. When you have got your bargain, you may, perhaps, think little of payment; but 'Creditors (poor Richard tells us) have better memories than debtors;' and in another place he says, 'Creditors are a superstitious sect, great observers of set days and times.' The day comes round before you are aware, and the demand is made before you are prepared to satisfy it; or if you bear your debt in mind, the term which at first seemed so long, will, as it lessens, appear extremely short. Time will seem to have added wings to his heels as well as at his shoulders. 'Those have a short Lent (saith poor Richard) who owe money to be paid at Easter.' Then since, as he says, 'The borrower is a slave to the lender, and the debtor to the creditor,' disdain the chain, preserve your freedom, and maintain your independency; be industrious and free; be frugal and free. At present, perhaps, you may think yourselves in thriving circumstances, and that you can bear a little extravagance without injury; but

'For age and want save while you may,
No morning sun lasts a whole day,'

as poor Richard says. Gain may be temporary and uncertain; but ever, while you live, expense is constant and certain; and 'It is easier to build two chimnies, than to keep one in fuel,' as poor Richard says. So, 'Rather go to bed supperless than rise in debt.'

'Get what you can, and what you get hold,
'Tis the stone that will turn all your lead into gold,'

as poor Richard says. And when you have got the philosopher's stone, surely you will no longer complain of bad times, or the difficulty of paying taxes.

This doctrine, my friends, is reason and wisdom; but, after all, do not depend too much upon your own industry, and frugality, and prudence, though excellent things; for they may be blasted, without the blessing of Heaven; and therefore ask that blessing humbly, and be not uncharitable to those that at present seem to want it, but comfort and help them. Remember Job suffered, and was afterwards prosperous.

And now, to conclude, 'Experience keeps a dear school; but fools will learn in no other, and scarce in that; for it is true we may give advice, but we cannot give conduct,' as poor Richard says. However, remember this, 'They that will not be counselled cannot be helped,' as poor Richard says; and further, that 'If you will not reason, she will surely rap your knuckles.'"

Thus the old gentleman ended his harangue. The people heard it, and approved the doctrine, and immediately practised the contrary, just as if it had been a common sermon; for the auction opened, and they began to buy extravagantly, notwithstanding all his cautions, and their own fear of taxes. I found the good man had thoroughly studied my Almanacs, and digested all I had dropped on those topics during the course of twenty-five years. The frequent mention he made of me, must have tired every one else; but my vanity was wonderfully delighted with it, though I was conscious that not a tenth part of the wisdom was my own, which he ascribed to me, but rather the gleanings that I had made of the sense of all ages and nations. However, I resolved to be the better for the echo of it; and though I had at first determined to buy stuff for a new coat, I went away, resolved to wear my old one a little longer."

As Franklin advanced in worldly prosperity, he endeavoured to make his personal acquirements keep pace with his upward progress in society; and amongst other accomplishments applied himself sedulously to the study of the dead and modern languages, of which, besides his native tongue, he as yet scarcely knew any thing. The following is his own account of his private *curriculum*:—

"I had begun in 1733 to study languages. I soon made myself so much a master of the French, as to be able to read the books in that language with ease. I then undertook the Italian. An acquaintance, who was also learning it, used often to tempt me to play chess with him. Finding this took up too much of the time I had to spare for study, I at length refused to play any more, unless on this condition, that the victor in every game should have a right to impose a task, either of parts of the grammar to be got by heart, or in translations, &c., which tasks the vanquished was to perform upon honour before our next meeting. As we played pretty equally, we thus beat one another into that language. I afterwards, with a little pains-taking, acquired as much of the Spanish as to read their books also. I have already mentioned that I had only one year's instruction in a Latin school, and that when very young, after which I neglected that language entirely; but when I had attained an acquaintance with the French, Italian, and Spanish, I was surprised to find, on looking over a Latin Testament, that I understood more of that language than I had imagined, which encouraged me to apply myself again to the study of it; and I met with the more success, as those preceding languages had greatly smoothed my way."

CIVIC PREFERMENTS AND DUTIES.

It was not to be supposed that a man of Franklin's comprehensive mind, and useful practical talents, would be allowed to remain long in the ranks of private life. Accordingly, in the year 1736, he was appointed clerk to the general assembly at Pennsylvania. No opposition was made to his appointment the first year; but on the next election, a new member of the house opposed his return in a long speech. Franklin was, however, again elected, much to his satisfaction; for although the place was one of almost no direct emolument, it gave him an opportunity of making friends amongst the members, and ultimately to secure to himself the printing of most of the public papers, which was previously shared with his rivals. The new member who had resisted his re-election, was a man of talents and character; and Franklin, although too independent to pay any cringing servility to him, perceived the propriety of gaining his good opinion; and the expedient he hit upon for this purpose affords another instance of his shrewdness and knowledge of human nature. Having learned that the gentleman possessed a very rare and curious book, he wrote him a polite note, requesting that he would do him the favour of lending it for a few days. The book was immediately sent; and in about a week was returned by the borrower, with a short epistle, expressive of his gratitude for the favour. The member was so much conciliated by the circumstance, that the next time he met him in the house, he addressed him with great civility; manifested ever afterwards a great desire to serve him; and they became, in short, intimate friends. "This is another instance," observes Franklin, "of the truth of an old maxim I had learned, which says, 'He that has done you a kindness, will be more ready to do you another, than he whom you yourself have obliged.' And it shows how much more profitable it is prudently to remove, than to resent, return, and continue, inimical proceedings." He was thereafter re-elected to the same post, without opposition, for several years successively. In the following year, 1737, he supplanted his rival in trade, Bradford, in the office of deputy-postmaster for the state of Pennsylvania. These honourable preferments induced him to incline his thoughts to, and take a more active part in, public affairs than he had hitherto done.

He first turned his attention to the state of the city police, which was then in a shameful condition; and he soon effected a thorough reformation in the whole system. He suggested and promoted the establishment of a fire insurance company, the first that was projected in America. He afterwards successively exerted himself in organising a philosophical society, an academy for the education of youth, and a militia for the defence of the province. In short, every department of the civil government, as he tells us, and almost at the same time, imposed some duty upon him. "The governor," says he, "put me into the commission of the peace; the corporations of the city chose me one of the common council; and the citizens at large elected me (1747) a burgess to represent them in Assembly. This latter station was the more agreeable to me, as I grew at length tired with sitting there to hear the debates, in which, as clerk, I could take no part, and which were often so uninteresting, that I was induced to amuse myself with making magic squares, or circles, or any thing, to avoid weariness; and I conceived my becoming a member would enlarge my power of doing good. I would not, however, insinuate that my ambition was not flattered by all these promotions—it certainly was; for, considering my low beginning, they were great things to me; and they were still more pleasing as being so many spontaneous testimonies of the public good opinion, and by me entirely unsolicited."

About this period (1739), the celebrated preacher Whitfield arrived at Philadelphia from Ireland. He was at first permitted to preach in some of the town churches; but the clergy soon took a dislike to him, and he was compelled to exercise his eloquence in the open streets or fields. This circumstance, however, like all displays of persecution in matters exclusively connected with private opinion, only rendered him the more popular; and the effects of his oratory speedily manifested themselves.

"It was wonderful," says Franklin, "to see the change soon made in the manners of our inhabitants. From being thoughtless or indifferent about religion, it seemed as if all the world were growing religious, so that one could not walk through the town in an evening without hearing psalms sung in different families of every street; and it being found inconvenient to assemble in the open air, subject to its inclemencies, the building of a house to meet in was no sooner proposed, and persons appointed to receive contributions, than sufficient sums were soon received to procure the ground and erect the building, which was one hundred feet long and seventy broad; and the work was carried on with such spirit as to be finished in a remarkably short time."

On leaving Philadelphia, Mr Whitfield went, preaching all the way, through the colonies to Georgia. The settlement of that province had then been recently commenced, and was attempted by people entirely unfit for such an experiment. They were unable to endure the fatigues and hardships of their situation, and perished in great numbers, leaving many helpless children with nothing to feed or clothe them. "The sight of their miserable situation," says Franklin, "inspired the benevolent heart of Mr Whitfield with the idea of building an orphan house there, in which they might be supported and educated. Returning northward, he preached up this charity, and made large collections; for his eloquence had a wonderful power over the hearts and purses of his hearers, of which I myself was an instance. I did not disapprove of the design; but as Georgia was then destitute of materials and workmen, and it was proposed to send them from Philadelphia at a great expense, I thought it would have been better to have built the house at Philadelphia, and brought the children to it. This I advised; but he was resolute in his first project, rejected my proposal, and I, therefore, refused to contribute.

"I happened soon after to attend one of his sermons, in the course of which I perceived he intended to finish with a collection, and I silently resolved he should get nothing from me. I had in my pocket a handful of copper, three or four silver dollars, and five pistoles in gold. As he proceeded, I began to soften, and concluded to give the copper. Another stroke of his oratory made me ashamed of that, and determined me to give the silver; and he finished so admirably, that I emptied my pocket wholly into the collector's dish, gold and all!

"At this sermon there was also one of our club, who, being of my sentiments respecting the building in Georgia, and suspecting a collection might be intended, had, by way of precaution, emptied his pockets before he came from home. Towards the conclusion of the discourse, however, he felt a strong inclination to give, and applied to a neighbour who stood near him to lend him some money for the purpose. The request was fortunately made to perhaps the only man who had the firmness not to be affected by the preacher. His answer was—'At any other time, friend Hopkinson, I would lend thee freely; but not now, for thee seems to me to be out of thy right senses!'"

Franklin, who was employed by Mr Whitfield to print his sermons, journals, &c., and had otherwise much intercourse with him, warmly repudiates the charges brought against him of appropriating any part of the collections he made, ostensibly for charitable purposes, to his own use. Speaking of his style of enunciation, he says, "He had a loud and clear voice, and articulated his words so perfectly, that he might be heard and understood at a great distance, especially as his auditories observed the most perfect silence. By repeated trial, in retiring to a distance from him while preaching, I computed that he might well be heard by more than thirty thousand; and I was reconciled to the newspaper accounts of his having preached to 25,000 people in the fields, and to the history of generals haranguing whole armies, of which I had sometimes doubted."

At this time there was no military defensive force in Pennsylvania. The inhabitants were mostly Quakers, and neglected to take any measures of precaution against the dangers to which, from the French possessions in Canada, they were continually exposed. All the exertions of the governor of the province to induce the Quaker assembly to pass a militia law, proved ineffectual. Franklin thought something might be done by a subscription among the people; and to pave the way for this, he wrote and published a pamphlet called "Plain Truth." In this he clearly exposed their helpless and perilous situation, and demonstrated the necessity of co-operating for their mutual defence. The pamphlet had a sudden and surprising effect. A meeting of the citizens was held, at which proposals of the intended union, previously drawn up and printed by Franklin, were distributed about the room, to be signed by those who approved of them; and when the company separated, it was found that above twelve hundred signatures had been appended to the papers. Other copies were distributed through the province, and the subscribers at length amounted to upwards of ten thousand! All these individuals furnished themselves, as soon as they could, with arms; formed themselves into companies and regiments; chose their officers, and had themselves regularly instructed in military exercises. The women made subscriptions amongst themselves, and provided silk colours, which they presented to the companies, embellished with devices and mottoes furnished by Franklin. Such influence has one master-mind amongst his fellows in a time of emergency!

Franklin's modesty, however, was more than commensurate with his patriotism. The officers of the companies composing the Philadelphia regiment unanimously chose him for their colonel, but he declined the office in favour of a man of greater wealth and influence, who, on his recommendation, was immediately elected. These exertions of Franklin procured him great confidence from the governor and council, who consulted him on all their public measures. Notwithstanding, too, of the passive principles of the Quakers, it was soon seen that the precautions of military defence were any thing but disagreeable to them. A distinguished individual of their number, Mr Logan, published an address declaring his approbation of defensive war, and supporting his opinion by able and elaborate arguments. This gentleman, who came over from England when a young man, as secretary to the famous William Penn, used to relate an anecdote respecting his old master, which is sufficiently amusing.

During their voyage, they were chased by an armed vessel, supposed to be an enemy. Their captain prepared for defence, but told Penn and his company of Quakers that he did not expect their assistance, and that they might retire into the cabin. This notification they all complied with, excepting Logan, who remained on deck, and was quartered to a gun. The supposed enemy proved a friend, so that there was no fighting; but when the secretary carried the joyful news for his friends in the cabin, Penn reproved him severely for staying on deck, and lending his assistance in defence of the vessel, as being a breach of the principles of their society. Logan, nettled at this comment on his courageous conduct, which was made before the whole company, replied, "I being thy servant, why did thee not order me to come down? but thee was willing enough that I should stay and help to fight the ship, when thee thought there was danger!"

ELECTRICAL AND OTHER PHILOSOPHICAL DISCOVERIES.

It would, perhaps, have been desirable to have followed Franklin through the remainder of his public and political career, without pausing to advert to other pursuits, entirely unconnected therewith, to which he devoted himself. We find, however, that the chronological violence of which we would in that case necessarily be guilty, would only serve to confuse our narrative. We will now, therefore, proceed to introduce him to our readers in an entirely new character from any in which they have yet seen him; for, in the language of the poet, his truly was

> "A mind so various that he seemed to be
> Not one, but all mankind's epitome."

Down to the close of the sixteenth century, all that was known of the principle of electricity was the discovery of a power inherent in amber,* and one or two other substances, to attract to them, when rubbed, light bodies, such as small bits of paper, straw, &c. In the year 1600, Dr Gilbert of London considerably enlarged the catalogue of these electrical or attractive substances, including the diamond and other precious stones, glass, sulphur, sealing wax, rosin, &c. For above a century afterwards, however, electricity was little attended to, although Dr Wall, Sir Isaac Newton, Guericke, and others (the latter of whom first observed the repulsive power and explosive quality of electricity), added some important facts. In 1728, it was discovered that electricity may be communicated from one body to another, even without these bodies being in contact.

The beginning of the year 1746 is memorable in the annals of electricity for the accidental discovery of the possibility of accumulating large quantities of the electric fluid, by means of what was called the Leyden jar, or phial. M. Cuneus, of that city, happened one day, while repeating some experiments which had been originally suggested by M. Von Kleist, Dean of the Cathedral in Camin, to hold in one hand a glass vessel, nearly full of water, into which he had been sending a charge from an electrical machine, by means of a wire dipped into it, and communicating with the prime conductor, or insulated non-electric, exposed in the manner we have already mentioned to the action of the excited cylinder. He was greatly surprised, upon applying his other hand to disengage the wire from the conductor, when he thought that the water had acquired as much electricity as the machine could give it, by receiving a sudden shock in his arms and breast, much more severe than any thing of the kind he had previously encountered in the course of his experiments. The same thing, it was found, took place when the glass was covered, both within and without, with any other conductors than the water and the human hand, which had been used in this instance; as, for example, when it was coated on both sides with tinfoil, in such a manner, however, that the two coatings were completely separated from each other, by a space around the lip of the vessel being left uncovered. Whenever a communication was formed by the interposition of a conducting medium between the inside and outside coating, an instant and loud explosion took place, accompanied with a flash of light, and the sensation of a sharp blow, if the conductor employed was any part of the human body. The first announcement of the wonders of the Leyden phial excited the curiosity of all Europe. The accounts given of the electric shock by those who first experienced it are perfectly ludicrous, and well illustrate how strangely the imagination is acted upon by surprise and terror, when novel or unexpected results suddenly come upon it.

The extraordinary phenomena of the Leyden jar, soon, of course, attracted the attention of Franklin, and his inquisitive mind set itself to find out the reason of such strange effects, which astonished and perplexed the ablest philosophers of Europe. Out of his speculations arose the ingenious and beautiful theory of the action of the electric influence which is known by his name, and which has ever been received as the best, because the simplest and most complete, demonstration of the phenomena that has yet been propounded. His earliest inquiries were directed to ascertain the *source* of the electricity, which friction made manifest in the glass cylinder. This he demonstrated, by experiments, to be in the pores of the glass, and not in the coating, as previously supposed. After the cylinder, or phial (as it is frequently termed), was charged, he removed the coating, and found, that, by applying a new coating, the shock might still be received. He showed clearly, that, when charged, the cylinder contained no more electricity than before, but that as much was taken from one side as was thrown on the other, and that by making a communication between the inside and outside coating, by which, as has already been seen, a loud explosion was caused, the equilibrium was at once restored. In order to determine whether the virtue was created by the friction in the electric, or only communicated to it by other bodies, he resorted to the very simple experiment of endeavouring to electrify himself—that is to say, having insulated himself, and excited the cylinder by rubbing it with his hand, he then drew off its electricity from it in the usual manner into his own body. But he found that he was not thereby electrified at all, as he would have been by doing the same thing, had the friction been applied by another person. No spark could be elicited from him, after the operation by the presentment of a conductor. It was plain, therefore, that the electricity had passed in the first place out of his own body into the cylinder; which, therefore, in communicating it to him in the second instance, only gave back what it had received, and, instead of electrifying him, only restored him to his natural state. To prove this still farther, he insulated two individuals, one of whom he made to rub the cylinder, while the other drew the electricity from it. In this case, they were both affected; the one having given out as much electricity to the cylinder in rubbing it, as the other had drawn from it. In proof of this, he made them touch one another, when both were instantly restored to their usual state. The spark produced by their contact was also greater than that which took place when either of them were touched by an unelectrified person. From these results, then, Franklin constructed his theory, that every body in nature has a natural quantity of electricity, which may be diminished or increased in the way we have just described. In the former case he regarded the body as *negatively*, in the latter as *positively*, electrified. In the one case it had less, in the other more, than its natural quantity of electricity; in either, therefore, supposing it to be composed of electricity and common matter, the usual equilibrium or balance between its two constituent ingredients was for the time upset or destroyed.

But to return to the Leyden phial: Franklin was not contented with merely ascertaining the principle of it. He made also a very happy application of this principle, which afforded a still more wonderful manifestation than had yet been obtained of the powers of accumulated electricity. Considering the waste that took place, in the common experiment, of the fluid expelled, during the process of charging, from the exterior coating, he conceived the idea of employing it to charge the inner surface of a second jar, which he effected, of course, by the simple expedient of drawing it off by means of a metal rod communicating with that surface. The electricity expelled from the outside of this second jar was conveyed, in like manner, into the inside of a third; and, in this way, a great number of jars were charged with the same facility as a single one. Then, having connected all the inside coatings with one conductor, and all the outside coatings with another, he had merely to bring these two general conductors into contact or communication, in order to discharge the whole accumulation at once. This contrivance he called an *Electrical Battery*. The general sketch we have thus given will put the reader in possession, at least, of the great outlines of the Franklinian theory of electricity, undoubtedly one of the most beautiful generalizations to be found in the whole compass of science.

We now advert to another brilliant discovery by this illustrious philosopher, namely, the similarity between lightning and electricity. The Abbé Nollet had, before him, hinted his suspicions of this resemblance, but only in the most loose and distant way.

In a paper, dated Nov. 7, 1749, Franklin enumerates all the known points of resemblance between lightning and electricity. In the first place, he remarks, it is no wonder that the effects of the one should be so much greater than those of the other; for if two gun-barrels electrified will strike at two inches distance, and make a loud report, at how great a distance will ten thousand acres of electrified cloud strike, and give its fire; and how loud must be that crack! He had known for some time the extraordinary power of pointed bodies, both in drawing and in throwing off the electric fire. The true explanation of this fact did not occur to him; but it is a direct consequence of the fundamental principle of his own theory, according to which the repulsive tendency of the particles of electricity towards each other, occasioning the fluid to retire, in every case, from the interior to the surface of bodies, drives it with especial force towards points and other prominences, and thus favours its escape through such outlets; while, on the other hand, the more concentrated attraction which the matter of a pointed body, as compared with that of a blunt one, exerts upon the electricity to which it is presented, brings it down into its new channel in a denser stream. In possession, however, of the fact, we find him concluding the paper we have mentioned as follows:—"The electric fluid is attracted by points. We do not know whether this property be in lightning; but since they agree in all the particulars in which we can already compare them, it is not improbable that they agree likewise in this. Let the experiment be made."

Full of this idea, it was yet some time before he found what he conceived a favourable opportunity of trying its truth in the way he meditated. A spire was about to be erected in Philadelphia, which he thought would afford him facilities for the experiment; but his attention having been one day drawn by a kite which a boy was flying, it suddenly occurred to him that here was a method of reaching the clouds preferable to any other. Accordingly, he immediately took a large silk hankerchief, and, stretching it over two cross sticks, formed in this manner his simple apparatus for drawing down the lightning from its cloud. Soon after, seeing a thunder storm approaching, he took a walk into a field in the neighbourhood of the city, in which there was a shed, communicating his intentions, however, to no one but his son, whom he took with him to assist him in raising the kite: this was in June 1752.

The kite being raised, he fastened a key to the lower extremity of the hempen string, and then insulating it by attaching it to a post by means of silk, he placed himself under the shed, and waited the result. For some time no signs of electricity appeared. A cloud, apparently charged with lightning, had even passed over them without producing any effect. At length, however, just as Franklin was beginning to despair, he observed some loose threads of the hempen string rise and stand erect, exactly as if they had been repelled from each other by being charged with electricity. He immediately presented his knuckle to the key, and, to his inexpressible delight, drew from it

* The term electricity is derived from the Greek word *electron*, amber.

the well-known electrical spark. He said afterwards that his emotion was so great at this completion of a discovery which was to make his name immortal, that he heaved a deep sigh, and felt that he could that moment have willingly died. As the rain increased, the cord became a better conductor, and the key gave out its electricity copiously. Had the hemp been thoroughly wet, the bold experimenter might, as he was contented to do, have paid for his discovery with his life. He afterwards brought down the lightning into his house, by means of an insulated iron rod, and performed with it, at his leisure, all the experiments that could be performed with electricity. But he did not stop here. His active and practical mind was not satisfied even with the splendid discovery, until he had turned it to a useful end. It suggested to him, as is well known, the idea of a method of preserving buildings from lightning, which is extremely simple and cheap, as well as effectual, consisting, as it does, in nothing more than attaching to the building a pointed metallic rod, rising higher than any part of it, and communicating at the lower end with the ground. This rod the lightning is sure to seize upon, in preference to any part of the building; by which means it is conducted to the earth, and prevented from doing any injury. There was always a strong tendency in Franklin's philosophy to these practical applications.

Franklin's discoveries did not at first attract much attention in England; and, in fact, he had the mortification to hear that his paper on the similarity between lightning and electricity had been ridiculed when read in the Royal Society. Having fallen, however, into the hands of the naturalist Buffon, that celebrated man translated and published it at Paris, when it speedily excited the astonishment of all Europe. What gave his book the more sudden and general celebrity was the success of one of its proposed experiments for drawing lightning from the clouds, made at Marly. This engaged the public attention every where. The "Philadelphia experiments," as they were called, were performed before the king and court, and all the curious of Paris flocked to see them. Dr Wright, an English physician, being at Paris at the time, wrote to a member of the Royal Society of London, with an account of these wonders, and stating the surprise of all the learned men abroad of Franklin's writings being so little noticed in England. The society were thus in a manner compelled to pay more attention to what they had previously considered as chimerical speculation, "and soon," says Franklin, "made me more than amends for the slight with which they had before treated me. Without my having made any application for that honour, they chose me a member, and voted that I should be excused the customary payments, which would have amounted to twenty-five guineas, and ever since have given me their Transactions gratis. They also presented me with the gold medal of Sir Godfrey Copley for the year 1753, the delivery of which was accompanied with a very handsome speech of the president, Lord Macclesfield, wherein I was highly honoured."

Although the numerous important public duties which Franklin was called upon latterly to discharge, chiefly engrossed his time, he still returned to his philosophical studies on every occasion that offered, and made several curious and interesting discoveries. Amongst others, was that of producing so intense a degree of cold, by the evaporation of ether in the exhausted receiver of an air-pump, as to convert water into ice. This discovery he applied to the solution of a number of phenomena, particularly a singular fact, which philosophers had previously laboured in vain to account for, namely, that the temperature of the human body, when in health, never exceeds 96° of Fahrenheit's thermometer, though the atmosphere which surrounds it may be heated to a much greater degree. This he attributed to the increased perspiration, and consequent evaporation, produced by the heat.

The tone produced by rubbing the brim of a drinking glass with a wet finger, had been generally known. This subsequently gave rise to the art of playing tunes on a variety of glasses of different sizes, now called "musical glasses." The sweetness of the tones induced Dr Franklin to make a variety of experiments; and he at length formed that elegant instrument which he called the Armonica.

Perhaps no philosopher ever stood on a prouder eminence in the world's eye than Franklin during the latter half of his life. The obscurity of his origin served but to make his elevation the more brightly conspicuous, and honours were showered on him from all quarters of the civilised world. In 1766 he visited Holland and Germany, and was received with the greatest testimonies of respect from all men of science and distinction. At Paris, Louis the Fifteenth honoured him with the most distinguished marks of his favour. Some years afterwards he visited Scotland with his son, when the University of St Andrew's conferred upon him the degree of Doctor of Laws. Its example was followed by Edinburgh and Oxford; and he was also elected a member of almost every learned society throughout Europe.

POLITICAL CAREER.

This part of Franklin's life need only be very generally touched on, the scenes and transactions in which he bore a part having long since become matter of history, with which almost every individual is now more or less acquainted. We have before mentioned that he was elected a member of the General Assembly of Pennsylvania as burgess for the city of Philadelphia in 1747. Warm disputes at this time subsisted between the assembly and the proprietaries,* each contending for what they conceived to be their just rights. Franklin, a friend to the interests of *the many* from his infancy, speedily distinguished himself as a steady opponent of the claims of the proprietaries, and he was soon looked up to as the head of the opposition. His influence with the Assembly is said to have been very great. This arose not from any superior powers of elocution; he spoke but seldom, and he never was known to make any thing like an elaborate harangue. "His speeches," says his intimate friend, the late Dr Stuber of Philadelphia, "frequently consisted of but a single sentence, or of a well-told story, the moral of which was always obviously to the point. He never attempted the flowery fields of oratory. His manner was plain and mild; his style of speaking was, like that of his writings, simple, unadorned, and remarkably concise. With this plain manner, and his penetrating and solid judgment, he was able to confound the most eloquent and subtle of his adversaries, to confirm the opinions of his friends, and to make converts of the unprejudiced who had opposed him. With a single observation, he has rendered of no avail an elegant and lengthy discourse, and determined the fate of a question of importance."

Franklin had conducted himself so well in the office of postmaster for the state of Pennsylvania, and had shown himself so well acquainted with the business of that department, that it was thought expedient to raise him to a more dignified station. In 1753, he was appointed deputy-postmaster-general for the British colonies. It is said that the revenue from this source, in Franklin's hands, yielded to Great Britain three times as much as that of Ireland. In 1754, Franklin drew up the celebrated "Albany Plan of Union," the purpose of which was the establishment of a general government in the colonies, to be administered by a president-general, appointed by the crown, and by a grand council, consisting of members chosen by the representatives of the different colonies; the whole executive authority to be committed to the president-general; the legislative to the grand council and president jointly; and all laws to be approved of by the king. This plan was unanimously approved of by the commissioners for the crown and the colonies appointed to consult on the question, but its final fate was singular. It was rejected by the Ministry of Great Britain as too democratical, and by every local assembly as too despotic. These verdicts were, perhaps, the best proof of its excellence, and of its having steered exactly in the middle betwixt the interests of both.

The British government having thus rejected a proposal of internal defence in the colonies, they were soon obliged to adopt measures of another sort for their protection. Aggressive operations were again threatened by the French; and in 1754, General Braddock was dispatched from England with two regiments of regular English troops to resist them. The troops were landed at Alexandria, and marched thence to Fredericktown in Maryland, where they halted for carriages to transport their baggage, ammunition, &c., to the frontiers. Great reluctance was manifested by the country people to supply these, and, in fact, so few were sent in, and so many other difficulties occurred, that the general was about to abandon the expedition altogether. In this dilemma he was fortunately joined by Franklin, who, aware of the necessity and importance of the expedition, asked General Braddock what recompense he would afford to the owners for the use of their waggons and horses. General Braddock referred the terms to himself; they were drawn up, and accepted; and Franklin immediately published them in an advertisement, with an animated appeal from himself to the loyalty and patriotism of his countrymen. The consequence was, that, in two weeks, 150 waggons and 260 horses poured into the camp, the owners of whom, however, declined the security of the British commander for compensation, and insisted on having the personal bond of Franklin. This he accordingly gave them, and even advanced several hundred pounds of his own in present payment.

The expedition accordingly set forward, and its disastrous issue must still be well remembered. Although a brave man, Braddock had far too much confidence in the prowess of his regular troops, and too much contempt for the Americans and Indians. About one hundred of the latter joined him on his march, who would have proved of the utmost use to him as guides and scouts, but he treated them so slightingly that they all left him. No appearance of the enemy was seen until the troops had penetrated far into the interior; and the first intelligence which they had of the approach of a foe, was in finding that they had fallen into an ambuscade, where they were mowed down in hundreds by invisible antagonists secreted amongst the trees and bushes. A general rout and confusion almost immediately ensued. The drivers cut their horses' traces and fled, abandoning the waggons, which also obstructed the retreat of the soldiers. The general was with difficulty brought off severely wounded; and, out of eighty-six officers, sixty-three were killed or wounded, with seven hundred and fourteen privates killed, out of eleven hundred who fell into the snare. All the artillery and stores, of course, were left to the enemy.

As soon as the news of the defeat, and the loss of the waggons and horses became generally known, the owners came in a body upon Franklin for the amount of their claims for which he had given bond, amounting to nearly L.20,000! It was with difficulty that many of these claimants were prevented from suing him, until government had time to examine into their charges and order payment; but the matter was at length satisfactorily settled.

In the above affair, Franklin gave a striking proof of his prudent and sagacious character. Before receiving news of the defeat, two gentlemen came to Franklin with a subscription paper, for raising money to pay the expense of a grand firework, which it was intended to exhibit on receiving the news of taking Fort Duquesne. Franklin told them gravely that he thought it would be time enough to prepare for rejoicing when they knew they should have occasion to rejoice. They seemed surprised that he did not immediately comply with their proposal. "Why," said one of them, "you surely do not suppose that the fort will not be taken?" "I don't know," replied Franklin, "that it will not be taken; but I know that the events of war are subject to great uncertainty." The plan was fortunately abandoned.

The assembly now laid a tax, to raise money for the defence of the province, and Franklin was appointed one of the commissioners to dispose of it. He had also carried a bill through the house for establishing and disciplining a voluntary militia. To promote the association necessary to form the militia, he wrote a dialogue upon the subject, which was extensively circulated, and thought to have great effect. While the several companies in the city and country were forming, and learning their exercise, the governor prevailed upon Franklin to take charge of the north-western frontier, which was infested by the enemy, and provide for the defence of the inhabitants, by raising troops, and building a line of forts. Franklin did not think himself very well qualified for the military, but was willing to be of all the service in his power. He received a commission from the governor, with full authority, and a parcel of blank commissions for officers, to be given to whom he thought fit. Five hundred and sixty men were soon raised and placed under his command.

The first place selected for the erection of a fort was Gnadenhutten, a small settlement of Moravians, and thither Franklin set out in the middle of winter, amid torrents of rain, and through almost impassable roads. Upon arriving at the village, he lost not a moment in planning and marking out the fort, with a circumference of 455 feet; and the men were instantly set to work with their axes to cut down trees for palisades. Seeing the trees fall so fast, Franklin had the curiosity to look at his watch when two men began to cut at a pine. In six minutes they had it upon the ground, and it was fourteen inches in diameter. Each pine made three palisades of eighteen feet long, pointed at one end. While these were preparing, other men dug a trench all round, of three feet deep, in which the palisades were to be planted. When these were set up, the carpenters built within them a platform of boards all round, about six feet high, for the men to stand on and fire through the loopholes. They had one swivel gun, which they mounted, and fired as soon as it was fixed, that the Indians might know they had such pieces. Thus their fort, such as it was, was finished in a week, though it rained so hard every other day that the men were almost unable to work.

"This gave me occasion to observe," says Franklin, "that when men are employed they are best contented. For on the days they worked, they were good-natured and cheerful, and, with the consciousness of having done a good day's work, they spent the evening jollily. But, on our idle days, they were mutinous and quarrelsome, finding fault with the pork and the bread, and were continually in bad humour; which put me in mind of a sea captain, whose rule it was to keep his men constantly at work; and when his mate once told him that they had done every thing, and there was nothing further to employ them about, '*O*,' said he, '*make them scour the anchor.*'

"This kind of fort," he continues, "however contemptible, is a sufficient defence against Indians who have no cannon. Finding ourselves now posted securely, and having a place to retreat to on occasion, we ventured out in parties to scour the adjacent country. We met with no Indians, but we found the places, on the neighbouring hills, where they had lain to watch our proceedings. There was an art in their contrivance of those places that seems worth mentioning.

"It being winter, a fire was necessary for them; but a common fire, on the surface of the ground, would, by its light, have discovered their position at a distance; they had, therefore, dug holes in the ground about three feet in diameter, and somewhat deeper; we found where they had, with their hatchets, cut off the charcoal from the side of burnt logs lying in the woods. With these coals they had made small fires in the bottom of the holes, and we observed, among the weeds and grass, the prints of their bodies, made by their lying all round, with their legs hanging down in the holes, to keep their feet warm; which, with them, is an essential point. This kind of fire, so managed, could not discover them either by its

* The descendants of the original settlers who had received grants of land from the British government, who claimed exemption from all taxes and other privileges.

light, flame, sparks, or even smoke; it appeared that the number was not great, and it seems they saw we were too many to be attacked by them with prospect of advantage.

"We had for our chaplain a zealous Presbyterian minister, Mr Beatty, who complained to me that the men did not generally attend his prayers and exhortations. When they enlisted they were promised, besides pay and provisions, a gill of rum a-day, which was punctually served out to them, half in the morning and half in the evening, and I observed they were punctual in attending to receive it." Franklin advised that the rum should be distributed just only after prayers, and never were prayers more generally or more punctually attended.

Franklin's military career was, however, a short one; for he had scarcely completed his defensive preparations, when he received a summons to attend the assembly, where his advice and assistance were found indispensable.

The disputes between the proprietaries and the people, before referred to, continued to increase in 1755 and 1756, although a war was then raging on the frontiers—the French having still possession of Canada. The popular assemblies insisted on the justice of taxing the proprietary estates; but the governors constantly refused to assent to such a measure. The assemblies at last resolved to appeal to the mother country; and a petition was accordingly made out, addressed to the king in council. Franklin was appointed to present this address, as agent for the province of Pennsylvania, and departed for England in June 1757. During this time, the governor passed a law imposing a tax, in which no discrimination was made in favour of the estates of the Penn family, which were immensely large. The Penns thereupon used their most strenuous exertions to prevent its passing into a law. After long debate and deliberation, a proposal was made that Franklin should *personally* engage that the proprietary estates should pay no more than a just proportion of the tax. This he agreed to do—the proprietaries withdrew their opposition, and tranquillity was once more restored to the province. The manner in which this dispute was terminated sufficiently evinces the high confidence entertained of Franklin's honour and integrity, even by those opposed to his political views. After this, Franklin remained some time at the British court, having, besides Pennsylvania, been also appointed agent for the states of Massachusetts, Maryland, and Georgia.

The French in Canada still continuing to molest and interrupt the trade of the other colonies, Franklin published his famous Canada pamphlet, in which he in a forcible manner pointed out the advantages which would result from the conquest of that province. An expedition was accordingly sent out under General Wolfe, the result of which is well known. At the treaty in 1762, France ceded Canada to Great Britain, and by her cession of Louisiana at the same time, relinquished all her possessions on the continent of America.

In the summer of 1762, Franklin returned to America, and received the thanks of the Assembly of Pennsylvania, as well for the faithful discharge of his duty to that province in particular, as for the many and important services done to America in general, during his residence in Great Britain. A compensation of L.5000, Pennsylvania currency, was likewise decreed him for the services he had performed in England. He was also immediately re-elected to his seat in the Assembly.

Upon the breaking out of the fatal disturbances in consequence of Mr Grenville's stamp act, Franklin had again returned to England, as agent for Pennsylvania and other states. During his residence in England, he consulted, with unremitting industry, the best interests of his native country. He was every where received with respect, on account of his reputation as a writer and philosopher. In 1766, he made a visit to Holland and Germany, and received the greatest marks of attention from men of science. In the following year he travelled into France, where he was received with much kindness and favour. He became acquainted with a number of literary men, and was introduced to the king, Louis the Fifteenth. Difficulties had now commenced between Great Britain and her provinces in America. Franklin was unwearied in his efforts to bring about a reconciliation. He had frequent interviews with Lord Howe and Lord Chatham, and other distinguished English statesmen, who entertained for him the highest respect and esteem. Most of the time during his present residence in England was occupied in these vain efforts. It is well known that the first violent demonstrations against the imposition of the stamp act, broke out in Franklin's native place, Boston, the capital of the state of Massachusetts. The governor, Hutchinson, and other functionaries, wrote to the home government, recommending the adoption of the most rigorous coercive measures, and inveighing in unmeasured terms against the leading characters of the state. By some unaccountable means, these letters fell into Franklin's hands ere they reached their destination. He instantly transmitted them back to the Assembly at Massachusetts, who, enraged at the conduct of the governor, sent a petition to the king, praying for his dismissal, and Franklin was appointed to present it. As might have been expected, the petition was dismissed as "frivolous and vexatious;" and Franklin incurred so much obloquy for his interception of the governor's dispatches (the mode of which was never discovered), that he was dismissed from his office of deputy-postmaster-general. He still continued in England, however, and left nothing untried to effect a reconciliation between the mother-country and the colonies; but finding all his endeavours unavailing, he returned to America in 1775. The day after his arrival, he was elected by the legislature of Pennsylvania as a delegate to Congress. Hostilities had then commenced; but it would be repeating a thrice-told tale to enter into any account of the protracted and bloody struggle that ensued, or the nature of its termination. In 1778, Franklin was sent as ambassador to the court of France, where he soon brought about an alliance between that nation and the North American states. When the British ministry at length saw the necessity of recognising the independence of the states, the definitive treaty to that effect was signed at Paris on the 3d of September 1783, by Dr Franklin, Mr Adams, and Mr Jay, for the states, on the one hand; and by Mr David Hartley, for Great Britain, on the other. Franklin continued at Paris for the two following years; but at last, by his own urgent request, was recalled. Shortly after his return, he was elected president of the supreme executive council, and lent all his still perfect energies to consolidating the infant government. Age and infirmities, however, claimed their usual ascendancy; and in 1788 he retired wholly from public life.

DEATH.

Franklin's last public act—and it was one in beautiful accordance with the whole tenor of his life—was putting his signature, as president of the Anti-Slavery Society, to a memorial presented to the House of Representatives, praying them to exert the full powers entrusted to them to discourage the revolting traffic in the human species. This was on the 12th of February 1789. From this day forward, he was confined almost constantly to bed with the stone, from which he suffered the most excruciating agony. Yet when his paroxysms of pain drew forth, as they did occasionally, an irrepressible groan, he would observe, he was afraid he did not bear his sufferings as he might—acknowledged his grateful sense of the many blessings he had received from the Supreme Being, who had raised him from small and low beginnings to such high rank and consideration among men, and made no doubt but his present afflictions were kindly intended to wean him from a world in which he was no longer fit to act the part assigned him. He latterly sunk into a calm lethargic state; and, on the 17th April 1790, about eleven o'clock at night, he quietly expired. He was then aged exactly eighty-four years and three months. The following epitaph, written by himself many years previous to his death, was inscribed on his tombstone:—

"The Body of BENJAMIN FRANKLIN, Printer (like the cover of an old book, its contents torn out, and stript of its lettering and gilding), lies here food for worms; yet the work itself shall not be lost, for it will (as he believed) appear once more in a new and more beautiful edition, corrected and amended by THE AUTHOR."

CHARACTER.

In looking back on Franklin's career, it is evident that the principal feature in his character was *worldly prudence*—not in the usual and selfish acceptation of the term, but that prudence, founded on true wisdom, which dictates the practice of honesty, industry, frugality, temperance—in short, all those qualities which may be classified under the name of "moral virtues," as being the only certain means of obtaining distinction, respect, independence, and mental cheerfulness. There is no other writer who inculcates lessons of practical wisdom in a more agreeable and popular manner, and we much regret that the limits of this work prevent our giving many extracts illustrative of this quality. His whole conduct and writings, indeed, present the somewhat singular union of great genius with practical good sense, and of singular worldly shrewdness, with the loftiest integrity of principle. The greatest worldly honours—and few have attained higher—could not for a moment make him forget or deviate from the principles with which he started in life. Ever keeping before his mind his own origin and rise, he justly considered every man to be originally on a par in as far as regarded real intrinsic worth; and, equally by precept and example, contributed more, perhaps, than any individual who ever existed, to breaking down those invidious bars to eminence and success in life which the conventional habits and artificial feelings of society had theretofore interposed to the elevation of those unblessed by birth and fortune.

As the present biography must be considered as more immediately instructive to the industrious and productive portion of mankind, we shall conclude it by giving the following "Advice to a Young Tradesman," written by Franklin at the time when his industrious and frugal habits were just beginning to be rewarded with independence and worldly respect.

"Remember that *time* is money. He that can earn ten shillings a-day by his labour, and goes abroad, or sits idle one-half of that day, though he spends but sixpence during his diversion or idleness, ought not to reckon *that* the only expense; he has really spent, or rather thrown away, five shillings besides.

Remember that *credit* is money. If a man lets his money lie in my hands after it is due, he gives me the interest, or so much as I can make of it during that time. This amounts to a considerable sum where a man has good and large credit, and makes good use of it.

Remember that money is of a prolific, generating nature. Money can beget money, and its offspring can beget more, and so on. Five shillings turned is six; turned again is seven and threepence; and so on till it becomes a hundred pounds. The more there is of it, the more it produces every turning, so that the profits rise quicker and quicker. He that kills a breeding sow, destroys all her offspring to the thousandth generation. He that murders a crown, destroys all that it might have produced, even scores of pounds.

Remember that six pounds a-year is but a groat a-day. For this little sum (which may be daily wasted either in time or expense, unperceived) a man of credit may, on his own security, have the constant possession and use of a hundred pounds. So much in stock, briskly turned by an industrious man, produces great advantage.

Remember this saying, 'The good paymaster is lord of another man's purse.' He that is known to pay punctually, and exactly to the time he promises, may at any time, and on any occasion, raise all the money his friends can spare. This is sometimes of great use. After industry and frugality, nothing contributes more to the raising of a young man in the world, than punctuality and justice in all his dealings; therefore never keep borrowed money an hour beyond the time you promised, lest a disappointment shut up your friend's purse for ever.

The most trifling actions that affect a man's credit are to be regarded. The sound of your hammer at five in the morning, or nine at night, heard by a creditor, makes him easy six months longer; but if he sees you at a billiard-table, or hears your voice at a tavern, when you should be at work, he sends for his money the next day; demands it before he can receive it in a lump.

It shows, besides, that you are mindful of what you owe; it makes you appear a careful as well as an honest man, and that still increases your credit.

Beware of thinking all your own that you possess, and of living accordingly. It is a mistake that many people who have credit fall into. To prevent this, keep an exact account, for some time, both of your expenses and your income. If you take the pains at first to mention particulars, it will have this good effect—you will discover how wonderfully small trifling expenses mount up to large sums, and will discern what might have been, and may for the future be saved, without occasioning any great inconvenience.

In short, the way to wealth, if you desire it, is as plain as the way to market. It depends chiefly on two words—*industry* and *frugality*; that is, waste neither *time* nor *money*, but make the best use of both. Without industry and frugality nothing will do, and with them every thing. He that gets all he can honestly, and saves all he gets (necessary expenses excepted), will certainly become *rich*—if that Being who governs the world, to whom all should look for a blessing on their honest endeavours, doth not, in his wise providence, otherwise determine."

About forty years later, after a long life of experience, he penned the following similar admonitions, entitled, "Necessary Hints to those that would be Rich;"—

"The use of money is all the advantage there is in having money.—For six pounds a-year you may have the use of one hundred pounds, provided you are a man of known prudence and honesty.—He that spends a groat a-day idly, spends idly about six pounds a-year, which is the price for the use of one hundred pounds.—He that wastes idly a groat's worth of his time per day, one day with another, wastes the privilege of using one hundred pounds each year.—He that idly loses five shillings' worth of time, loses five shillings, and might as prudently throw five shillings into the sea.—He that loses five shillings, not only loses that sum, but all the advantages that might be made by turning it in dealing; which, by the time that a young man becomes old, will amount to a considerable sum of money.—Again: he that sells upon credit, asks a price for what he sells equivalent to the principal and interest of his money for the time he is to be kept out of it; therefore, he that buys upon credit, pays interest for what he buys; and he that pays ready money, might let that money out to use; so that he that possesses any thing he has bought, pays interest for the use of it.—Yet, in buying goods, it is best to pay ready money, because, he that sells upon credit, expects to lose five per cent. by bad debts; therefore, he charges, on all he sells upon credit, an advance that will make up that deficiency.—Those who pay for what they buy upon credit, pay their share of this advance.—He that pays ready money, escapes, or may escape, that charge.

A penny saved is twopence clear;
A pin a-day's a groat a-year."

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HISTORY OF THE ISLAND OF GREAT BRITAIN,

From the Rebellion of 1745, till the end of the reign of George IV.

REBELLION OF 1745 CONCLUDED.

DERBY was the utmost point of that daring inroad into England which was described at the end of the preceding sheet. The dangers which surrounded the Highland army on all hands except in the rear, now determined the chiefs of the enterprise, all except Prince Charles himself, to return to Scotland. The retreat was accordingly commenced, December 6, and conducted with such skill and expedition, that the army of the Duke of Cumberland never came up with the insurgents. A garrison, which had been left in Carlisle, surrendered to the duke, who, being recalled on the rumour of a French invasion on the southern coast of England, left General Hawley to prosecute the war in Scotland.

Prince Charles conducted his forces by Glasgow to Stirling, where he was joined by large reinforcements from Perth, while the English general concentrated his troops in Edinburgh. The two armies, nearly equal in number, came to an action, January 17, 1746, at Falkirk, which ended in the disgraceful retreat of the royal army. The prince, however, being unable to make any use of his victory, soon after found it necessary to withdraw his forces to the neighbourhood of Inverness, where he spent the remainder of the winter. The Duke of Cumberland now returned to put himself at the head of the royal troops, which had been augmented by 6000 auxiliaries under the Prince of Hesse. During the months of February and March, the Highland army was cooped up within its own territory, by the Hessians at Perth, and the royal troops at Aberdeen. At length, April 16, Prince Charles met the English army in an open moor at Culloden, near Inverness, and experienced a total overthrow. He had himself the greatest difficulty in escaping from the country, and the Highlands were subjected for several months to the horrors of military violence in all its worst forms. To complete the subjugation of this primitive people, the hereditary jurisdictions under which they and the rest of the people of Scotland still lived, and by which the nobles and gentry were enabled to administer justice at their own discretion, were abolished by act of Parliament. Another act put an end to the tenure of wardholdings, by which the land-proprietors were enabled to command the personal services, in peace and war, of those who lived on their estates. A third act prohibited the use of tartan and the ancient Highland fashion of clothes, which were supposed to have the effect of keeping alive the warlike spirit of the mountaineers. The two former of these measures produced a marked improvement in the social state of the Scottish people, and, with the suppression of the Stuart cause, enabled the people to direct their energies towards commerce and manufactures. This is indeed the era of that rapid advancement in wealth and domestic comfort, for which Scotland has latterly been as much distinguished, as she was formerly for poverty and sloth.

PEACE OF AIX-LA-CHAPELLE.

During the remainder of the war in which Britain and other powers were now engaged with France, the latter was generally successful by land, and unfortunate at sea. It is indeed a curious fact, that, from the time of Marlborough to that of Wellington, Great Britain hardly ever succeeded in any military, or failed in any naval enterprise. In 1748, the two countries found, after nine years of contention, that their losses were equal, though in different departments of their strength. Thirty millions had been added to the national debt of Britain, and France had expended an equal sum. They therefore agreed, by a treaty formed at Aix-la-Chapelle, mutually to restore their respective conquests, and to go back to exactly the same condition in which they had stood before the war. A more signal illustration could have scarcely been held forth, of a truth which ought at every opportunity to be impressed upon nations—that war is to the parties in general only a means of waste and loss, and can do no good to any man, except at the expense of his neighbour.

ADMINISTRATION OF MR PELHAM.

For several years after this period, the national resources were greatly improved under the peaceful administration of Mr Pelham, whose commercial and financial schemes were generally very successful. The prosperity of Britain, unfortunately, roused the jealousy of the French, who, seeing the great advantages which their neighbours derived from colonies and naval force, were extremely anxious to take the same means of bettering their own circumstances. Nations were then, and in some measure still are, in the same state as individuals before their moral faculties are cultivated. A child or a savage can see no better way of bettering himself than by violating the rights or diminishing the property of his neighbours; while an enlightened person knows, that, without a respect for the interests of his fellow, he will not reap nearly the full advantages of his own labour. The French on this occasion acted like the former: instead of honestly and peaceably endeavouring to extend their own external resources, they began by trying to diminish those of the British—a mode of procedure which could only produce general loss, and retard the period of their own prosperity, as a man by robbing or cheating only injures others in order to mar his own good.

While many parts of the world still remained open for the occupation of an European people, the French, from their settlements in the East Indies and in Canada, commenced an aggressive system upon the neighbouring possessions of the British; in particular, they drew a line of forts along the back settlements of the whole range of the British American colonies, from the Gulf of St Lawrence to the Mississippi, so as to prevent the settlers from advancing beyond the Appalachian mountains. For two or three years, the British government suffered these aggressions, and even insults of a more decided character, to pass unresented; but at length it was found necessary in 1756 to proclaim war. A campaign of a novel and difficult character was opened in North America, for the purpose of driving the French from their forts. All the first movements were attended with defeat and disaster. The French had gained the exclusive affection of the native Indians, who proved a dangerous and barbarous enemy to the British. Several of the forts were attacked, but without success: in one instance—that of Ticonderago—two thousand men were killed. At length, a more auspicious era commenced under the administration of Mr Pitt, afterwards Earl of Chatham. The British troops and provincials became more experienced in the nature of the service. One after another, the principal forts fell into their hands; and a diversion was created by an attack upon Canada. In September 1759, General Wolfe reduced the town and fort of Quebec, though at the expense of his own life; and the whole colony soon after submitted to the British arms. In fact, the French were punished for their improper attempts to extend their colonies, by losing those which they formerly had.

While Britain was thus successful in one quarter of the world, she experienced a different fortune on the continent. Austria, Russia, and Poland, had combined with France against the new and rising power of Prussia, which was at present directed by Frederick II., commonly called Frederick the Great. Britain on this occasion became the ally of the Prussian monarch, not from any regard to her own interests, but in order that the king might be able to protect his Hanoverian dominions. Immense sums of money were raised from the British people, for the purpose of paying the troops of those very countries which the king was anxious to defend: the Duke of Cumberland was appointed their commander. This prince, who never was successful except at Culloden, was so unfortunate, September 1757, as to bring an army of forty thousand men into an angular piece of country, from which there was no escaping, so that the whole were obliged to lay down their arms to the French, who then became masters of Hanover. Notwithstanding this failure on the part of his ally, Frederick was able, by his extraordinary military genius, and by British subsidies, to defend his dominions for several years against all the forces that Austria, France, and Russia, could bring against him.

ACCESSION OF GEORGE III.

In the midst of this war, October 25, 1760, George II. died suddenly in the 77th year of his age, and was succeeded by his grandson George III., then only in his twenty-third year. The new king espoused, in the ensuing September, the Princess Charlotte of Mecklenburg-Strelitz, by whom he had a large family.

THE BUTE ADMINISTRATION—PEACE OF 1763.

One of the earliest measures of the new king was to introduce his preceptor, the Earl of Bute, into the cabinet as secretary of state. This, with other alterations, infused a peaceful disposition into his majesty's councils, which was not much relished by Mr Pitt. That minister, having secretly discovered that Spain was about to join France against Britain, and being thwarted in the line of policy which he consequently thought it necessary to assume, retired with a pension, and a peerage to his wife; after which the ministry was rendered still less of a warlike temper. A negociation for peace was entered into with France, which offered, for that end, to give up almost all her colonial possessions. The demands of the British were, however, rather more exorbitant than France expected, and not only was the treaty broken off, but Spain commenced those hostilities which Mr Pitt had suspected. Nevertheless, Britain continued that splendid career of conquest which, except at the beginning, had been her fortune during the whole of this war. In a very few months, Spain lost Havannah, Manilla, and all the Philippine Isles. The forces of that country were also driven out of Portugal, which they had most unjustly invaded. At sea, the British fleets reigned every where triumphant, and at no period of her annals was she in so proud a situation respecting her neighbours. The ministry, however, were sensible that war, even with all this good fortune, was a losing game; and they therefore, much against the will of the nation, concluded a peace in February 1763. By this treaty, Great Britain gave up a certain portion of her conquests in exchange for others which had been wrested from her; but she was nevertheless a gainer to an immense amount. She acquired, from the French, Canada, that part of Louisiana east of the Mississippi, Cape Breton, Senegal, the islands of Grenada, Dominica, St Vincent's, and Tobago, with all the acquisitions they had made upon the Coromandel coast in the East Indies since 1749. From Spain, she acquired Minorca, East and West Florida, with certain privileges of value. The continental states in alliance with Great Britain were also left as they had been. These advantages on the part of Great Britain had been purchased at the expense of an addition of sixty millions to the national debt (which now amounted in all to L.133,959,270); but as that country had been dragged unwillingly into the war, the losses are only to be considered in the light of a misfortune, which the evil dispositions of neighbouring powers had rendered unavoidable. But what are we to say of the case of France, which had commenced hostilities for the purpose of increasing her resources, but, as a due punishment for the improper means she had taken for that end, was left denuded at last of even those resources she had formerly possessed, with a vast addition to her public burdens besides!

CASE OF MR WILKES.

Ever since the accession of the Brunswick family in 1714, the government had been chiefly conducted by the Whig party, who formed a very powerful portion of the aristocracy of England. Walpole, Pelham, Newcastle, and Pitt, had all ruled chiefly through the strength of this great body, who, till a period subsequent to the rebellion of 1745, seem to have had the support of the greater part of the people. After that period, when the Stuart claims ceased to have any effect in keeping the government in check, a division appears to have grown up between the governing and the governed, which was manifested in various forms even before the demise of George II., but broke out in a very violent manner during the early years of his successor. George III. had imbibed Tory principles from the Earl of Bute, and, on ascending the throne, showed an evident disposition to extend the power of the crown, and to exact from the people a more implicit obedience to the measures of the state than had been demanded by any sovereign since the Revolution. The administration, indeed, of the Earl of Bute, was the commencement of that long period of Tory ascendancy, which has continued with little interruption down almost to the present day.

Partly on account of his Tory notions, partly on account of his being a native of Scotland, the Earl of Bute was the most unpopular minister that had served the crown since the days of the Cabal. The newspaper press was at this time rising in strength and influence, and a great part of its force was directed, with an almost savage degree of malignity, against this unfortunate minister. He was particularly blamed for concluding the war, though nothing can be clearer than that more was lost than gained even by such a career of conquest as the British arms had lately experienced. To this storm the Earl of Bute at length yielded, by retiring, April 8, 1763.

Among the public writers who assailed the ministry, none was more virulent than Mr John Wilkes, member for Ailesbury, and editor of a paper entitled the North Briton. Mr George Grenville, who succeeded Bute, commenced his career by prosecuting Wilkes for a libel, contained in the forty-fifth number of his paper, in which he had directly accused his majesty of falsehood. The king's messenger, being provided with a general warrant against the editor, printers, and publishers of the North Briton, entered the house of Mr Wilkes, and apprehended him. After being examined before the secretaries of state, he was committed to the Tower, and his papers were seized and sealed up. A few days after, he was brought to Westminster Hall by *habeas corpus*, and released by Chief Justice Pratt, in consideration of his being a member of parliament. The parliament ordered the seditious paper to be burnt by the hands of the common hangman—an operation that produced a riot, not in itself dangerous, but serving to discover the angry spirit of the populace. Mr Wilkes was soon after expelled from the House of Commons, and found it convenient to retire to the continent; but the effects of his case were favourable to liberty. A prosecution which he instituted against the secretary of state, on the plea that his seizure was illegal, terminated in a verdict of damages, and a declaration by Chief Justice Pratt, that general warrants were inconsistent with the laws of England.

AMERICAN STAMP-ACT.

The administration of Mr Grenville is memorable for the first attempt to tax the American colonies. In March 1765, an act for imposing stamps on those countries was passed, almost without comment, and by a great majority; no one apparently dreaming of the resistance it was to meet with. The people of America were the descendants, in many instances, of persons who had fled from their native country, in order to enjoy more liberal institutions in a world of their own forming. They might in some measure be described as a more liberalised class of Englishmen, with none of those aristocratic grades and institutions which served to control the popular spirit at home. The attempt to subject them to taxation, while they had no representation real or supposed in the House of Commons, appeared to them as the commencement of a system of tyranny, which, if not resisted at the first, would in time reduce them to absolute bondage. They therefore combined almost universally to resist the introduction of the stamped paper by which the tax was to be raised. Resolutions were passed in the various assemblies of the states, protesting against the assumed right of the British legislature to tax them. The act itself was publicly and ignominiously burnt. The stamps, on arriving, were seized by an enraged multitude, and destroyed. Those who had accepted commissions to act as distributors were forced by public oath to renounce all concern in them. In short, partly by popular violence, and partly by the declarations issued by the local legislative assemblies, the object of the act was completely defeated.

The conduct of the Americans produced great embarrassment in his majesty's councils, and it was long debated whether there would be most disadvantage in forcing the acceptance of the stamps, or in giving way to the demands of a people almost in open rebellion. It was at length agreed to repeal the act, but to accompany the favour by a declaration of the right of Great Britain to impose taxes on her colonies. The Americans appeared satisfied with the relief they had thus obtained from the immediate pressure of taxation, and did not seem to regard much the accompanying declaration, which was looked upon as only a salvo for the injured honour of the government.

Between the stamp act and its repeal, a change had taken place in the administration: the latter measure was the act of a Whig ministry under the Marquis of Rockingham, which, however, did not long survive. From the very commencement of his reign, George III. had shown that disposition which characterised him through life, to place his confidence chiefly in some favourite near his own person, and to render his responsible ministers only the instruments by which the policy so suggested was to be carried into effect. It was generally believed by the nation that the Earl of Bute still had the chief direction of affairs; and such was the odium in which ministers were sure to be held under such degrading circumstances, that even the splendid reputation of Mr Pitt, on his accepting office in 1766, was unable to bear up against it. This minister, now created Earl of Chatham, was the most popular of all that directed British affairs during the eighteenth century. His wisdom, energy, and eloquence, were only to be equalled by the liberal spirit which seemed to animate all his actions; and the only fault attributed to him in his public character was a certain imperiousness towards his ministerial associates, which sometimes lost to him a support of which he and the country stood much in need. If he now submitted to form part of a government in which an irresponsible favourite of the king had the chief sway, it can only be ascribed to the decline of his faculties under the ravages of ill health—for no circumstance could be less characteristic of Chatham in his best days.

At the suggestion of Mr Charles Townsend, who formed part of this new cabinet, it was resolved in 1767 to impose taxes on the Americans in a new shape, namely, upon British goods imported into the colonies, for which there was some show of precedent. An act for imposing duties on tea, glass, and colours, was accordingly passed with little opposition. Soon after this, Mr Townsend died, and Lord Chatham, who had been prevented by illness from taking any share in the business, resigned. The Americans met the new burdens with the same violent opposition as formerly, and finally (1770) obliged the ministers to give way on all the various articles, except tea, which the colonists therefore refused to import from the mother country. The affections of the Americans were now very generally alienated from the British government, the lofty measures of which were even at home exciting no small degree of dissatisfaction.

THE WILKES TUMULTS.

At the general election of 1768, Mr Wilkes re-appeared in Britain, though a sentence of outlawry still stood against him. He even ventured to become candidate for the county of Middlesex, where he was returned by a large majority. Having previously surrendered to the jurisdiction of the King's Bench, his outlawry was reversed; but, by virtue of the verdicts which two courts had given against him, he was subjected to a fine and two years' imprisonment. On his arrest, Mr Wilkes quietly committed himself to the officers of justice, but was forcibly rescued by the populace; and in a riot subsequent to this violence, a young man, who had no participation in the tumult, was killed. During his imprisonment, Mr Wilkes was formally expelled the house, on the pretext that by the vote of censure passed by the preceding parliament, he was for ever disqualified from being a representative of the people. This decision incensed a great portion of the community, and the man came to be identified in their estimation with the liberties of the nation itself. Four times did the county of Middlesex return Mr Wilkes; but the rival candidate, Colonel Luttrell, with only a fourth of the votes, was accepted by the house. These proceedings occasioned many keen debates in the House of Commons, where a Whig Opposition of much talent and ardour of purpose now took up every popular question. Tumults of a dangerous character were constantly taking place; the cry of "Wilkes and Liberty" resounded every where, except in Scotland, where his scurrility against the Scottish nation had rendered him detested; the magistrates and public bodies of London signalised themselves by several warm remonstrances to the king against the overbearing character of his government; and a series of letters, the most pointed in style and forcible in invective that had ever appeared in the English language—though by an author still unknown—from time to time directed the public indignation against both the men and the measures of the cabinet. Still the young monarch persevered in his course, fully two-thirds of the House of Commons being favourable to whatever measure his ministers might propose.

AMERICAN WAR OF INDEPENDENCE.

In the meantime, the merchants of Britain found the state of things in America highly opposed to their interests; and the East India Company, in order to regain the market for their tea, was enabled, by a drawback granted to them by government, to reduce the price of the article so low as to cover the duty, which was only threepence a-pound. In the confident expectation that the Americans would give way to this expedient, immense shipments of tea took place to American ports. Such a transaction only demonstrates how little able the British people were to appreciate the nature of the American dissentients. It was not for a trifling addition to the price of tea that they were threatening resistance to the mother country; it was to the principle of a right in the House of Commons, where they were not represented, to impose taxes upon them, or to interfere with their internal affairs: it was, in fact, as they always most pathetically represented, the question of their slavery or freedom. Accordingly, at New York and Philadelphia, the cargoes of tea were forbidden to land; in Charleston it was permitted to land, but put into stores, and prohibited from being sold; while at Boston, a ship-load, which had been introduced into the harbour, was seized by a lawless mob, and tossed into the sea. This last act of violence was resented by the passing of a bill for interdicting all commercial intercourse with the port of Boston, and another for taking away the legislative assembly of the state of Massachusetts. The former measure was easily obviated by local arrangements; and in reference to the latter, a congress of the various states met at Philadelphia in September 1774, when it was asserted that the exclusive power of legislation, in all cases of taxation and internal policy, resided in the provincial legislatures. The same assembly denounced other grievances, which we have not particularly adverted to, especially an act of the British legislature for trying Americans, for treasonable practices, in England—the act, perhaps, of all others in the eighteenth century, that now appears most characterised by a spirit of arbitrary and vindictive barbarity. The congress also framed a covenant of non-intercourse, by which the whole utility of the colonies to the mother country, as objects of trading speculation, was at once laid prostrate. The colonists still avowed a desire to be reconciled, on the condition of a repeal of the obnoxious statutes. But the government—partly encouraged by their own immediate subjects—had now resolved to attempt the reduction of the colonists by force of arms. Henceforth, every proposal from America was treated with a proud silence on the part of the British monarch and his advisers, as if they had considered themselves under no obligation to depart a single iota from their erroneous position, when the sacrifice of a small sum of money, and a few lives to both parties, was so sure to bring the recusants to their feet.

As it is probable that we shall have occasion in another part of the present series, to give a full account of the American revolution, we shall be very brief in this place. The war was opened in summer 1775, by skirmishes between the British troops and armed provincials, for the possession of certain magazines. At the beginning, there seemed no hope of the contest being protracted beyond one campaign; and indeed one unlucky British officer—a Colonel Grant—offered to enter the American territory with five regiments of the line, and drive the rebels, as they were called, from one end of the country to the other. The population of the colonies was at this time only three millions, and they were greatly inferior in discipline and appointment to the British troops. They possessed, however, an indomitable zeal in the cause they had agreed to defend, and fought with the advantage of being in the country of their friends. The British government was rather surprised to find at the end of one year that no progress had been made towards a reduction of the Americans, and sent out an offer of *pardon* to the colonists, on condition that they would lay down their arms; a proposal that only excited ridicule. On the 4th of July 1776, the American congress took the decisive step of a declaration of their independence, embodying their sentiments in one of the most solemn and dignified documents that ever was penned. For two campaigns, the war continued, and the slender forces of the new republic were hardly able any where to face the large and well-appointed armies of Great Britain. Much misery, as may easily be supposed, was endured by this patriotic people, in resisting the invaders of their country. Besides the civilised soldiers brought against them, they had to protect themselves from the savages of the wild, whom the British ministers had deemed it proper to bribe and debauch into their service, and whose warfare was one of extermination. Notwithstanding every disadvantage and many defeats, America remained unsubdued, to the infinite astonishment of Great Britain, her king, her ministers, and her people, the last of whom had reflected less upon the justice of their cause against America, than upon the hopes which were held forth of the cheap and speedy conquest of the country.

WAR WITH FRANCE, SPAIN, AND HOLLAND.

So much had Britain now reduced her resources, increased her expenses, and engrossed her naval and military strength in a distant and unprosperous warfare, that one after another almost all the powers of Europe became her enemies. The French, in 1778, formed an alliance with America as a separate state, and sent out large auxiliary forces to aid in the securing of her independence. The Spaniards soon after joined the French in a war against Britain, and in 1780 Holland was added to the number of her enemies. Russia then put herself at the head of what was called an Armed Neutrality, embracing Sweden and Denmark, the object of which was indirectly hostile to Britain. So tremendous was the force reared against Britain in 1779, even before all these powers had entered into hostilities, that it required about three hundred thousand armed men, three hundred armed vessels, and twenty millions of money annually, merely to protect herself from her enemies. Even her wonted superiority at sea seemed for a long time to have deserted her.

STATE OF THE GOVERNMENT.

The ministry was headed, throughout all these troubles, by Lord North; but the sovereign himself was the chief director of affairs. Had the parliament been more nearly a representation of public feeling, it seems highly questionable that such a career of national loss and injury would have ever been entered upon. But the general sense of the people found no response within the House of Commons, except from a small minority, which, though animated by the eloquence of a Fox and a Burke, spent its force in vain upon a cabinet fortified by so many servile votes. The ministers received their first alarm at the end of 1777, in the surrender of an army of ten thousand men under General Burgoyne to the American commander. But for a long time, they were so bound up in the idea that there could be no good without the subjugation of America, and that that event was certain, that every disaster and obstruction was overlooked as only a temporary inconvenience. The defence put forward by the friends of the government chiefly referred to the necessity of curbing the spirit of insubordination, both in America and at home, which was always represented as of a dangerous and vicious character. It must be acknowledged that the popular check upon the measures of state, was not then so enlightened or so well regulated an organ as it has since become, and that it did not uniformly act with that moderation and dignity, or with that absence of a factious spirit, which are necessary to gain respect for every public cause. On an attempt of the government, in 1780, to take away the penal statutes resting on the Catholics, the London populace committed several riots of a most alarming kind, in which they showed that the spirit of freedom did not animate them in one of its purest forms. At the beginning of June, exasperated by the rejection of one of their petitions by the House of Commons, they kept the capital in a state of anarchy for five days, during which many houses and property to a large amount were destroyed; nor was it till the king himself directed the military to attack the rioters, two hundred of whom were killed, that order was restored. These and other circumstances tended unquestionably to rank upon the ministerial side many respectable and wealthy persons, whose good sense would have disposed them to take an unfavourable view of the existing policy. The king, moreover, with all his faults, exhibited a haughty virtue and a conscientious firmness in adhering to certain principles, that gained for him and his measures much confidence and approbation, which he could not otherwise have obtained, and which the factious spirit sometimes observable in his opponents tended to increase.

CONCLUSION OF THE WAR—ROCKINGHAM ADMINISTRATION.

At the end of the year 1781, another large army under Lord Cornwallis surrendered to the French and American generals at Yorktown; after which, though several posts were still maintained, no British troops appeared openly in America. The ministry began to sink under the prevailing sense of the inexpediency and hopelessness of the war. The House of Commons, though chiefly the representatives of the aristocracy, or at least of a narrow portion of the people, had given way so far to the popular sentiment in 1780, as to leave the ministers in a minority on Mr Dunning's celebrated resolution against the increase of the crown influence. The Protestant riots had since then taken so much from the respectability of the Opposition, as to enable the ministers to proceed; but in the beginning of 1782, on finding the balance of their majority reduced on a certain motion to eight, they gave up the places which, for twelve years, they had held so much to the injury of the national interests. During that time, the prosperity of the country had been retarded, a hundred millions added to the national debt, three millions of the people alienated for ever, and, besides America, several colonies lost to the enemy; while not one positive triumph had been gained either by sea or land.

The new administration was formed, as usual in such cases, out of the Opposition. The Marquis of Rockingham was made prime minister, and Mr Fox one of the secretaries of state. The new ministers lost no time in taking measures for the restoration of peace. Unfortunately for their credit with the nation, Sir George Rodney gained his important victory over the French fleet off the island of Dominica, April 12, 1782, after the ministers had dispatched another officer to supersede him in the command. On this occasion thirty-seven British vessels encountered thirty-four French, and chiefly by the dexterous manœuvre of a breach of the enemy's line, gained one of the most complete victories recorded in modern warfare. The triumph was imminently necessary, to recover in some measure the national honour, and enable the ministers to conclude the war upon tolerable terms. In November, provisional articles for a peace with the United States of America, now acknowledged as an independent power, were signed at Paris, and the treaty was concluded in the ensuing February. War was soon after concluded with France, Spain, and Holland, but not without some considerable concessions of colonial territory on the part of Great Britain.

The conclusion of this war is memorable as a period of great national suffering, which partly arose from the depression of commerce, and partly from a bad harvest. This, however, is also the era of Arkwright's invention of the cotton-spinning machine, by means of which Britain has immensely increased the aggregate of her manufactures, and endured expenses under which she must have otherwise sunk. The principles of prosperity were so firmly fixed in the country, that, immediately after the first distresses had passed away, every department of the state resumed its wonted vigour, and, during the ten ensuing years of peace, a great advance was made.

The death of the Marquis of Rockingham, in July 1782, proved the destruction of a ministry which might have been expected to conduct the national affairs for many years. His place being given to the Earl of Shelburne, Mr Fox and other leading members of the cabinet gave in their resignations. Among the new appointments subsequently found necessary, was that of Mr William Pitt, second son of the illustrious Chatham, and now only in his twenty-third year, to the office of chancellor of the exchequer. This young statesman had already signalised himself by taking an active part in the proceedings out of parliament, for a reform of that body; a measure which the legislative proceedings of the last few years had convinced many to be highly necessary.

COALITION MINISTRY.

The present ministry was opposed by two parties of very different principles, namely, the adherents of the North administration, and the friends of those Whigs who had lately retired from the cabinet. These two parties, notwithstanding that they had been opposed to each other throughout all the late war, coalesced for factious or ambitious purposes, and, being triumphant over the ministry, forced themselves upon the king's councils. Then was formed, April 2, 1783, what was called the Coalition Ministry, in which Lord North and Mr Fox acted together as secretaries of state, though two years had hardly elapsed since the latter had breathed the most violent threats in parliament against not only the power, but the life of his present brother. This unprincipled and vicious state of things, in which the aristocratic influences of the House of Commons threatened to usurp both the royal prerogative and the supposed privileges of the people, lasted only for a short time. Mr Fox had prepared and carried through the lower house his famous bill for the regulation of the East India Company, by which all authority was to devolve on seven directors eligible by the House of Commons—in other words, by which the immense patronage of this offshoot of the empire was to fall into the hands of the ministry. The people had beheld the unseemly association with disgust; and now the king perceived that a power was rising under him, which would soon be able to set him at defiance. He therefore used his personal influence, in no very covert way, to induce the House of Lords to throw out the bill; a measure which certainly saved the country from a tyranny of a very ominous kind. He then sent, December 18, to demand the seals of office from his over-ambitious ministers, appointing Mr Pitt to be the prime minister and chancellor of the exchequer of a new cabinet, consisting chiefly of his majesty's friends. The beneficial uses of a king and house of lords under such a constitution as that which then existed, was shown by these transactions in a very marked manner.

The various departments of the state were now thrown into a relative position which had never been known before, and has never recurred since. The king and his ministers, backed by a decided majority of the public, were opposed by two powerful aristocratic factions in the House of Commons, who defeated every measure that was introduced, refuted the usual supplies, and voted again and again resolutions against the continuance of the present men in office, which they denounced as unconstitutional. In the course of a few weeks, however, the influence of the Opposition was sensibly reduced; the public sentiment and the power of the court began to take effect even on this intractable body; and when at length their majority had been worn down to *one*, which happened on a motion by Mr Fox, the king dissolved the parliament; a measure which, whatever it might promise to him, he did not previously think justifiable. So far were the motives of the coalition from being based on popular support, that, in the new election, no fewer than one hundred and sixty members lost their seats. The new House of Commons was of course so favourable towards the king and his young minister, as to enable the public service to go on without farther interruption.

MINISTRY OF MR PITT—FROM 1784 TO THE COMMENCEMENT OF THE FRENCH REVOLUTION.

In 1786, Mr Pitt established his celebrated but fallacious scheme for redeeming the national debt, by what was called a Sinking Fund. The revenue was at this time above fifteen millions, being about one million more than was required for the public service. This excess he proposed to lay aside annually, to lie at compound interest; by which means he calculated that each million would be quadrupled at the end of twenty-eight years, and thus go a great way towards the object he had in view. To this scheme Mr Fox added the infinitely more absurd amendment, that, when the government required to borrow more money, one million of every six so obtained should be laid aside for the same purpose. The scheme was so well received as to increase the popularity of the minister, and it was not till 1813, when it was exposed by the late Professor Hamilton, in his work on the National Debt, that its fallacy was generally acknowledged. The discovery, unfortunately, was made twenty years too late—for, during the whole of the French revolutionary war, the reliance upon the Sinking Fund tended to reconcile the people to an expenditure against which they would have otherwise remonstrated in a more effectual manner.

In the same year commenced the parliamentary proceedings against Mr Warren Hastings, for alleged cruelty and robbery exercised upon the natives of India, during his governorship of that dependency of Great Britain. These proceedings were urged by Mr Burke and other members of the Liberal or Whig party, and excited so much public sentiment against Mr Hastings, that the ministry was obliged, though unwillingly, to lend their countenance to his trial, which took place before parliament in the most solemn manner, and occupied one hundred and forty-nine days, extending over a space of several years. The result was the acquittal of Mr Hastings.

The eldest son of the king had now been for several years of age, and exempted from the control of his father. He had no sooner been set up in an establishment of his own, than he plunged into a career of vice and prodigality, forming the most striking contrast with the chastened simplicity and decorum of the paternal abode. He also attached himself to the party of the Opposition, though rather apparently from a mere principle of contradiction to his father, than a sincere approbation of their political objects. The result was the complete alienation of the Prince of Wales from the affections of the king.

In November 1788, an aberration of intellect, resulting from an illness of some duration, was observed in the king, and it became necessary to provide some species of substitute for the exercise of the royal functions. To have invested the Prince of Wales with the regency appeared the most obvious course; but this would have thrown out the ministry, as it was to be supposed that his royal highness would call the chiefs of his own party to his councils. Mr Fox contended that the hereditary nature of the monarchy pointed out an unconditional right in the prince to assume the supreme power under such circumstances; but Mr Pitt asserted the right of parliament to give or withhold such a character, and proposed to assign certain limits to the authority of the intended regent, which would have placed the existing ministry beyond his reach. The Irish parliament voted the unconditional regency to the prince, but that of Great Britain was about to adopt the modified plan proposed by Mr Pitt, when, March 1789, the king suddenly recovered, and put an end to the difficulty. The debates on the regency question show in a very strong light the readiness of statesmen to abandon their most favourite and strongest principles, on the call of their own immediate interests.

FRENCH REVOLUTION.

The country had for several years experienced the utmost prosperity and peace, when it was roused by a series of events that took place in another state. The proceedings of the French nation for redressing the political grievances under which they had long laboured, commenced in 1789, and were at first very generally applauded in Britain, as likely to raise that nation to a rational degree of freedom. Ere long, however, the abolition of hereditary privileges, the destruction of the Bastile, the open disrespect for religion, and other symptoms of a violent spirit, manifested by the French, produced a considerable change in the sentiments of the British people. The proceedings of the French were still justified by the principal leaders of Opposition in parliament, and by a large class of the community; but they inspired the government, and the propertied and privileged classes generally, with great alarm and distrust. Under the impulse of the example of France, a number of associations were formed throughout the country, for the purpose of urging that reform in the House of Commons, which had so long been called for; the society in London being headed by Mr (afterwards Earl) Grey, and Mr (afterwards Lord) Erskine. There also appeared a profusion of pamphlets in favour of a general amelioration of the social and ruling systems—particularly several by Mr Thomas Paine, a writer who had formerly distinguished himself as a literary partisan of liberty in the United States. The public mind was greatly agitated by the various events and discussions which were constantly taking place; all the more ardent, and speculative, and benevolent minds entering heartily into the views of the French, while the more cautious, and the more wealthy, and in general all those who are least ready to think well of the species, expressed their fears for the result. A considerable number of those accustomed to oppose government took this opportunity to join its ranks; the chief of whom was Mr Burke, who, in November 1790, published his celebrated pamphlet on the French Revolution, in which he employed unexampled eloquence, and a vast range of historical illustration, to show that it was founded on principles adverse to real liberty and to public security.

The improvement of the public institutions of France would have probably taken place without any material consequences, if it had not been deranged by external events. That national weakness which had been the main cause of the revolution, prompted two ambitious powers—Austria and Prussia—to form a scheme (summer 1791) for overrunning France, and, while they restored the king to full apparent authority, disabling his country for opposing them in future, by a partition of its best provinces, after the manner of a recent transaction in Poland. This treaty was believed to have provided that Austria should obtain Bavaria in exchange for the Netherlands, part of which belonged to France, but was to be conquered by him, and transferred in exchange to the elector of Bavaria. The archduke Charles was to have the duchy of Lorraine; Strasburg and Alsace were to be restored to Germany; the king of Sardinia was to have Dauphiné, provided he should accede to the coalition; other parts of the French dominions were to be bestowed on Spain and Switzerland. The intelligence of these designs produced the utmost indignation among the French, and was the first cause of the more violent proceedings at Paris. In reply to a question from France respecting the troops assembling on the frontier, Frances II. of Austria made no scruple to avow an intention, with his ally, to interfere in the settlement of the French government; the consequence was a proclamation, by France, of war against Austria, Prussia, and Sardinia. In the summer of 1792, the combined powers placed an army under the charge of the Duke of Brunswick—reinforced by large bodies of the fugitive noblesse of France—for the purpose of invading that country, which they had no doubt, after their late success in Poland, they would speedily find at their mercy. A manifesto issued by the duke at Coblentz, called upon all the French authorities, in the most insolent terms, to submit to the king, under the pain of military execution, and threatened to give up the city of Paris to spoliation, if the least injury should be offered to the royal family, who were invited to come under the protection of the allied army. The result was an universal rising of the military spirit of the French against the invader, who, before the end of the year, was ignominiously defeated, and driven from the country, by troops of raw but enthusiastic recruits; while the king, having, by an attempted flight, given reason for suspicion that he was disposed to regain his former power by means of foreign assistance, was deposed (August 10, 1792), and thrown with his family into confinement.

WAR DECLARED AGAINST FRANCE, 1793.

The circumstances attending the latter revolution were unhappily of so violent and even bloody a character, as, together with the establishment of a republic, to convey unavoidable alarm wherever hereditary institutions were known, and excite, amongst good but timid people, a spirit highly adverse to the progress of liberal ideas. The French convention increased this unfavourable feeling, November 1792, by a decree, intended as a retaliation for the conduct of Austria and Prussia, proffering aid to any people who might be inclined to reform their institutions; and still farther, by bringing their deposed king to the block, January 21, 1793. Previous to the last incident, they had overrun the Netherlands, and opened the navigation of the Scheldt, which Great Britain was obliged by treaty to keep shut for the advantage of Holland. The decree, and the opening of this river for general commerce, afforded to the British government an excuse for entering into a war with France, while the real motives were exactly similar to those which animated Austria and Prussia—a desire of restoring monarchy in France, and preventing the contagion of French doctrines in Britain. The French convention, who made peace one of their first principles, offered to explain away the decree, and to give up the question of the Scheldt; but the ministry, with the same ill-omened haughtiness which had been displayed towards America, paid no attention to the proposal. It was confidently expected by the king, his ministers, and the great body of respectable persons who rallied round the throne and the aristocracy on this occasion, that the French republic had not strength to stand a single campaign against Britain and the other powers combined against it. The bulk of the nation, high and low, was either eager for the war, or made no opposition to it. Comparatively few of the common people were then capable of reflecting upon such a subject; and there had even been riots at Birmingham, July 1791, against the friends of liberal institutions. The few who penetrated the evil consequences likely to arise from the war, and still maintained a demand for reform in our own country, were overpowered by numbers, and branded as enemies to religion and civil order: some were tried for high treason and sedition, though only in the cases of Muir, Palmer, and two or three others, in Scotland, were verdicts obtained. Through a feeling of alarm respecting her monarchy, her church, and her aristocracy, Great Britain plunged into a war, which was to add six hundred millions to her debt, and desolate Europe, and retard civilisation for twenty years

UNEXPECTED SUCCESSES OF THE FRENCH.

After alliances had been formed with the other Anti-Gallican powers, Great Britain sent an army into the Netherlands to co-operate in reducing the fortresses in possession of the French, while the town of Toulon, being inclined to royalty, put itself into the hands of a British naval commander. At first, the French seemed to fall somewhat in their defences; but on a more ardently republican party acceding to power under the direction of the infamous Robespierre, the national energies became much increased, and the Duke of Brunswick experienced a series of disgraceful reverses. Prussia, having now taken new views of the case of France, began to withdraw her troops, on the pretext of being unable to pay them; and though Britain sent her nearly a million and a quarter to keep her nine months on the field, she contrived to do nothing towards the general cause, and soon retired altogether from the contest. In 1794, the French experienced a severe defeat at sea; but they not only drove the combined armies out of the Netherlands, but, taking advantage of an unusually hard frost, invaded Holland by the ice which covered the Rhine, and reduced that country to a republic under their own control. The successes of the British were limited to the above naval victory achieved by Lord Howe, the temporary possession of Corsica and Toulon, the capture of several of the French colonies in the West Indies, and the spoliation of a great quantity of the commercial shipping of France; against which were to be reckoned the disgraceful expulsion of her army from the Netherlands, the loss of ten thousand men in an unsuccessful descent upon the west coast of France, and some considerable losses of her shipping—not to speak of immense sums squandered in vain, and an increase of annual expenditure from about fourteen to near forty millions. In 1796, the French invaded Italy under Bonaparte, and were there so successful as not only to add greatly to the territory of the republic, but to bring Austria to a humiliating peace. The British government would have now been glad to obtain peace also, and took some steps for that purpose, which were as deficient in dignity as its declaration of war had been replete with pride. But France was found unwilling to make sufficient concessions of her conquests, to satisfy Great Britain. The year 1797 was distinguished by the great naval victories of St Vincent and Camperdown; but the finances of the country were now becoming so much embarrassed as to compel the government to relieve the bank of England from the duty of paying gold for their notes; a measure which had the effect of increasing the prices of all goods, and rendering the money that was borrowed by the nation greatly less in value than what they afterwards stood indebted for, when cash payments had to be resumed: in fact, the national obligations were, by this single act, immensely increased. It is almost inconceivable to a Briton born since that period, how the nation should have advanced so far in so hopeless and ruinous a course. Much of the delusion is attributed to the dread of an invasion by the French; an event, from its very singularity, regarded with horror by the British people, and to obviate which, almost every man in the country took up arms. In fact, the two parties mutually invigorated each other during the course of the war. The British, by their attempts to overturn the new French government, gave it a firmness it could not otherwise have had, and drew forth such powers in the nation as it had never exhibited even in its best days, under Louis XIV. and his famous financier Colbert. The French, on the other hand, by their threats of invading Britain, touched on a string which vibrated as strongly, and rendered a peaceful country of merchants one universal camp, in which defiance to French doctrines and influence was every where breathed.

EXPEDITION TO EGYPT—NEW COALITION AGAINST FRANCE.

In 1798, the French overrun and added to their dominions the ancient republic of Switzerland, which gave them a frontier contiguous to Austria, and enabled them eventually to act with increased readiness and force upon that country. The great eastern powers, which had commenced the war with the design of parting France like the garments of a criminal among themselves, thus saw her after a few years of warfare, not only preserve her own proper soil, but add to it all the neighbouring countries. In this year the directors of the French republic beginning to be afraid of the ambition of their general, Bonaparte, sent him at the head of an expedition to reduce and colonise Egypt, intending from that country to act against the British empire in the East Indies. The expedition was successful in its first object; but the fleet which had conveyed it was attacked in Aboukir Bay, by Nelson, and almost totally destroyed or captured. While so much of the strength of the French army was thus secluded in a distant country, the eastern powers thought they might safely recommence war with the republic. Austria, Naples, and Russia, formed a confederacy for this purpose; and Britain, to supply the necessary funds, submitted to the grievance of an income tax, amounting in general to ten per cent., in addition to all her previous burdens. Our government had at this time to contend with a perplexity of a new kind—namely, a rebellion in Ireland, which, though fomented and assisted by the French, was suppressed without much bloodshed, and led two years after to an incorporating union of the two countries.

The new confederacy against France was so successful in 1799, as to redeem the greater part of Italy from her dominion. In the campaign which produced this result, the Russian army, under the famous Suwarof, acted the most prominent part; but at the close, attempting to expel the French from Switzerland also, this large force was nearly cut to pieces in one of the defiles of that mountainous country. In August of the same year, Great Britain made a corresponding attempt to expel the French from Holland. Thirty-five thousand men, under the Duke of York, formed the military part of the expedition. The fleet was successful at the first in taking the Dutch ships; but the army, having landed under stress of weather at an unfavourable place for their operations, was obliged, after an abortive series of skirmishes, to make an agreement with the French, purchasing permission to go back to their country by a surrender of eight thousand prisoners from England.

BONAPARTE ELECTED FIRST CONSUL—HIS OVERTURES OF PEACE.

The reverses which France experienced in 1799 were generally attributed to the weakness of the directory—a council of five, to which the executive had been entrusted. Bonaparte suddenly returned from his army in Egypt, and, by a skilful management of his popularity, overturned that species of government, and caused himself to be appointed the sole depository of the executive power of the state, under the denomination of First Consul. He immediately wrote a letter to King George III., making overtures of peace, but was haughtily answered, that no dependence could be placed by Great Britain on any treaty with France, unless her government were again consolidated under the Bourbons. Bonaparte was so sincere in his desire of peace, as to reply to this note, vindicating France from the charge brought against her by the British secretary, of having commenced a system of aggression inconsistent with the interests of other states, and asserting her right to choose her own government—a point, he said, that could not decently be contested by the minister of a crown which was held by no other tenure. But the British government was at this time too much elevated by the expulsion of the French army from Italy, and the late changes in the executive, which, in their estimation, betokened weakness, to make peace with a country, which, in the favourite phrase of the times, was "at enmity with order, religion, and morality." Two years before, when this moral war was at a still greater height in France, Britain had thought proper to make peaceful overtures, through a channel which might almost be called mean; but at that time the Anti-Gallican cause was blessed with inferior success, and England herself found some rather alarming difficulties at the bank. In fact, the profession of fighting for the support of "order, religion, and morality," was only heard of when Britain and the other powers were flattering themselves with a hope of extirpating this example of a republic.

SUCCESSES OF BONAPARTE.

The events of 1800 formed as complete a punishment for this infidelity to principle, as those of 1793 and the few subsequent years had proved in regard to original design of dismembering France, and dictating to her respecting her internal affairs. Sir Sidney Smith, who commanded the British forces in Syria, had made a treaty with the French army after it had been deserted by Bonaparte, whereby it was agreed that the French should abandon Egypt, and retire unmolested to their own country. The British government, in their present elevation, refused to ratify this arrangement; the consequence was, that the French overthrew an immense Turkish army at Grand Cairo, and made themselves more effectually than ever the masters of the country, so that Britain had to send an army next year, under Sir Ralph Abercromby, to accomplish, at an immense expense and a great waste of human life, what the French had formerly agreed to do without firing a shot or shedding one drop of blood. In Europe the same cause was equally unsuccessful. By one of his most dexterous movements, Bonaparte eluded the Austrians, led an army over the Alps by the Great St Bernard into the Milanese, and, having gained a decisive victory at Marengo, at once restored the better part of Italy to French domination. Contemporaneously with his own movements, Moreau led another army directly into Germany, overthrew the Austrians in several battles, and advanced to within seventeen leagues of Vienna. These reverses obliged Austria to make a peace next year, by which France became mistress of all Europe west of the Rhine and south of the Adige.

CHANGE OF MINISTRY, AND PEACE OF AMIENS, 1801.

At the commencement of 1801, Britain had not only to lament this unexpected turn of fortune, but to reckon among her enemies the whole of the northern states of Europe, which had found it necessary to place themselves on a friendly footing with Bonaparte, and, though they did not declare war against Britain, yet acted in such a manner as to render hostilities unavoidable. Nelson sailed in March, with a large fleet, against Copenhagen, and proved so successful against the Danish fleet, as to reduce that country to a state of neutrality. The death of Paul, which took place at the same time, and the accession of Alexander, who was friendly to Britain, completely broke up the northern confederacy. Yet the great achievements of France on the continent, joined to the distresses of a famine which at this time bore hard on the British people, produced a desire for that peace which only a year before might have been gained upon so much better terms, but had been so insultingly rejected. With a view, apparently, to save the honour of Mr Pitt and his friends, a new ministry was appointed under Mr Addington, by whom a peace was at length, in the end of the year (1801), concluded with France, which was left in the state of aggrandisement we have just described.

RESULTS OF THE WAR.

The war of the French revolution placed Great Britain in possession of a considerable number of islands and colonies in the East and West Indies and elsewhere; and while two war-ships was the whole amount of our losses at sea, we had taken or destroyed eighty sail of the line, 181 frigates, and 224 smaller ships belonging to the enemy, together with 743 privateers, fifteen Dutch, and seventy-six Spanish ships. The triumphs of the British fleets were indeed numerous and splendid, and had the effect of keeping the national commerce almost inviolate, during the whole of the war, while that of France was nearly destroyed. There was, however, hardly the most trifling instance of success by land; and the expenses of the contest had been enormous. The supplies usually voted before the war were fourteen millions; those for 1801 were L.42,197,000, being double the amount of the whole land-rent of the country. The result was stated not more epigrammatically than truly by Mr Sheridan in the House of Commons. "The late minister (Pitt) had told us," said he, "that the example of a Jacobin government in Europe, founded on the ruins of a bloody altar, and the tomb of a martyred monarch, was a spectacle so dreadful and infectious to Christendom, that we could never be safe while it existed, and could do nothing short of our last effort for its destruction. For these fine words we had laid out near two hundred thousand lives, and nearly three hundred millions of money—and had gained Ceylon and Trinidad." The whole contest is to be looked upon as one of the most extensive displays of the weaker and worse of the human passions that has ever taken place.

WAR RENEWED WITH FRANCE, 1803—BONAPARTE MADE EMPEROR.

The evil, however, was not yet at an end. It was only one of the results of the war against French independence, that the country was led by the course of events to place herself under the control of her chief military genius, Napoleon Bonaparte; a man whose spirit, though relieved by qualities which men have hitherto called illustrious, was innately narrow and selfish. It was soon perceptible that Bonaparte did not relish the condition of peace. Having taken undue advantage of several points left loose in the treaty, Great Britain retaliated by retaining possession of Malta; and the war was accordingly recommenced, in May 1803. Britain immediately employed her superior naval force to seize the French West India colonies; while France took possession of Hanover, and excluded British commerce from Hamburgh, which, during the late war, had been one of its principal depositaries. Bonaparte collected an immense flotilla at Boulogne for the avowed purpose of invading England; but so vigorous were the preparations made by the whole British population, and so formidable the fleet under Lord Nelson, that he never found it possible to put his design in execution. In the year 1804, he was elevated to the condition of Emperor of the French; and France once more exhibited the formalities of a court, though not of the kind which the European sovereigns wished to see established. In April of the same year, the Addington administration was exchanged for one formed by Mr Pitt, and of which he formed the chief.

SUBJUGATION OF AUSTRIA BY NAPOLEON.

In 1805, a new coalition of European powers, consisting of Russia, Sweden, Austria, and Naples, was formed, under the fostering influence of Great Britain, against Napoleon. He, on the other hand, had drawn Spain upon his side, and was making great exertions for contesting with Britain the empire of the sea. A fleet of thirty-three sail, partly French and partly Spanish, met a British fleet of twenty-seven, under Nelson, off Cape Trafalgar, October 25, 1805, and was completely beaten, though at the expense of the life of the British commander. Britain thus fixed permanently her dominion over the seas and coasts of the civilised world. At this time, however, Napoleon was asserting with equal success his supremacy over continental Europe. By a sudden, rapid, and unexpected movement, he conducted an army into Germany, where the Austrian troops were already making aggressions upon neutral territory; on the 17th, took the fortress of Ulm, with its artillery, magazines, garrison of 30,000 men, and the commander, General Mack; entered Vienna without resistance on the 15th November; pursued the fugitive court of Vienna, and the allied armies of Russia and Austria, into Moravia; and on the 2d of December, gained the decisive victory of Austerlitz, which put an end to the coalition, and rendered Napoleon the dictator of the continent.

DEATH OF MR PITT—AND OF MR FOX.

This series of events caused a gloom in the British councils, and proved, with the impeachment of his colleague, Lord Melville (for malpractices in the Admiralty), and other painful circumstances, a deathblow to Mr Pitt, who expired on the 23d of January 1806, completely worn out with state business, at the early age of forty-seven, half of which time he had spent in the public service. A writer of much talent* says—"Mr Pitt merits the praise of patriotism as a man, and talents as a minister; but if he might claim the gratitude, he had at least equal reason to entreat the forgiveness of his country at his last hour. The elements were contrasted in him, like that allegorical statue of Persepolis, which the beholder was alternately disposed to admire and to destroy." Mr Pitt's ministry was succeeded by one composed of the friends of Lord Grenville and Mr Fox, and which was comprehensively called Whig, notwithstanding the modified Toryism of the former individual. This new cabinet, in the course of 1806, made a strenuous but not undignified attempt to obtain a peace from France, which now threatened to bring the whole world to its feet. But the Grenville administration encountered serious difficulties from the king, who now more than ever had recourse to that confidential and irresponsible cabinet, which was formed in his own court, and went by the name of the Back-stairs Influence. Exhausted by his ungrateful labours, Mr Fox died, September 13, 1806. "Frank and simple," says the writer just quoted, "he knew no theatric artifice, no politic concealment, no factitious diversity of personage between the statesman and the man. The errors which prove the weakness of humanity were in him as undisguised as the endowments which ennoble it. Without those weaknesses and errors, his character would have been nearer perfection, but not more grand—and his generous sympathies might have been less active and redundant. His last effort as a minister was to procure peace; his last act to propose the abolition of the slave trade." The war was thus, among its other evil consequences, breaking the hearts of the most able and worthy of the sons of England.

* Mr W. Wallace, in his Life of George IV., Lardner's Cabinet Library.

PRUSSIA REDUCED—THE BERLIN DECREES.

A new coalition, excluding Austria, but involving Prussia, had been subsidised by Britain, and was now preparing to act. With his usual decision, Napoleon led what he called his "Grand Army" by forced marches into Prussia; gained, on the 14th of October, the battles of Jena and Averstadt, which at once deprived that country of her army, her capital, and her fortresses; and then proclaimed the famous "Berlin Decrees," by which he declared Great Britain in a state of blockade, and shut the ports of Europe against her merchandise. The King of Prussia, Frederick William III., took refuge with his court in Russia, which now was the only continental power of any importance that remained unsubdued by France.

RUSSIA COMPELLED TO MAKE PEACE.

Towards that country Napoleon soon bent his steps, taking assistance on his march from Poland, which he promised to restore to independence. After a series of skirmishes and battles of lesser importance, he met the Russian army in great strength, June 14, 1807, at Friedland, and gave it a total overthrow. He might now have easily reduced the whole country, as he had done Austria and Prussia; but he contented himself with forming a treaty (at Tilsit), by which Russia agreed to become an ally of France, and entered into his views for the crippling of Britain by the exclusion of her commerce from continental ports. France had thus the glory of disarming, in the course of a few years, the whole of Europe, excepting Great Britain; an amount of military triumph for which there was no precedent in ancient or modern history.

CHANGES OF ADMINISTRATION.

The Grenville administration was displaced in spring 1807, in consequence of the difference between its members and the king, on the subject of the Catholic claims, which had long been urged by the Whig party, with but an imperfect support from the people. The next ministry was headed by the Duke of Portland, and included Lords Hawkesbury and Castlereagh (afterwards Earl of Liverpool and Marquis of Londonderry), and Mr Canning, as secretaries; Mr Spencer Perceval, recently a solicitor, being chancellor of the exchequer. It is generally allowed to have been one of the most incapable ministries ever known; yet it was as good as could be obtained at the time to conduct the affairs of a country, where, on the one hand, the will of the sovereign and borough-proprietors, and on the other the clamours of the people, presented so many obstacles to an efficient course. One of the first acts of this cabinet was the dispatch of a naval armament to Copenhagen, to seize and bring away the Danish shipping, in order that it might not be, by possibility, employed for the injury of Britain. The end of the expedition was easily gained; but it was the means of lowering the honour of Britain in the eyes of foreign states.

FIRST PENINSULAR CAMPAIGN.

The time seems to have now arrived when the retaliation of France upon Europe, for its interference with the revolution, was completed, and when farther measures against neighbouring states became offensive on her part, and accordingly indefensible. France, however, was now given up to the direction of a military genius, who had other ends to serve than the defence of the country against foreign aggression or interference. The amazing successes of Napoleon Bonaparte had inspired him with the idea of universal empire; and so great was the influence he had acquired over the public mind and physical energies of France, that the attainment of his object seemed by no means impossible. There was a difference, however, between the opposition which he met with before this period, and that which he subsequently encountered. In the earlier periods of the war, the armies brought against him could be considered as little else than the mercenaries of the dominant classes in England, and of the despotisms of eastern Europe; henceforth a fiercer and more patriotic spirit rose every where against him: he was looked upon in England and elsewhere as the common enemy of humanity and of freedom; and every exertion made for the humiliation of France was animated by a sentiment of desperation, in which the governors and governed alike participated.

The Spanish peninsula was the first part of the prostrated continent, where the *people* could be said to have taken a decidedly hostile part against Napoleon. He had there gone so far as to dethrone the reigning family, and give the crown to his elder brother Joseph. A sense of wrong and insult, mingled with religious fanaticism, raised the Spanish people in revolt against the French troops; and though their conduct was every where barbarous in the extreme, it was hailed in Britain as capable of being turned to account. In terms of a treaty entered into with a provisional government in Spain, a small army was landed, August 8, in Portugal, which country had been recently taken possession of by the French. Sir Arthur Wellesley, who has since been so famous as Duke of Wellington, was the leader of this force. In an engagement at Vimeira, on the 21st, he repulsed the French, under Junot, who soon after agreed, by what was called the Convention of Cintra, to evacuate the country. Sir Arthur being recalled, the British army was led into Spain under the command of Sir John Moore; but this officer found the reinforcements poured in by Napoleon too great to be withstood, and accordingly, in the end of December, commenced a disastrous though well-conducted retreat towards the port of Corunna, whither he was closely pursued by Marshal Soult. The British army suffered the severest hardships and losses on this occasion, but did not experience a check in battle, or lose a single standard. In a battle which took place at Corunna, January 18, 1809, for the purpose of protecting the embarkation of the troops, Sir John Moore was killed.

CASE OF THE DUKE OF YORK.

Public attention was at this time almost exclusively occupied by an inquiry into a charge against the Duke of York, the commander-in-chief of the army. He was represented as having given commissions to individuals, at the recommendation of a Mrs Clarke, who was his mistress, and who profited to a great extent by her influence. While the country was making such sacrifices to maintain the throne, the two persons nearest to it were sunk in sensualities only comparable to those of the court of Charles II. The Prince of Wales, in order to induce the nation to pay his debts, had, in 1796, married the Princess Caroline of Brunswick, from whom he had lived separated almost ever since, indulging freely in those vices which most tend to degrade our common nature. It now appeared that the Duke of York, though also married, revelled in the grossest debaucheries, for which he did not pay out of his income, but from the public purse. The censure of parliament was only avoided by his resigning his office.

AUSTRIA AGAIN PROSTRATED BY NAPOLEON.

In 1809, Austria was induced once more to commence war with a power by which she had been so often overthrown. Upwards of half a million of men were brought into the field, under the command of the Archduke Charles. Bonaparte, leaving Spain comparatively open to attack, moved rapidly forward into Germany, and, by the victory of Eckmuhl, opened up the way to Vienna, which surrendered to him. After gaining a slight advantage at Essling, the archduke came to a second decisive encounter at Wagram, where the strength of Austria was completely broken to pieces. The peace which succeeded was sealed by the marriage of Napoleon to Maria Louisa, daughter of the Emperor of Austria, for which purpose the former divorced his wife Josephine.

WALCHEREN EXPEDITION.

In the autumn of 1809, the British government dispatched an armament of 100,000 men, for the purpose of securing a station that would command the navigation of the Scheldt. The expedition was placed under the command of the Earl of Chatham, elder brother of the late premier; a nobleman totally unacquainted with military affairs on such a scale—who had never been entrusted by his own brother with any office—but who needed the pay, and was a favourite of the court. Under such management, the enterprise altogether failed. Too much time was put off in the preliminary siege of Flushing; Antwerp was effectually prepared to resist every effort; and the unhealthy season came on before any thing considerable had been done. The army having disembarked on the insalubrious island of Walcheren, was swept off in thousands by disease. The survivors returned in December, without having done any thing towards the object for which they had set out. This tragic affair became the subject of inquiry in the House of Commons, which, by a majority of 272 against 232, vindicated the propriety of the detention of the army for three months in an unhealthy island; and was therefore, in mockery, nicknamed the Walcheren Parliament.

SECOND PENINSULAR CAMPAIGN.

A new expedition in Spain was attended with better success. Taking advantage of the absence of Napoleon in Austria, a considerable army was landed, April 23, 1809, under the command of Sir Arthur Wellesley, who immediately drove Soult out of Portugal, and then made a rapid move upon Madrid. King Joseph, a weak voluptuary in character, came forth with a considerable force under the command of Marshal Victor; and on the 28th of July, attacked the British and Spanish troops in a strong position at Talavera. The contest was obstinate and sanguinary;

and though the French did not retreat, the advantage lay with the British. The government, glad to find that a battle had been fought without defeat, elevated Wellesley to a peerage, under the title of Viscount Wellington of Talavera. He was obliged immediately to fall back upon Portugal, where he occupied a strong position near Santerem. Early in 1810, Napoleon reinforced the army in Spain, and gave orders to Massena to "drive the British out of the peninsula." Wellington posted his troops on the heights of Busaco—eighty thousand in number, including Portuguese—and there, on the 27th of September, was attacked by an equal number of French. Both British and Portuguese behaved well: the French were repulsed with great loss, and, for the first time in the war, conceived a respectful notion of the former troops. Wellington now retired to the lines of Torres Vedras, causing the whole country to be desolated as he went, for the purpose of embarrassing the French. When Massena observed the strength of the British position, he hesitated; and finally, in the spring of 1811, performed a disastrous and harassed retreat into Spain.

It now became an object of importance with Wellington to obtain possession of the Spanish fortresses which had been seized by the French. On the 22d of April, he reconnoitred Badajos, and soon after laid siege to Almeida. Massena advancing to raise the siege was met on fair terms at Fuentes d'Onoro, May 5, and repulsed. Almeida consequently fell into the hands of the British. General Beresford, at the head of another body of British forces, gained the bloody battle of Albuera over Soult, and thereby protected the siege of Badajos, which, however, was soon after abandoned. During the same season, General Graham, in command of a third body of troops, gained the battle of Barossa. At the end of a campaign, in which the French were upon the whole unsuccessful, Wellington retired once more into Portugal.

COMMITTAL OF SIR FRANCIS BURDETT.

The domestic transactions of this period are interesting, though they are far from showing that either the government or the public was in a healthy state. The exclusion of strangers from the House of Commons during the inquiries into the Walcheren expedition, had been made a subject of discussion in a debating-club, the president of which was therefore committed to Newgate for a breach of privilege. Sir Francis Burdett, member for Westminster, made this proceeding the subject of some acrimonious remarks in a letter to his constituents, denying the right of the House of Commons to imprison without trial, and describing that body as "a part of our fellow-subjects, collected together by means which it is not necessary for me to describe." The letter was voted a libel on the house, and a warrant was issued by the speaker for committing Sir Francis to the Tower. A measure so uncommon and so violent, it may easily be imagined, could only happen under a government to which the popular spirit had given occasion for alarm. Sir Francis, denying the legality of the warrant, resisted its execution by remaining in his own house, where he was protected from the officers by immense crowds of people. After suffering a kind of siege for two days, he was forcibly taken by a large train of soldiers, and lodged in the Tower. The capital was convulsed by this bold measure for several days; and in the course of the tumults which took place, a number of lives were lost.

PRINCE OF WALES APPOINTED REGENT.

The intellect of George III., which had experienced several temporary aberrations, gave way at the close of the year 1810, and rendered it necessary that a regent should be appointed. Accordingly, in December, parliament imposed that duty upon the Prince of Wales, though under certain restrictions as to the appointment of officers and other branches of the royal prerogative. The Tory party had not now the same reason to dread the accession of the prince which they had in 1789. His sentiments on the Catholic claims, originally favourable, had in 1804 experienced a decided change, which proved the means of alienating him considerably from the Whigs, with whom emancipation was a leading and unalterable principle. Though he did not at first show any disinclination to take his old friends into the ministry, he contrived, when the first year of restriction had elapsed, to let them remain in their wonted state of opposition, without seeming to have desired it. For the mere purpose of preserving his consistency, he made overtures to the leaders of the Whigs to *enter* the existing cabinet; and, as might have been expected, they refused to coalesce with men differing so much with themselves in principle. In truth, the prince regent was too well pleased with the complaisance of the present ministers, and too sensible of the advantage of the present habitually compliant state of parliament, to wish for their removal. Nor did he lose with the public for thus overlooking the Whigs. "The Whigs," says an acute writer, "had more of parliamentary influence and talent, than of popular support. It should have become apparent to them, from the accession of George III.—at least from the developement of his principles of government at the commencement of his reign—that their only hope of power was in the support of the nation; yet did they still look to the crown as the sole dispenser of office, and never frankly identified themselves with any great popular cause. The coalesced parties of Lords Grey and Grenville joined, it is true, in an enlightened view of the great question of religious freedom. But they were in advance of opinion and the age, and their generous support and promotion of Catholic liberty alienated at the same time the sovereign and the people. Hence the Prince of Wales gained rather than lost with the public by discarding the Whigs, and adopting the Tories."

GREAT DEPRESSION IN ENGLAND.

The year 1811 is generally looked upon as the period of greatest depression and distress which the British empire has known for several ages. At this time, with the exception of an uncertain footing gained in Spain, as much by the superstition and patriotism of the natives as by British valour, the influence of England was unknown on the continent. Bonaparte seemed as firmly seated on the throne of France as any of her former monarchs, while every other civilised European kingdom either owned a monarch of his express appointment, or was in some other way prostrate to his power. By the Berlin and Milan decrees, he had shut the ports of the continent against British goods, so that they could only be smuggled into their usual markets. By British orders in council, which, though intended to be retaliatory, only increased the evil, no vessel belonging to a neutral power—such, for instance, as the United States—was permitted to carry goods to these ports, unless they should previously land and pay a duty in Britain. Thus we at once suffered from the short-sighted despotism of the French emperor, and from our own narrow and imperfect views of commerce, for, by crippling America, we only deprived ourselves of one of our best and almost sole-remaining customers. The consequence of these measures, and of the excessive issue of bank paper which had now for some years been in progress, was, that the paper currency sunk considerably below its usual value in the precious metals; in other words, all necessaries became considerably dearer than they had formerly been; while foreign exchanges were executed at a loss of from fifteen to twenty per cent. At this time, a guinea could not be obtained for less than twenty-seven shillings in bank notes. On the causes of this derangement being explained by a committee of parliament, a panic took place, followed by a number of mercantile failures. Yet even at this time of unexampled distress, the means of redemption were in preparation.

RUSSIAN CAMPAIGN.

The power of Bonaparte, procured and brought about by an antagonism to the old despotisms, might have been permanent, if managed with discretion. It was used, however, in such a way as to produce a decided reaction throughout Europe in favour of those antiquated systems, which, twenty years before, had trembled under the ban of popular sentiment. The exclusion of British goods—a measure which he had dictated in resentment against England—proved the source of inconceivable distress, oppression, and hardship throughout the continent, and was greatly instrumental in exciting a spirit of hostility against him. The very circumstance of a foreign power domineering over their native princes, raised a feeling in favour of those personages, which, being identified with the cause of national independence, acted as a very powerful stimulant. On the other hand, a sense of the grasping ambition of Napoleon—of his hostility to real freedom—of his unscrupulousness in throwing away the lives of his subjects for his own personal aggrandisement—had for some time been gaining ground in France itself.

In 1812, when already the transactions in Spain had done a little to shake the idea of his infallibility, Alexander Emperor of Russia ventured upon a defiance of his decrees against British merchandise, and provoked him to a renewal of the war. With upwards of half a million of troops, appointed in the best manner, he set out for that remote country, determined to reduce it into perfect subjection. Here an accident of nature did that for mankind which they had been unable, with their utmost efforts, to do for themselves. The city of Moscow, after being possessed by the French troops in September, was destroyed by incendiaries, so that no shelter remained for them during the ensuing winter. Napoleon was obliged to retreat; but, overtaken by the direst inclemency of the season, his men perished by thousands in the snow. Of his splendid army, a mere skeleton regained central Europe. Returning almost alone to Paris, he contrived with great exertions to reinforce his army, though there was no replacing the veterans lost in Russia. Early in 1813, he opened a campaign in northern Germany, where the Emperor of Russia, now joined by the King of Prussia, and various minor powers, appeared in open field against him. After various successes on either side, an armistice was agreed to on the 1st of June, and Bonaparte was offered peace on condition of restoring only that part of his influence and his dominions which he had acquired since 1805. Inspired with an overweening confidence in his resources and military genius, he refused these terms—and lost all. At the end of the armistice in August, his father-in-law, the Emperor of Austria, joined the allies, making up a force of 500,000 men against 300,000, which was the utmost he could at present bring into the field. Henceforth he might be considered as overpowered by numbers. By steady though cautious movements, the allies advanced nearer and nearer to France, driving him reluctantly before them, and increasing their own force as the various states became emancipated by their presence. At the close of 1813, they rested upon the frontiers of France, while Lord Wellington, after two splendid campaigns in Spain, had advanced in like manner to the Pyrenees.

DOMESTIC AFFAIRS—WAR WITH AMERICA.

Some changes had in the meantime taken place in the British administration. On the 11th of May 1812, the premier, Mr Percival, was shot in the lobby of the House of Commons, by a man named Bellingham, whom some private losses had rendered insane. Lords Liverpool and Castlereagh then became the ministerial leaders in their respective houses, but were quickly voted down by a majority of four, upon a motion by Mr Stuart Wortley, now Lord Wharncliffe. Another treaty with Lords Grenville and Grey, which this vote rendered necessary, was rendered ineffectual by the intrigues of the regent's personal friends, the Earl of Moira and Mr Sheridan—two men of generally popular qualities, but who sacrificed consistency and even character for their royal patron. The ministry was finally rendered satisfactory to parliament, by the admission of Earl Harrowby as president of the council, Mr Vansittart as chancellor of the exchequer, and Lord Sidmouth (formerly premier while Mr Addington) as secretary for the home department; Lord Liverpool continuing as premier, and Lord Castlereagh as foreign and war secretary. Notwithstanding the successes which were at this period brightening the prospects of Britain, her sovereign and his ministers were highly unpopular. The latter were generally stigmatised as the weak tools of three influences which at this time presided over public affairs—the aristocracy and borough proprietors, the regent, and the secret friends of that latter personage, among whom were reckoned the Hertford family, whose connection with his royal highness was of a nature highly obnoxious to scandal. The regent himself had lost the favour and esteem of his subjects, in consequence of the frivolous and sensual tenor of his private life, and of the persecution which his consort had suffered for many years under his express agency. The general discontents were increased by the effects of the orders in council, for prohibiting the commerce of neutral states. Vast multitudes of the lower orders were thrown idle by the stagnation of manufactures, and wreaked their vengeance in commotion and riot. The middle classes expressed their dissatisfaction by clamours for parliamentary reform. At this unhappy crisis, provoked beyond all patience by the orders in council, as well as by a right assumed by British war-vessels to search for and impress English sailors on board the commercial shipping of America, that country, June 1812, declared war against us. Before the news had reached our shores, the orders had been revoked by the influence of Lord Liverpool; but the Americans, nevertheless, were too much incensed by a long course of injury and suffering to retrace their steps. During the summer and autumn, several rencontres took place between single American and British ships, in which, owing perhaps to superior numbers of men, the former were successful. It was not till June 1, 1813, when the Shannon and Chesapeake met on equal terms, that the British experienced any naval triumph in this war with a kindred people. On land, the Americans endeavoured to annoy the British by assaults upon Canada, but met with no decisive success. The British landed several expeditions on the coast of the States, and were successful at Washington, at Alexandria, and one or two other points, but experienced a bloody and disastrous repulse at New Orleans. The war ended, December 1814, without settling any of the principles for which the Americans had taken up arms. But while thus simply useless to America, it was seriously calamitous for Britain. The commerce with the States, which amounted in 1807 to twelve millions, was interrupted and nearly ruined by the orders in council, and the hostilities which they occasioned: henceforth America endeavoured to render herself commercially independent of Britain, by the encouragement of native manufactures—a policy not immediately advantageous, perhaps, to herself, but infinitely less so to Great Britain. The fatality of the Berlin and Milan decrees to Napoleon, and of the orders in council to the interests of Britain, shows how extremely dangerous it is for any government to interfere violently—for any avowed end whatever—with the large commercial systems upon which the immediate interests of their subjects depend.

PEACE OF 1814—ABDICATION OF NAPOLEON.

At the close of 1813, it was evident that Bonaparte could hardly defend himself against the vast armaments collected on all hands against him. At the end of January 1814, having wrung from France almost every youth capable of bearing arms, he opposed the allies on the frontiers, with a force much less numerous and worse disciplined. Even now he was offered peace, on condition that he should only retain France as it existed before the revolution. But this was too humiliating to his spirit to be accepted; he trusted too much to the faithless hope that, at the worst, his father-in-law would not permit him to be dethroned. Two months were spent in almost incessant conflict with the advancing allies, who on the 30th of March entered Paris in triumph, and, in the course of a few days, substituted the ancient rule of the Bourbons for that of Napoleon, who was granted only the sovereignty of Elba, a small island in the Mediterranean.

CONGRESS OF VIENNA.

In the measures for settling France under Louis XVIII., Great Britain concurred by her representative Lord Castlereagh, who attended the allies during the campaign of 1814; and peace was proclaimed in London on the 20th of June. France was deprived of all the acquisitions gained both under the republic and the empire, and restored to the rule of a family of which it was emphatically said that they had forgot nothing and learned nothing during their exile. The Emperor of Russia and the King of Prussia visited England in June, and were received with all the honours due to men who were considered as the liberators of Europe. Wellington, now created a duke, received a grant of L.400,000 from the House of Commons, in addition to one of L.100,000 previously voted; and had the honour to receive the thanks of the house in person for his services, which were generally esteemed as comparable only to those of Marlborough a century before. Representatives from the various European powers concerned in the war, met at Vienna, October 2, in order to settle the disturbed limits of the various countries, and provide against the renewal of so disastrous a period of war. Ideas of liberalism and of national and individual independence were now suffering under general obloquy, as having been the original cause of the war; it was therefore natural, however wrong, that the congress of Vienna should have been less actuated by a sense of justice than of expediency. The powers in deliberation certainly violated every correct principle in their treatment of Norway, of Saxony, of Poland, of Belgium, of Genoa, and of Italy, which they transferred from one domination to another, without the least regard to the rights or predilections of the inhabitants. It was represented by the friends of the congress, that these alterations of boundaries were dictated by a view solely to the general interests of Europe; but others saw more immediately a spoliation of territory, by which every power except Great Britain directly profited; while the complaints of the nations thus tampered with appealed to a principle with which every people could sympathise.

TEMPORARY RESTORATION OF NAPOLEON—BATTLE OF WATERLOO.

In March 1815, the proceedings of the congress were interrupted by intelligence that Napoleon had landed in France, and was advancing in triumph to the capital. He had been encouraged by various favourable circumstances to attempt the recovery of his throne; and so unpopular had the new government already become, that though he landed with only a few men, he was every where received with affection, and, on the 20th of March, was reinstated in his capital, which had just that morning been deserted by Louis XVIII. The latter sovereign had granted a charter to his people, by which he and his successors were bound to rule under certain restrictions, and with a legislature composed of two chambers, somewhat resembling the British houses of parliament. Bonaparte now came under similar engagements, and even submitted to take the votes of the nation for his restoration, on which occasion he had a million and a half of affirmative voices, against less than half a million of negative, the voting being performed by ballot. His exertions to reorganise an army were successful to a degree which showed his extraordinary influence over the French nation. On the 1st of June, he had 559,000 effective men under arms, of whom 217,000 were ready to take the field.

A Prussian army of more than 100,000 men, under Blucher, and one of about 80,000 British, Germans, and Belgians, under Wellington, were quickly rendezvoused in the Netherlands, while still larger armies of Austrians and Russians, making the whole force above a million, were rapidly approaching—not, it was professed, to make war on France, but against Bonaparte alone, who was denounced as having, by his breach of the treaty, "placed himself out of the pale of civil and social relations, and incurred the penalty of summary execution." Napoleon, knowing that his enemies would accumulate faster in proportion than his own troops, crossed the frontier on the 14th of June with 120,000 men, resolved to fight Blucher and Wellington in detail, if possible. The rapidity of his movements prevented that concert between the Prussian and English generals, which it was their interest to establish. On the 16th, he beat the former at Ligny, and compelled him to retire. He had at the same time entrusted to Marshal Ney the duty of cutting off all connection between the two hostile armies. His policy, though not fully acted up to by his marshals, was so far successful, that Blucher retired upon a point nearly a day's march from Wellington. After some farther fighting next day, he brought his whole forces to bear, on the 18th, against Wellington alone, who had drawn up his troops across the road to Brussels, near a place called Waterloo. The battle consisted of a constant succession of attacks by the French upon the British lines; assaults attended with great bloodshed, but nevertheless resisted with the utmost fortitude till the evening, when Blucher came up on the left flank of the British, and turned the scale against the French, who had now to operate laterally, as well as in front. The failure of a final charge by Napoleon's reserve to produce any impression on the two armies, decided the day against him; his baffled and broken host retired before a furious charge of the Prussian cavalry, who cut them down unmercifully for several miles. On his return to Paris, Napoleon made an effort to restore the confidence of his chief councillors, but in vain. After a fruitless abdication in favour of his son, he retired on board a small vessel at Rochfort, with the intention of proceeding to America, but being captured by a British war-vessel, was condemned by his triumphant enemies to perpetual confinement on the island of St Helena, in the Atlantic, where he died in 1821.

Louis XVIII. was now restored, and the arrangements of the Congress of Vienna were completed. The expenses of Great Britain during this last year of hostilities exceeded seventy millions, and the national debt, which in 1793 had been 230,000,000, now amounted to 860,000,000, or nearly three times the former sum.

HOLY ALLIANCE.

It has been stated that a reaction had taken place throughout Europe, during the latter years of Napoleon, against the innovatory doctrines, which, by producing the French revolution, had been the cause, innocent or guilty, of so much ruinous warfare. Encouraged by this sentiment, the three sovereigns of Austria, Prussia, and Russia, had no sooner settled the new government of France, than they entered, September 26, 1815, into a personal league or bond for assisting each other on all occasions when the least commotion took place among their respective subjects. This treaty was composed in somewhat obscure terms, and from its professing religion to be the sole proper guide "in the councils of princes, in consolidating human institutions, and remedying their imperfections," was burlesquely termed the Holy Alliance. It was published at the end of the year, and communicated to the Prince Regent of England, who approved, but did not accede to it. By the liberal party in England, it was denounced as a hypocritical conspiracy against the liberties of mankind.

The reaction had also its effect in Great Britain, in fixing the power of that strange mixture of aristocratic influences, which, by appointing and composing the two houses of parliament, might be said to constitute the government. The security of this predominating power was indicated by several acts in which their peculiar interests were consulted at the expense of all the remaining classes of the community. In the preceding year had been passed an act, prohibiting the importation of grain from the now opened continent, when the price in this country should be less than eighty shillings per quarter. An attempt to continue the income and property taxes, which pressed with greatest severity on the wealthy and landed classes, was also negatived.

THE PRINCESS CHARLOTTE.

In May 1816, the Princess Charlotte, only child of the prince regent, was married to Prince Leopold of Saxe Coburg, a young officer who had gained her affections when attending the allied sovereigns at the British court. In November 1817, to the inexpressible grief of the whole nation, the young princess died in childbed, after having given birth to a dead son. Her surviving husband continued to enjoy the allowance fixed by parliament upon the pair (L.60,000 a-year), excepting L.10,000, which had been given under the denomination of pin-money to the princess.

In August 1816, a British armament under Lord Exmouth bombarded Algiers, and reduced that piratical state to certain desirable conditions respecting the treatment of Christian prisoners.

PERIOD OF GENERAL DISTRESS.

The year 1816, and the four following years, will always be memorable, as forming an epoch of extraordinary distress, affecting almost every class of the community. The liberation of European commerce at the end of the war, produced a proportionate diminution of that trade which England had previously enjoyed, through her exclusive possession of the seas. While all public burdens continued at their former nominal amount, the prices of every kind of produce, and of every kind of goods, had fallen far below the unnatural level to which a state of war and of bank restriction had raised them; and hence the expenses of the late contest, which had never been felt in the fictitious prosperity then prevalent, came to press with real severity upon the national resources, at a time when there was much less ability to support them. To complete the misery of the country, the crop of 1816 fell far short of the usual amount, and the price of bread was increased to an amount more than double what has since been the average rate. Tumultuary proceedings took place in various parts of the country, and a desire for a reform in the House of Commons, by which alone was there any hope of reducing the public expenditure, began to take deep root among the lower orders. At a large metropolitan meeting of the working classes, in December, a portion of the mass became suddenly animated with what appeared a spirit adverse to the public peace, and, rushing in a riotous manner through the streets of London, gave serious or assumed alarm to the government and its supporters. An apothecary named Watson, and three other persons, were seized and imprisoned for being concerned in this riot. On the 28th of January 1817, when the prince regent was returning from the ceremony of opening parliament, his carriage window was said to have been perforated by a stone and two bullets, the latter supposed to have proceeded from an air-gun. The government then adopted expedients, which have since met with general condemnation, for counteracting the force of the popular spirit. They endeavoured to make it appear that an extensive conspiracy had been formed for the overthrow of the government—though the reports of their parliamentary committees, upon the documents submitted as evidence of that fact, only served by their vagueness of expression to excite suspicions against their ministerial policy. Of the four rioters who were charged with high treason, a conviction was only obtained against one. Such unanimity, however, prevailed between the ministry and the parliament, that, at the close of February, an act was passed for the suspension of habeas corpus, and for several other objects hostile to popular rights. The ministers also sent emissaries into the country, not only for the legitimate purpose of gathering information respecting the state of the public mind, but to mingle with the unemployed and starving workmen, to foment their discontents, and lead them into such partial demonstrations of violence, as might at once enable the ministers to obtain a few victims for the terror of the rest, and, by convincing the wealthier orders of the reality of a conspiracy, induce them to give more effectual support to his majesty's government. Many persons were accordingly imprisoned, and, by virtue of the suspension act, detained at the will of the ministers. Even the liberty of the press, which has always been so dear to the English bosom, was quietly yielded by parliament to Lord Sidmouth, the home-secretary, who, upon the authority of the crown lawyers, gave permission to justices of peace to seize and hold to bail any person whom they might find guilty of publishing seditious or blasphemous papers. It is more gratifying to mention, that, in April, parliament granted half a million for public works, in order to employ the discharged operatives. By another array, however, of proofs of the alleged conspiracy, the suspension of the habeas corpus act was continued beyond the close of the session. In autumn, the ministers experienced a noted defeat, in the prosecution of Mr William Hone, for publishing what were styled blasphemous parodies upon the litany, and other parts of the church service. The severe measures of this administration are chiefly attributed to Lord Castlereagh, a statesman described as personally amiable in a high degree, but actuated by principles which have not for a long period been familiar to the British people.

THE MANCHESTER MEETING OF AUGUST 1819.

A temporary revival of prosperity occurred in 1818, but was quickly followed by the former distress. In the autumn of 1819, the misery of the working classes had reached its greatest height, and still parliamentary reform was demanded as the only measure which could permanently improve their prospects. On the 12th of July, at a public meeting in the unrepresented town of Birmingham, an attorney was elected to proceed to Westminster, and openly claim to be received as a member of parliament on their behalf. On the 16th of August, a vast body of operatives assembled at Manchester, in an open space of ground called St Peter's Field, for a similar purpose, though professedly to petition for parliamentary reform. Though they had come in a kind of regular array, and bearing banners with inscriptions, no symptom of violence was observable in their proceedings; when suddenly a body of troops, consisting chiefly of yeomanry, dashed into the mass, trampling down many persons of both sexes under the horses' feet, and killing and wounding others with their sabres. The meeting was dispersed by these means, and Messrs Hunt and Johnston, the principal orators, were apprehended. But the tragic nature of the event, combined with a consideration of its being an invasion of the popular right of meeting for redress of grievances, produced a very general feeling of resentment throughout the country, even among some who were habitually the defenders of ministerial measures. The magistrates who conducted the attack were instantly thanked by the government; but their fame is not of an enviable character. In a country where social advancement is so great as in Britain, no proceedings, public or private, by which the poorer classes may be led to think themselves objects of persecution or even of neglect with the rich, can receive the unqualified approbation of any considerable portion of the community.

THE "SIX ACTS."

When parliament reassembled in November, there was an evident increase of attachment to the ministry, and, in addition to the strong measures already taken for suppressing popular discontent, six acts were passed, which have since been frequently stigmatised as inimical to the liberty of the subject. One took away the common-law right to traverse an information or indictment from one session to the next. The second imposed a stamp duty on all publications communicating events or occurrences, or conveying remarks on affairs of church and state, if under a certain number of sheets, or published periodically oftener than once in twenty-six days. The third enacted that the publishers of such works should give security before commencing them, and that a second commission of the offence of publishing a blasphemous or seditious libel should be punishable by transportation. The other acts were for the prevention of secret training to arms, which was declared a capital offence—the seizure of arms—and the restriction of the right of calling a public meeting to magistrates. Earl Grey denounced these measures as a new system of government by terror and coercion; but they were nevertheless approved by great majorities. They have not since been repealed; but no party now suffers from them except that by which they were enacted.

The year 1819 was remarkable, among other things, for the provision made, by act of parliament, for the resumption of cash payments at the bank.

ACCESSION OF GEORGE IV.

On the 29th of January 1820, George III. died at Windsor, in his eighty-second year, without having experienced any lucid interval: his consort, Charlotte of Mecklenburgh, had died in November 1817. The prince regent was immediately proclaimed as George IV.; but there was no other change to mark the commencement of a new reign. A few days after the decease of George III., died the Duke of Kent, fourth son of their late majesties, leaving an infant daughter Victoria, who has since become heiress-presumptive.

CATO STREET CONSPIRACY.

The bloodshed at Manchester, and other ministerial measures, inspired a small band of desperate men with the atrocious design of assassinating the ministers at a cabinet dinner, and thereafter attempting to set themselves up as a provisional government. On the 23d of February 1820, they were surprised by the police in their place of meeting, and, after a desperate resistance, five were seized, among whom one Thistlewood was the chief. These unhappy men were tried for high treason, and executed. Nearly about the same time, an attempt was made by the workmen in the west of Scotland to bring about some alteration in the state; and two men, supposed to have been deluded by government spies, were executed. There is little reason to doubt that the violence of the people at this period was solely the result of those severe measures which the government had taken for the repression of what had previously been only an imaginary disposition to insurrection.

THE QUEEN'S TRIAL.

On the accession of the king, his consort's name had been omitted from the liturgy. This and other insults induced her to return to England, June 1820, to the infinite embarrassment of the king and his ministers. Her majesty, who had long been befriended by the Opposition, was received by the people with the warmest expressions of sympathy. Her guilt, if any really attached to her, was overlooked on account of the infinitely more notorious debaucheries of her husband, and the persecutions which she had suffered at his hands for twenty-four years. The king, having had a system of observation planted round her majesty during her late residence in Italy, caused a bill of pains and penalties to be brought into parliament, July 6, against her majesty. The House of Lords thus became a court for her trial. The examination of witnesses occupied several weeks, and daily during that time were the moral feelings of the public shocked by details of the most revolting kind. Yet no evidence of criminality could soften the indignation with which almost all classes of the community regarded this scandalous prosecution. Though the bill was read a second time by a majority of 28, in a house of 218, and a third time by 108 against 99, the government was compelled to abandon it, leaving the queen and the people triumphant.

ROYAL VISIT TO IRELAND, &c.

In July 1821, the coronation of George IV. took place under circumstances of elaborate splendour, contrasting strangely with the depressed state of the country. On this occasion, the queen made an attempt to enter Westminster Abbey, for the purpose of witnessing the ceremony, but was repelled by the military officers who guarded the door; an insult which gave such a shock to her health as to cause her death on the ensuing 7th of August. During this month, the king paid a visit to Ireland, where he was received with much cordiality by all classes of that excitable people, notwithstanding his known hostility to the Catholic claims. In September, he paid a visit to the kingdom of Hanover. In August of the ensuing year, he completed this series of visits by a voyage to Scotland, where he was also received with extreme kindness; a feeling, however, attributable in both cases rather to the novelty of the occasion, and a national feeling of the honour of the royal presence, than to a sincere approbation of either the public measures or the private character of the king. During his absence in Scotland, his leading minister, the Marquis of Londonderry (formerly Lord Castlereagh) put an end to his own life, in consequence of a morbid sense of the difficulty of his position in regard to continental affairs. He had involved himself and his country in the policy of the arbitrary governments, to a degree which threatened to bring both into disgrace, and he did not know how to retrieve his steps. Both in Italy and in Spain, there was a strong disposition to popular ascendancy, and while this was deeply sympathised with in England, the minister was pledged to co-operate in its suppression. This, indeed, was just the crisis between the late reaction for controlling popular movements and the present reaction for giving them play; and Lord Londonderry was the victim at once of his own rashness and of the altered views of his countrymen.

ASCENDANCY OF MR CANNING.

His successor in the direction of foreign affairs was Mr Canning, who had left the cabinet two years before on account of the prosecution of the queen, and was just at this time preparing to leave the country as governor-general of India. Though apparently a willing participator in all the anti-popular measures of the last few years, and a zealous enemy to parliamentary reform, Mr Canning was a man in many respects calculated to please and gain the affections of a people like the English. He very quickly released the country from the obligations under which his predecessor had placed it regarding the movements in Italy and Spain, and, from being a tame follower of the continental despotisms, restored the country to its more proper condition of an arbitress among other nations. From this time, moreover, there was a marked amelioration in the system of home affairs, which, united with the restoration of comparative prosperity, had the ultimate effect of producing a degree of internal tranquillity beyond what had been experienced since the early days of Mr Pitt.

COMMERCIAL DISASTERS OF 1825-6.

The two ensuing years were characterised by an extraordinary activity in almost all departments of trade and commerce. Mr Huskisson, an able commercial minister introduced by Mr Canning, originated several measures of a highly important kind; especially the repeal of all duties on goods passing between Great Britain and Ireland—an alteration in the duties affecting the silk manufacture—the repeal of the combination laws, and of the law against the emigration of artisans; while the executive formed commercial treaties on the reciprocity system, with various countries of Europe, and, acknowledging the independence of the revolted Spanish colonies in America, drew them as additional customers into the British market. Capital so far exceeded the ordinary means of its employment, that many joint-stock companies were formed as a means of giving it a wider range than that to which it was usually limited. Some of these associations professed objects which were by long established usage the business of individuals alone, and of a comparatively humble class. In truth, there seemed to be no kind of employment or traffic so very mean as to be beyond the reach of this mania. The depressed state of trade in 1821 and 1822 had led to a diminished importation and production of goods, and to an advance of prices in 1823. The consequences of this was a sudden and unusually active demand, and a powerful reaction of supply, which did not cease till production had proceeded far beyond the bounds of moderation. The delusion was kept up longer than it would otherwise have been, through the facilities afforded by large issues of paper. The first symptom of something being wrong was the turning of the exchange against England. A diminution of issues at the bank followed. Merchants began to feel a difficulty in answering pecuniary obligations. Then took place a run upon the banks, which began to give way, first in London and then in the country. Between October 1825 and February 1826, fifty-nine commissions of bankruptcy were issued against English country banks, and four times the number of private compositions were calculated to take place during the same period. While the merchant and manufacturer were without credit, their inferiors were without employment, and distress reached almost every class of the community. Some liberal pecuniary measures on the part of the bank of England helped in a short time, rather by inspiring confidence than by actual disbursement of money, to retrieve the desperate circumstances of the country.

MINISTERIAL CHANGES OF 1827-8.

In spring 1827, the illness of Lord Liverpool (followed soon after by his death) opened the way for Mr Canning's promotion to the first place in the administration; on which occasion all the Tories of the old school resigned their places, leaving the reins of government in the hands of a much more yielding and popular party. Mr Canning, however, sunk under the new load imposed upon him, and died in the ensuing August, with more of the regrets of his country than had ever perhaps honoured the memory of any minister. His friend Lord Goderich succeeded as premier, but, finding the duties above his strength, resigned in January 1828, when the Duke of Wellington was appointed in his place.

CATHOLIC EMANCIPATION.

From the year 1805, the Catholic claims had been a prominent subject of parliamentary discussion, and since 1821 they had enjoyed a decided majority in the House of Commons. Almost despairing of their cause, while left to the progress of mere opinion in the English aristocracy, the Irish Catholics had in 1824 united themselves into an association, with the ill-concealed purpose of forcing their emancipation by means of terror. An act was quickly passed for the suppression of this powerful body; but it immediately reappeared in a new shape. In fact, the impatience of the Catholic population of Ireland under the disabilities and degradation to which they were subjected on account of religion, was evidently becoming so very great, that there could be little hope of either peace or public order in that country till their demands were conceded. The English, through the influence of an adverse faith, and a habitual want of sympathy with the complaints of this alien race, lent no weight to the agitation with which the ministry and the local government were assailed; the king, moreover, was decidedly hostile to emancipation: nevertheless, the subject rapidly acquired importance with all classes, and in all parts of the empire. In spring 1828, a kind of preparation was made for the concession, by the repeal of the test and corporation oaths—a measure forced upon the government by a triumph of the Whigs. The ministry soon after received a still more alarming proof of the growing force of the question. Mr Vesey Fitzgerald had vacated his seat for the county of Clare, on becoming president of the board of trade. He was an emancipationist, and possessed great influence in the county; but he was also a member of an anti-Catholic administration. As an expedient for annoying the ministry, the Catholic Association, and all the local influences on that side, set themselves in motion to procure the return of Mr Daniel O'Connell, the most distinguished orator of the Catholic party. To the infinite surprise of the whole nation, Mr O'Connell was returned by a great majority; it was even surmised, upon good authority, that the laws for the exclusion of Catholics from parliament would be unable to prevent him from taking his seat. The Duke of Wellington now began to see the necessity of taking steps towards a settlement of this agitating question; the first and most difficult was to overcome the scruples of the sovereign. At the opening of the session of 1829, in consequence of a recommendation from the throne, bills were introduced by ministers for removing the civil disabilities of Catholics, and putting down the Catholic Association in Ireland; and notwithstanding a great popular opposition, as well as the most powerful exertions of the older and more rigid class of Tories, this grand measure of toleration was carried by a majority of 353 against 180 in the House of Commons, and 217 to 112 in the House of Lords. The ministers gained by this desertion of their professed principles, what every body of men, adopting a similar line of conduct, may reasonably expect—the enmity of their former friends, and a cold distrustful toleration at the hands of their former opponents. In Ireland, public tranquillity was far from being re-established; a matter of wonder to some and of reproach to others, who, having been told that the Catholic disabilities were the principal cause of discontent in the country, expected that their removal would be the signal for the immediate access of a contrary feeling. As well might we expect to see a man newly relieved from the rack, resume at once his usual equanimity, or employ his torn and bleeding limbs in dancing for joy.

DEATH OF GEORGE IV.—AND CONCLUSION.

In June 1830, after a few months' illness, George IV. died of ossification of the heart, in the sixty-eighth year of his age, after having governed in his various capacities of regent and king for nearly twenty years. Being predeceased by his next brother, the Duke of York, he was succeeded by the Duke of Clarence, who ascended the throne with the title of William IV. The reign of this prince was destined, in the course of events, to be the commencement of a most remarkable era of British history—the era of the remodelling of all those institutions which had come down from antiquity, and which had, for nearly a century, been maintained with so much difficulty, against the sentiments of a large portion of the people. Of this extraordinary revolution, so far as it has advanced, our limits do not permit us to give any account in this place; which is perhaps the less necessary, as the most of our readers may, in the meantime, be supposed to recollect the events with sufficient distinctness. We state with more regret that our narrow space has obliged us to treat various incidents of previous history in a more cursory manner than was to have been wished, and even to omit some events and public topics of no small importance. We believe, however, that we have succeeded in accomplishing one main object—which was, to give an *outline of British history, such as the generality of well-informed persons retain in their memories, from reading larger works*; a sketch fully descriptive of the main current of history—of the motives and movements of the government, and of the progress of the great and never-ceasing contest between the governors and governed—but, that it might be the more likely to impress the memory, burdened as little as possible with details and lateral and subordinate transactions. To those who have many things to study, or little time to employ in any kind of reading, these three sheets—containing the matter of a considerable volume—will suffice to communicate as much of this branch of knowledge as they may be able to acquire; and if any one should be disposed to pursue his studies farther, the means are open to him.

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MECHANICS.

In the strict sense of the word, Mechanics signifies the method of constructing machines to be put in motion, and to answer some useful end, by certain powers, which are either natural or artificial. It will thus be evident that the nature of the powers themselves is not the object of mechanical investigation, but rather the effect of them upon the passive bodies, which have received the conventional appellation of *Mechanics*, and the constructing of these in such a manner that the powers may act upon them with the smallest possible obstruction. We shall treat of this subject in its application to the various practical purposes of human life, embodying these in our description of what are usually denominated the *mechanic powers*.

INTRODUCTORY DEFINITIONS.*

1. Matter is a term denoting that substance of which every thing perceived by our senses is composed. Its relation to mechanics consists in its extension, impenetrability, and inertness.

2. Body is matter rendered palpable to our senses by its being collected in quantity. *Solid* bodies are such as are composed of particles of matter, with such an adhesive affinity, the one for the other, that they cannot be separated without effort; as exemplified in wood, stone, the metals, &c. There are also *fluid* bodies, whose particles adhere so slightly that they can easily be separated one from the other; as in air, wine, water, &c.

3. Divisibility is either a real or imaginary quality of bodies. Every substance may be divided into surprisingly minute parts by mechanical means; such as grinding, hammering, wiredrawing, &c.

4. Space is usually defined by the order of things which co-exist; in this sense, however, it is a mere abstract idea arising from our notion of the actual or possible situation of things amongst themselves. We may rather call space an extension considered as without bounds, immoveable, but penetrable, by matter. In this sense it may be termed *absolute space*.

5. Relative Space is that variable dimension, or measure of absolute space, which our senses define by its relation to bodies within it.

6. Place, or *absolute place*, is that limited portion of infinite space occupied by a body. *Relative place* is the situation which any body occupies when taken in relation to another body, or set of objects.

7. Mobility is that property by which bodies are capable of being transferred or removed from one part to another, or of existing in different parts of space.

8. Masses.—All bodies are porous, from which cause, taken with the extreme minuteness of the particles of which they are composed, it so happens that fluids have the power of insinuating themselves into all bodies; so that a mixture of two fluids will be less in bulk, and occupy less space, than when they are separate, and that the same bulk may contain different quantities of matter or *masses*.

9. Density, strictly speaking, denotes vicinity or closeness of the particles of which a body is composed. In mechanics, however, it is employed to signify the proportion of the number of equal particles, or the quantity of matter in one body, when compared with the number of equal particles in the same bulk of another body: density, therefore, is directly as the quantity of matter, and inversely as the magnitude of the body. For example, a pound of fir-wood will occupy a much larger space than a pound of lead; hence it is said that lead is a more dense body than wood.

10. Motion is a simple idea. When a boy whips a top, it turns round, or is in motion; but when he desists, it falls down, or is at *rest*.

The motion of bodies is considered either *absolute* or *relative*. A body is in *absolute motion* while it is actually passing from one point in fixed space to another; and in *relative motion* while its position is varying with respect to other bodies.

When a body is in *motion*, as much force is required to make it *rest*, as is required, while at rest, to put it in motion. Thus, suppose a boy strikes a ball from a trap, and another stands by to catch it, it will require as much strength or force to stop the ball, or put it in a state of rest, as the other gave to put it in motion, allowing for the distance the two boys stand apart. No body or part of matter can give itself either motion or rest; and, therefore, a body at rest will remain so for ever, unless it be put in motion by some external cause; and a body in motion will move for ever, unless some external cause stops it. For example, the reason why the top stops when the boy leaves off whipping, is, that the friction of its point upon the ground (or, if a boy were driving a hoop, and desisted from striking it), and the resistance of the air, soon put it at rest. Somewhat, too, might be said on the gravity and attraction between the top and the hoop, and the earth.

A body in motion will always move on in a straight line, unless it be turned out of it by some external cause. Thus we see that a ball rolled along the ice, if the surface be very smooth, will continue its motion in a straight line till it is stopped by the friction of the ice and air, and the force of attraction and gravitation.

The swiftness of motion is measured by the distance of place, and the length of time in which it is performed. Thus, if a golf-ball and a cricket-ball move each of them twenty yards in the same time, their motions are equally swift; but if the cricket-ball moves two yards while the golf-ball is moving one, then is the motion of the cricket-ball twice as swift as the other.

But we must also consider the quantity of the motion measured by its swiftness, as in the above instances, and the quantity of matter moved at the same time. Thus, if the cricket-ball be equal in bulk and weight to the golf-ball, and move as swiftly, then it hath an equal quantity of motion. But if the cricket-ball be twice as big and heavy as the golf-ball, and yet moves equally swift, it hath double the quantity of motion; and so in proportion.

With respect to *relative* and *absolute* motion, Dr Gregory says, "It is obvious that these two kinds of motion can only coincide when the bodies to which the reference is made are fixed: in other cases, a body in relative motion may or may not be in absolute motion. The determination of the absolute motions, by means of observations on the relative motions, is always a matter of great difficulty; nay, is generally absolutely impossible. Thus, when a ball is discharged from a piece of ordnance, it is possible, by means of the ballastic pendulum, and other contrivances of ingenious men, to ascertain its relative motion; that is, its motion with respect to that place on the earth's surface from which it is projected; but, in order to determine its absolute motion, the diurnal and annual motions of the earth about the sun, and probably the motion of that luminary about the centre of some more extensive system, must be taken into the account; so that, on the whole, this apparently simple inquiry becomes sufficiently complex to baffle the proudest efforts of human intelligence."

11. Time.—As motion cannot be instantaneous, the consideration of time is necessarily involved in it.

12. Absolute Time is a portion of duration whose quantity is only known by a comparison with another portion: the relation, therefore, between any two parts of absolute time, is not to be discovered. *Relative time* is a portion of duration which elapses during any motion of a body, or any succession of external appearances.

"There is a striking analogy between the affections of space and time; hence it is, that time may be represented by lines, and measured by motions. Hence, also, we say that an *instant* is the boundary between any two contiguous portions of time, as a point is the boundary of any contiguous lines. A *moment* is any small portion of time. To render time susceptible of mathematical discussion, it must be conceived as measurable; and, to this end, it is necessary to return to some event which we imagine uniformly requires equal times for its accomplishment. We are furnished with such an account in the complete rotation of the earth upon its axis, which makes out a natural day as an apt and obvious unit of time; this is divided into twenty-four equal parts, called hours: each of these into sixty equal parts, called minutes; and each of these, again, into sixty equal parts, called seconds. A second is the unit of time generally employed in mathematical disquisitions."

12. Velocity.—The quantity of motion is determined by velocity. It is that term which expresses the relation between the space described, by a body that is in motion, and the time which elapses during its description. This is determined by the space uniformly described during a given time.

13. The Direction of a Motion.—This is the position of the line, along which a body moves from one point to another. If a body moves on a straight line, it is termed the direction of the body; but if it moves on a curved body or line, its *direction* is continually changing.

14. Force or Power.—This, when applied in a mechanical sense, is that which effects a change in the state of a body, whether that state be rest or motion. The muscular power of animals, as well as pressure, impact, gravity, electricity, galvanism, &c. are considered as forces, or sources of motion. Bodies exposed to the free action of either of these are put into motion, or have the state of their motion changed. All forces, however various, are measured by the effects they produce in like circumstances, whether the effects be creating, accelerating, retarding, or deflecting motions.

15. Equilibrium signifies an equality of weights, powers, or forces of any sort. When bodies are at rest, they are in a state of equilibrium, or when they are acted upon by different forces, so as to be completely balanced, and have no tendency to move in any direction. Bodies are in motion when in a state of equilibrium—when the resistance to motion and the power producing it are so adjusted, that the result shall be uniform motion. It is by an accurate knowledge of both kinds of equilibrium that the theory can be applied to good practical purposes.

Mechanics, therefore, comprehends the doctrine of the *rest*, the *equilibrium*, and the *motions*. It has been divided into two branches, namely, *mechanics*, properly so called, and *hydraulics*. The former of these embraces *statics*, or the balance-rest of solid bodies; and *dynamics*, which is a consideration of the motion of solid bodies, and their force during the continuance of motion. The latter branch comprehends *hydrostatics*, which refers to the resting equilibrium of liquids or non-elastic fluid bodies; and *hydrodynamics*, which treats of such bodies in motion. *Pneumatics*, or the doctrine of the weight, pressure, and effects of elastic fluids, as air and gaseous bodies, is also referable to this branch of mechanics.

OF THE MECHANICAL POWERS.

The mechanical powers comprehend such simple machines as are useful in comparing the velocity of various bodies, and impressing on them at pleasure a greater or lesser degree of their power; such as making a great weight overcome a smaller one. By any of these powers, we may cause a weight of one pound, by moving through the space of ten feet, raise another of ten pounds through one foot, or *vice versa*. But none of the mechanical powers will be able to move a weight of ten pounds through eleven feet; nor by a single pound moving through a space of nine feet are we able to raise a weight of ten pounds through the space of one foot; so that the mechanical powers cannot make any absolute increase of the power applied; they can merely alter the velocity of that power, and thus transfer it either to a larger or smaller body

* For an account of some of the most important properties of matter, and laws of motion, see "A Popular View of Astronomy," No. 21 of this work.

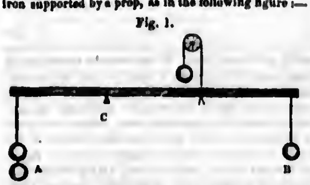
at pleasure. The whole practical part of mechanics depends upon this principle.

The mechanical powers are six in number—namely, the lever, the wheel in axle, the inclined plane, the wedge, the pulley, and the screw.

OF THE LEVER.

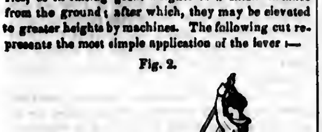
The lever is the most simple of all the mechanical powers, and is generally only a straight bar of wood or iron supported by a prop, as in the following figure:—

Fig. 1.



The weight to be raised is suspended at the short arm of the lever A; and exactly in the inverse proportion of the distance of the weight from the fulcrum, or prop C, is the quantity of weight, as B, necessary to keep it in equilibrio. Thus, if the weight at A be distant one foot, or one inch (for it signifies nothing which), from the prop, it will require an equal weight placed at the same distance on the other side to balance it; that is, if the prop were placed equidistant between where it is at present and the end to which the two balls are suspended. But where it is now placed, it only requires half the quantity of weight to keep it in equilibrio; and if it were removed a tenth part nearer the centre, then only one-third will be required to balance it. It must still be remembered, however, that, if the lever is put in motion, the small or single weight must move through a space ten times as great as that through which the large one passes; so that, in point of fact, there is not any acquisition of power by means of the lever, although it is one of the instruments most commonly used in mechanics, and extremely serviceable in loosening stones in quarries, or in raising great weights to a small distance from the ground; after which, they may be elevated to greater heights by machines. The following cut represents the most simple application of the lever:—

Fig. 2.



The weight to be raised is a log of wood; the lever or handspoke is in the hand of the man; a stone is laid on the ground to act as a prop or fulcrum; the log of wood is to be raised and suspended at the short arm of the lever, on that portion of it which extends beyond the stone.

In making experiments with this sort of lever, it is necessary either to have the short arm greatly thicker than the long one, so that it may exactly balance the longer end, or that portion of it which extends beyond the fulcrum, or a weight must be appended to it exactly sufficient to keep it in equilibrio, otherwise no accuracy can be expected in the experiments.

The lever is the foundation of every kind of balance, whether the common kinds or those known by the name of steelyard, which latter is simply the lever represented in our first cut. For if a scale is appended to the end A of the lever, and a weight, suppose of one pound, be used as a counterpoise to the body which is to be put into the scale, it will show exactly the weight of that body, by putting it at a proper distance from the fulcrum upon the long arm. Suppose the lever to be divided into twelve parts, and if the weight, when placed at the division five from the longer arm, counterpoises that placed in the scale, it shows the body weighs exactly five pounds; if it balances at the sixth division, then it proves that the body weighs six pounds. To this kind of lever may be reduced several useful instruments, such as scissors, snuffers, pincers, &c.

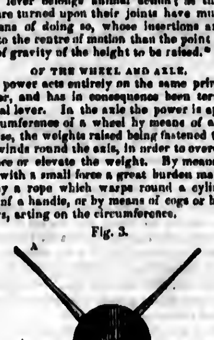
Levers are generally divided into three kinds, according to the respective dispositions of the fulcrum, the power, and the resistance; of these, two are very different in their action. One of these is where the forces act on *contrary* sides of the centre of motion or fulcrum, and another which acts on the *same* side.

The first kind are those where the fulcrum is between the power and the resistance; as the balance, snuffers, scissors, steelyards, &c. The second kind are those where the resistance is between the prop and the power; as oars, rudders of boats, and cutting-knives which are fixed at one end, and doors whose hinges serve as a fulcrum. Those of the third kind are where the power acts between the prop and the resistance; as in sheep-shears, tongs, &c. To this last kind of lever belongs animal action; as the bones which are turned upon their joints have muscles for the means of doing so, whose insertions are much nearer to the centre of motion than the point is to the centre of gravity of the height to be raised.*

OF THE WHEEL AND AXLE.

This power acts entirely on the same principle as the lever, and has in consequence been termed the perpetual lever. In the axle the power is applied to the circumference of a wheel by means of a rope or otherwise, the weights raised being fastened to a rope which winds round the axle, in order to overcome the resistance or elevate the weight. By means of this power, with a small force a great burden may be elevated by a rope which warps round a cylinder, by the aid of a handle, or by means of cogs or bars used as levers, acting on the circumference.

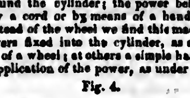
Fig. 3.



Suppose that B C represents the radius of a cylinder, and that B A represents the arm of a lever, by which the power A acts; if the length of B A is to that of B C as three to one, a power of one hundred pounds at A acting in a perpendicular direction at A B will balance a weight E of one hundred pounds. Hence it follows, that to elevate a weight by means of this machine, it is required that the power A should be to the weight E as the radius of the cylinder B C is to the lever B A; or, which amounts to the same thing, as the radius of the cylinder is to the radius of any wheel or handle by which it is turned. If in a state of equilibrium, the power is less than the weight, and that in the proportion of the radius of the cylinder to that of the handle which turns it; so in a state of motion the power has more velocity than the weight, and that in proportion as the radius of the handle or wheel that turns it is to that of the cylinder. This rule supposes that the power is always perpendicular to the radius by which it acts; for the direction of the weight is always perpendicular to the radius of the cylinder, since the cord that sustains it is always a tangent to its circumference.

This machine is often constructed with a cylinder, at the ends of which are placed pivots or axles, turning on solid pieces of timber; and the weight intended to be raised is fixed to the end of a rope, which is coiled round the cylinder; the power being applied either by a cord or by means of a handle. Sometimes instead of the wheel we find this machine made up of levers fixed into the cylinder, as spokes into the nave of a wheel; at others a simple handle serves for the application of the power, as under:—

Fig. 4.

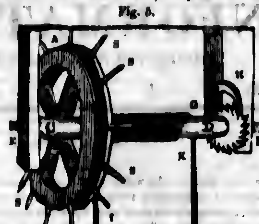


The effect is still the same, only that the rotation is less uniform. In some cases the cylinder is horizontal, as in the above figure, and in some kinds of these machines called cranes; in others it is vertical, as in the capstan, &c. But whether the cylinder be horizontal or vertical, this machine has a manifest advantage over the simple lever in point of convenience; for by the continual rotation of the wheel, the weight may be raised to any height, or from any depth; while by means of a lever it can only be elevated a little way higher than where it rests.

* See some instructive discussions on this interesting topic in Paley's Natural Theology, chapters 7 and 8; also, Animal Mechanics—Library of Useful Knowledge.

Where A B is the wheel (as represented below),

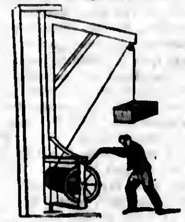
Fig. 5.



and E D F its axle, P the moving power, and W the weight to be raised by means of the rope K coiling itself about the axle, it must be evident that when the large wheel has made one revolution, the weight P will have descended through a space equal to the circumference, and as much of the cord I by which it is suspended will be wound off. On the other hand, the weight W will have ascended only through a space equal to the circumference of the axle; and hence just as much of the rope K will be wound upon it. As the circumference of the wheel, therefore, is to that of the axle, so will the velocity of the moving power be to that of the weight to be raised, and of consequence such will be the force of the machine. Thus, if the circumferences of the wheel be eight, ten, or twelve times as large as that of the axle, one pound applied to the circumference will counterbalance eight, ten, or twelve pounds applied to the axle, and a small additional weight will raise it up.

In great efforts, as it is necessary that the arms of the lever of power should be very long, when, therefore, it is extremely inconvenient to make them so, and when to multiply the number of them would weaken the head of the cylinder too much, it has been the practice to unite the extremities of the radii, or cogs, by a circumference, and form a kind of wheel to which other cogs are adapted, by which it is turned by men; as may be seen in the wheels used in quarries, and for cranes, as represented below.

Fig. 6.

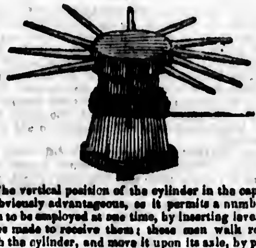


Sometimes cranes are moved by handles S S, &c. (fig. 5.), placed in the circumference of the wheel, which is turned by men's hands. Sometimes the wheel is hollow, and internally provided with steps, on which a man, who is inclosed in the wheel, continually sets his feet, as if he were ascending a stair; the wheel consequently yields to his weight, turns round, and coils up the rope which raises the weight above its axis. When the crane is to be turned by means of men's hands, it may advantageously have cogs all round the circumference, in which a small treddle may be made to work, and be turned by a winch, as represented in fig. 6. Thus, the power of the man who works it will be greatly increased; for his strength will be augmented as many times as the number of revolutions of the winch exceeds that of the axle D, fig. 5, when multiplied by the excess of the winch above the length of the semidiameter of the axle, added to the semidiameter, or half the thickness of the rope K, by which the weight is drawn up. Thus, supposing the weight of the diameter of the rope and axle taken together to be twelve inches, and, consequently, half their diameter to be six inches, so that the weight W will hang at six inches perpendicular distance from under the centre of the axle; let us imagine the wheel A B, which is fixed on the axle, to have eighty cogs, and to be turned by means of a winch, six inches long, fixed on the axis of a handle of eight staves or rounds, working in the cogs of the wheel. Hence is is evident that the winch and handle would make ten revolutions for one of the wheel A B, and its axis D, on which the rope K winds in raising the weight W; and the winch being no longer than the sum of the semidiameters of the great axle and rope, the handle could have no more power on the wheel than a man could have by pulling it round by the edge, because the winch would then have no greater velocity than the edge of the wheel has, which is supposed to be ten times the velocity of the raising weight; so that, in this case, the acquisition of power would be *ten to one*; but if the length of the winch be twelve inches, the power gained will be as *twenty to one*; and if eighteen inches, which is sufficient length for any man to work with, then the acquisition of power will be as *thirty* to *one*; because the velocity of the handle would be thirty times as great as that of the raising weight. And the absolute force of any machine is exactly in proportion to the velocity of the weight raised by it; for none of the mechanical powers are capable of gaining both power and velocity at the same time.

In every kind of crane, it is necessary to have a racked-wheel, as represented at G, on one end of the axle, with a catch H to fall into its teeth, which will at any time support the weight, and keep it from descending if the workman should happen to slip his hold; for in such a case, if there were not a racked or safety-wheel, dreadful accidents would occur in case of suddenly letting go the winch, which would run backwards with such irresistible force, that it would inevitably kill the men working it. For want of this precaution, also, terrible accidents have happened to people inclosed in cranes, by their inadvertently missing a step.

The capstan is a real windlass, and differs only in the position of the cylinder being vertical in place of horizontal, as in the windlass or crane. The manner of power acting upon a resistance or burden, by means of a wheel and axle or windlass, is entirely applicable to the capstan, but the latter is more advantageous. Capstans are often fixed in ships, to raise anchors or other burdens, to which cables are fastened, which are rolled or coiled upon the cylinder, as represented below:—

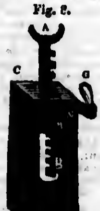
Fig. 7.



The vertical position of the cylinder in the capstan is obviously advantageous, as it permits a number of men to be employed at one time, by inserting levers in holes made to receive them; these men walk round with the cylinder, and move it upon its axle, by pushing the levers before them; and with this additional advantage, that there is no intermission of the power employed.

One of the most useful machines by which a great resistance or weight may be overcome by a small force, is the *creek or jack*. It consists of a perpendicular iron bar, as at A B in the following cut:—

Fig. 8.



This bar is provided with teeth on one of its sides, and works in a moveable case C D; the teeth of the bar fit into those of the nut D D, which turns upon an axle by the means of its handle G N. The action of the nut protrudes the bar, and the weight is raised in consequence, and placed at its head A. When the exertion that each tooth of the nut makes in D to raise the bar, is considered as a weight applied to a lever, it is evident that the power applied to the handle is to that weight as the radius of the nut is to the arm of the handle G N: from which it may be observed, that, by making the radius of the nut very small in proportion to that of the handle, a very considerable weight may be raised by a moderate force.

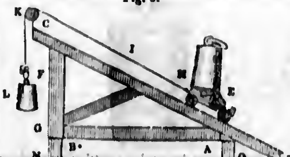
INCLINED PLANE.

The inclined plane is that which forms an angle with the plane of the horizon. This angle may be infinitely small, and then it is confounded with an horizontal line; on the contrary, it may be a right angle, and then the plane becomes vertical; between these two extremes are comprised all the other degrees of inclination.

The principle on which the whole theory of the inclined plane is founded is this: That the time which a rolling body takes to descend upon an inclined plane, is, to the time in which it would descend vertically by its absolute gravity from the highest part of the plane, in the ratio or proportion which the length of the plane bears to its perpendicular height; a body, therefore, placed upon an inclined plane, is partly sustained by the plane itself; and, therefore, a weight or power considerably inferior to that of the body itself is able to support it in its situation on the plane, and even to cause it to ascend. On this account it is, that, in making reservoirs for water, trenches, or fortifications, or in clearing the earth away from the foundations of buildings, the wheelbarrows or other vehicles employed are made to ascend upon a plank in scaffolding, which is placed in the direction of an inclined plane.

This power is represented by the following cut, and the advantage gained by it are exactly in the proportion of the length of the plane to the perpendicular height of it:—

Fig. 9.



Thus, let A B be a plane parallel to the horizon, and C D one inclined to it; suppose, also, the whole length C D to be three times as great as at the perpendicular height G F; in this case the machine E will be supported upon the plane C D, and kept from rolling down upon it by one-third part of its weight.

The force with which a rolling body descends upon an inclined plane will be to that with which it would descend by the power of gravity, as the height of the plane is to the length of it; for, supposing the above machine E to be placed on a plane parallel to the horizon, it will remain at rest on any part of it where it may be placed, and would continue in that situation for ever, unless impelled by some power. But if the plane C D, on which it is above represented, were to be so elevated that its perpendicular height C G would be equal to one-half of its length C D, then the machine E will roll down with half its own weight; for it would require a power (acting in the direction C H) equal to half its weight to keep it from rolling. If the plane C D be elevated so as to be perpendicular to the horizon, the machine E will descend with its whole force of gravity, for this simple reason, that the plane contributes nothing to its support or hinderance of it; for which reason it must require a power equal to the whole force of gravity to keep it from descending.

As the wheels of the machine E are made to move on axles, and the machine is furnished with a staple H, at the back part, for the reception of a rope I, which is fastened to it; if this rope go over the fixed pulley K, and have its other end tied to the ring in the weight L; if the specific gravity or weight of the weight L were equal to the machine E, together with the weight placed on it; and if the length of the perpendicular G F were equal to the length of the plane C D, the weight L would just support the machine E with its appendages; and the application of a very small force would either make it ascend or descend. In the time that the machine would move from C to D, it must rise through the whole height of the plane G F, and the weight will descend from K to N, through a space equal to the whole length of the plane C D.

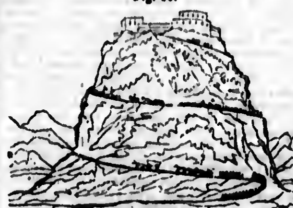
If the plane were now made to move on rollers or wheels placed at N O, and the machine to be supported upon it, the same power will draw the cylinder up the plane, provided the pivots of the wheels be small, and the wheels themselves pretty large. For let the whole machine C D N O be equal in height and length, be furnished with four wheels, and the machine E be laid upon the lower end of the inclined plane C D, and the rope I be extended from the frame of the machine E about six feet parallel to the plane C D, and fixed in that direction to a hook in the wall, this will be sufficient to keep the machine from rolling off the plane. Let the end of a rope be fixed to the end of this apparatus at D, and to the other extremity of this rope let a weight be attached of the same specific gravity as that which drew the machine E up the plane before; and if this is put over a pulley at a little distance, it will draw the whole apparatus C N O D along a horizontal plane, and under the machine E; and when the apparatus has been drawn the length of a plane equal to the length of the apparatus G D, the machine will be raised to C on the inclined plane, which is equal to the perpendicular height G C, above that part B A which may be supposed to represent the horizon.

Hence it is evident that the mechanical advantage gained by the inclined plane is in proportion as the length of the plane exceeds its height. Thus, if a weight of *four* ounces is laid on an inclined plane, the length of which is to its height as two to one, as is the case with that represented above in our cut, it will be counterbalanced by a weight of two ounces, drawing in the line of the rope from H to K, parallel to the plane; or if the length of the plane is to its height as four to one, then the body will be sustained by an ounce only. Hence, in drawing a cart up a hill, if the power of the horse bears the same proportion to the weight of the cart as the height of the hill to its declivity, then the waggon will not run back, and a small additional force will enable it to advance.

The inclined plane, viewed as a mechanical power, may easily be reduced to the lever, because the power acquired by it is always in the proportion of the length to the height, upon the same principle as the power acquired by a lever is in the proportion of the long arm to the short one. To exhibit the reason of the power of an inclined plane, therefore, we have only to construct a lever, the long arm of which is equal to the length of the plane, and the short arm to the height of it; consequently, whatever weight put upon the long arm counterpoises or equilibriates another weight put upon the short one, will also keep the same weight from rolling down the inclined plane.

It is upon the principle of the inclined plane that all roads leading over eminences are constructed. We can easily see that it would be next to an impossibility to ascend a precipitous mountain, as represented in the following cut, without this simple contrivance. The road being cut in a horizontal inclined plane, in the manner of a screw, the inclination is rendered gradual, and it can now be ascended with comparative ease. Waggons filled with stones may be dragged to its summits by the aid of a power equal to about half their weight (varying of course with the inclination of the plane), by the means of horses or other animal power.

Fig. 10.



Although the wedge is ranked as a distinct mechanical power, it must be regarded as belonging to the inclined plane, as it is, in point of fact, nothing more than a *double inclined plane*. To the same mechanical power may also be referred all cutting instruments which act as wedges, as knives, hatchets, &c.

From the same theory of the inclined plane, also combined with that of falling bodies, we deduce some of the most remarkable properties of the pendulum.

THE WEDGE.

The wedge is one of the six simple machines called mechanical powers. It is of a triangular form; the thinnest part is called the point, as in the following cut:—

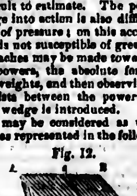
Fig. 11.

and the thicker end B, the head or base of the wedge.

The action of the wedge agrees most with that of the inclined plane. It is made use of to cleave, to raise, or to compress bodies; and to put it in action, the blow or stroke is usually given with a hard body, such as a sledge-hammer or mallet, although sometimes the pressure of a weight is employed. The resistance which may be overcome by means of the wedge often depends upon the tenacity of the parts, which is difficult to estimate. The percussion which puts the wedge into action is also difficult to judge of by the effects of pressure; on this account the theory of the wedge is not susceptible of great precision; although approaches may be made towards accuracy by substituting powers, the absolute force of which is known, as of weights, and then observing what proportion there exists between the power and the resistance when a wedge is introduced.

The wedge may be considered as two equally inclined planes, as represented in the following figure:—

Fig. 12.



Suppose D O F and C E B joined together at their bases *e* E F O, D C is the whole thickness of the wedge at its back A B C D, where the power is applied, E F is the depth, A O the length of one of its sides, equal to C F the length of the other side; and O F as its sharp edge, which is entered into the wood, or other matter to be split, by the force of a hammer or mallet striking perpendicularly upon its base A B C D. Thus, A B in the following cut is drawn into the cleft C D E F.

Fig. 13.

The wedge represented in this figure has a truncated or blunted point; wedges of this shape being always used where the opening is sufficiently wide to admit of an obtuse point being introduced. If the wedge is used for cleaving timber, there is a cleft made for its reception, and it is forced at the back by percussion, as already observed. The friction of the faces of the wedge with the timber should be sufficient to prevent its recoil. But to prevent this, recourse is had to making the sides of the wedge rough; for after the stroke of the mallet, the wedge, unless its weight were equivalent to the attraction of the parts of the timber to be separated, would presently be forced back from the place to which it had been driven by the mallet; and it is chiefly the roughness of the sides of the wedge, and the parts of the wood in contact with it, which, in that operation, keep the wedge from receding. It is that roughness, too, and the bluntness of the edge, which sometimes prevent the wedge from being moved by the stroke of the mallet; for were it not obstructed by roughness and bluntness, it would, according to what we have just now observed, be always driven forward, even by the least percussive force. When the timber does not cleave at any distance before the wedge, there will be an equilibrium between the power impelling the wedge downward, and the resistance of the wood acting against the two sides of the wedge; if the power be to the resistance as half the thickness of the wedge at the back is to either of its sides, and if the power be increased so as to overcome the friction of the wedge, and the resistance arising from the cohesion of the timber, the wedge will be driven in, and the timber split. But when the timber splits, as it commonly does, before the wedge, the power impelling the wedge will not be to the resistance of the timber as half the thickness of the wedge is to one of its sides, but as half its thickness is to the length of the other side of the cleft, estimated from the top or acting part of the wedge; for if we suppose the wedge to be lengthened down to the bottom of the cleft at E F, the same proportion will hold—namely, that the power will be to the resistance as half the thickness of the wedge is to the length of either of the sides; or, which is the same thing, as the whole thickness of the wedge is to the length of both its sides.

To prove this, let us imagine the wedge to be divided lengthways into two equal and similar parts; in which case it will evidently become two equally inclined planes, as may be seen in fig. 12, *e* B E C F. This shape of a wedge may be advantageously used for removing a moulding, or other projection, which is attached to a flat wall. It is evident, that when this half wedge is driven its whole length C F between the wall and mouldings, its inside *e* E F will have separated a quantity of moulding equal to its own length at least. But from what has already been shown concerning the inclined plane, it appears, that, to have an equilibrium between the power impelling the half wedge and the resistance of the moulding, the former must be to the latter as E B to C F, that is, as the thickness of the base which receives the stroke is to the length of the side against which the moulding acts. Since, therefore, the power upon the half wedge is to the resistance against its side as the half back E F is to the whole side C F, it is plain that the power upon the whole wedge, where the whole thickness is double the half back, must be to the resistance of both its sides as the thickness of the whole back is to the length of both sides of the cleft, when the timber splits at any distance before the wedge; for, when the wedge is driven quite into the timber, and the latter splits at ever so small a distance before it, the top of the wedge then becomes the acting part, because the timber does not touch it any where else. And since the bottom of the cleft must be considered as the place where the whole resistance is accumulated, it is plain, from the nature of the lever, that the farther the *power* is from the *resistance*, it acts with the greater advantage.

It has been imagined by some that the power of the wedge was in the proportion of its thickness to the length of its sides; but this cannot be the case, from what we have already shown. We have proved that the wedge is composed of two inclined planes, each of which has a perpendicular height of only one-half the thickness of the wedge itself. It is therefore evident, that, as the power of the inclined plane is always as the length to its perpendicular height, that the power of each of these inclined planes of which the wedge is composed, must be as the length of one side to half the thickness; and, consequently, the power of both must be as the length of both sides to the whole thickness.

If one tumbler is placed within another, as shown at fig. 14, and even a gentle pressure used to the inner tumbler, it is certain to burst the sides in one or more parts. It will be manifest upon a slight consideration.

There is one general theoretical principle, which always seems to hold good respecting the wedge, viz. that its power is increased by diminishing the angle.

Fig. 14.

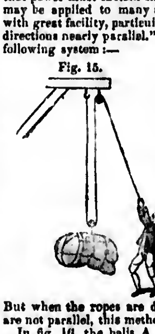
All instruments designed for cutting or stabbing, such as knives, swords, punches, and hatchets, are classed with the wedge. In short, they have at least two inclined planes, sometimes four or more, which form among them an angle more or less acute; nails, pins, and needles, are also included in this class.

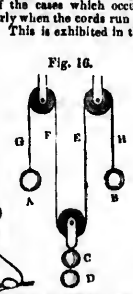
OF THE PULLEY.

The pulley is a small wheel of iron or wood, which is moveable upon its axis, with the circumference hollowed, to receive the cord, which is attached on the one hand to the moving power, and on the other to the resisting force. The wheel or pulley is usually fixed in a block or case, which admits the rope or cord to pass freely over the circumference of the wheel; and the gorge of the pulley, that is, the hollow part of the circumference which receives the cord, is usually hollowed out angularly, and not round; so that the cord, being in some measure pinched or compressed in this angle, will not be liable to glide or slip in its motion. The pulley is said to be *fixed* or *moveable* according as the block is fixed, or rises and falls with the weight. When several pulleys are associated together, they are called a *muffle* or *polyspaston*, of which some are in a fixed block, and others in a moveable one.

Some authors have explained the nature and effects of the pulley, when fixed as a lever, of the first order, and a moveable one as belonging to that of the second order. Others maintain that it is not applicable to the lever; among these was Professor Hamilton, who says that "the pulley cannot properly be considered as a lever of any kind; for when any power sustains a weight by means of a system of pulleys, that power will sustain the same weight if the pulleys be removed, and the ropes be brought over the axles on which the pulleys turned. If the weight were to be raised up, there would in this case be a very great resistance from the friction of the ropes on the axles; and it is merely to avoid this resistance that pulleys are used, which move round the axles with but little friction." "One of the most simple and natural methods," says Dr Gregory, "of computing the power and explaining the effects of the pulley, is by considering that every moveable pulley hangs by two parts of the same rope equally stretched, which must sustain equal parts of the weight; and, therefore, when one and the same rope goes round several fixed and moveable pulleys, since all its parts are equally stretched, the whole weight must be divided equally among all the ropes by which the moveable pulley hangs. And, consequently, if the power which acts on one rope be equal to the weight divided by the number of ropes, that power must sustain the weight. This principle may be applied to many of the cases which occur, with great facility, particularly when the cords run in directions nearly parallel." This is exhibited in the following system:—

Fig. 15. Fig. 16.





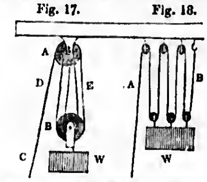
But when the ropes are drawn in directions which are not parallel, this method may lead to error.

In fig. 16, the balls A B are equal in weight to the balls C D; consequently the weight is equally divided by the balls A B, and are in equilibrio; each of the cords G E F H have an equal tension, and the slightest power applied to either of the balls A B would overcome the power of the balls C D; and by pulling the cords, the central balls would be elevated, while the ball A would sink, and B would remain stationary; and thus, by dividing the resistance or weight upon one or more cords, you are able, by pulling the one, to overcome the resistance proportionally. Upon this principle the man represented pulling the rope in fig. 15 can consequently raise nearly twice his own weight, by drawing a cord which has only half of the resistance.

A fixed pulley, fig. 17, A, has no mechanical advantage, as the power and the weight are equal. It is, however, of considerable convenience in accommodating the direction of the power to that of the resistance. Thus, by pulling downwards, we are able to draw a weight upwards. By means of this simple machine, a power, in whatever direction it may be, can be opposed to a resistance in a contrary direction.

The single moveable pulley, or runner, is shown in fig. 16 above, to which the balls C D are attached.

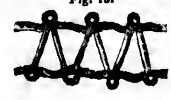
Fig. 17. Fig. 18.



In this machine the same rope extends from C, which represents the power, to the fixed point of the rope, and has an equal degree of tension throughout its whole length. Consequently it is evident that this tension is equal to the power, for in that part of the rope C A between the power and the fixed pulley, the power would be supported by this tension. The weight W is supported by the four cords between D and E. The effect of the weight of the pulley B, if taken into account, it is only necessary to add to it the weight.

In fig. 18, the tension is equally divided among the six ropes, between A and B, which sustain the weight W; and if there were fifty such pulleys, and the ropes running from one to the other in the same manner, each of these would bear its proportional share of the tension. This principle applies to the lacing of stays, beds, &c., as represented below.

Fig. 19.



By the aid of pulleys, burthens are elevated with greater ease, and in a more convenient manner, than they otherwise could be; because the motion is continued, and its direction may be changed so as to bring the whole force which is applied to it into immediate action; for by this means a horse, which can only exert his force in an horizontal direction, is able to overcome a vertical resistance. Burthens are moved more easily by pulleys, because a great weight may be elevated by a small force properly applied. Thus the power applied to a pulley draws in all directions without impediment, in consequence of the cord by which it acts being always a tangent* to the circumference of the pulley, and consequently always perpendicular to the radius. In proportion as the distance of the powers applied to pulleys is more distant from the axis, so is their force the greater in proportion, whether the cords run in several grooves, or several pulleys of different diameters turn upon the same axis. Consequently, those powers which act at the greatest distance from the axis will have the advantage over the other.

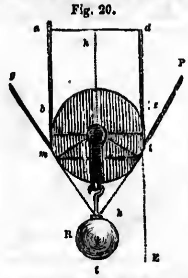
Pullies are of much use in practical mechanics, for by their means great weights may be raised to any height more expeditiously than by any other known method. Besides, their lightness and smallness fit them for being readily and easily conveyed from one place to another. At sea they are of universal utility, for hoisting the sails and yards, and tightening ropes, &c.

It is said that Archimedes, a famous geometrician of Syracuse, who flourished about 220 years before the birth of our Saviour, by means of a machine composed of pulleys, drew up a ship along the strand, in the presence of Hiero, king of Syracuse. But this, although it appears well authenticated, is doubted by various writers, in consequence of the great friction which is attendant on the application of blocks and pulleys, which arises from three causes—1st, The diameter of the axis bearing a considerable proportion to that of the wheels; 2d, Their rubbing against their blocks, or against one another; 3d, The stiffness of the rope that goes over and under them.

* A tangent is a right line drawn perpendicular from the extremity of the radius, and which touches the circumference of a circle without cutting it.

The following figure will explain how a pulley may be considered as a lever of the second order:—

Fig. 20.



This pulley has all the properties of a lever of the second order, when the resistance R is attached to the neck *o i*, and one of the ends of the cord which passes under the pulley is attached to the fixed point *a*, while the other is drawn or sustained by the power *d*; the pulley then becomes what is termed a moveable pulley, and is elevated with the weight; which, consequently, renders it analogous to a lever of the second order *b e*, of which the fulcrum or prop is at *b*, and is divided into two equal parts *b c*, *c e*, by the direction *c* I, of the resistance R. It is on this account only necessary that the power *d* should possess half the force R to keep it in equilibrium; and if the weight is elevated, the power *d* acts through twice the space of that of the resistance R, and consequently with double the velocity. For suppose the centre *c* of the pulley is carried to the point *h*, then there only remains under the line *d a* the portion of the cord which passes under the pulley; the two portions *b a* and *e d*, which mark the space, run through the pulley; then the power has a velocity double to that of the resistance. In this case the cord embraces half the circumference of the pulley, and the directions of the two powers are parallel. The arm of the lever of power is then the diameter *e b* of the pulley, that of the resistance is only the radius *c b*; because, to keep an equilibrium, it is necessary that the power should be to the resistance as the radius is to the diameter.

But if the direction of the power is oblique—as for instance if one end of the cord is attached to the fixed point *g*, while the other is sustained by the power P—it still represents a lever of the second order *m l*, of which the fulcrum will be at *m*, and which will be divided into two equal parts *m i*, *i l*, by the direction *c* I, of the resistance R, as the radius *c b* is to the space *l m* of the arch embraced by the cord.

If instead of drawing the cord upwards it is necessary to draw it downwards, a fixed pulley is placed above the moveable pulley, which makes no change in the effect of the power.

By means of a union of pulleys, a very great weight may be raised by a small force; for it is demonstrable that the force necessary to sustain a weight by means of several pulleys, is to the weight itself as unity is to double the number of moveable pulleys. So that the number of pulleys and the power being given, the weight which the system of pulleys is capable of sustaining is easily found by multiplying the power by double the number of moveable pulleys. For example, suppose that the power is equal to *sixty* pounds, and that the number of moveable pulleys is *three*; *sixty* multiplied by six (being double the number of three) will be equal to three hundred and sixty; which is the weight that this system of pulleys is able to sustain.

By the same mode of calculation, the number of moveable pulleys being given, together with the weight which the tackle is capable of sustaining, the power will be found by dividing the weight by double the number of moveable pulleys. Suppose the weight equal to 1600 lbs., and the number of moveable pulleys to be 8; 1600 divided by 16 (that is, double the number of the pulleys), gives the quotient 200 lbs.; which is the force necessary to sustain 1600 lbs., with such an union of pulleys.

To find the number of moveable pulleys which are requisite to sustain a given weight, with a given power, it will be necessary to divide the weight by the power, and that case half the quotient will be the number sought. Supposing the weight to be 1000 lbs., and the power 100; the apparatus ought to have 10 moveable pulleys; for 1000 divided by 100 gives 20 to the quotient, the half of which is 10.

Mr Nicholson, however, says, "It may be observed that, in all contrivances by which power is gained, a proportional loss is suffered in time. If one man, by means of a tackle, can raise as much weight as ten men could by their unassisted strength, he will be ten times as long about it. It is convenience alone, and not any actual increase of force, which we obtain from mechanics. This is shown by the following example:—

"Suppose a man at the top of a house draws up ten weights, one at a time, by a single rope, in ten minutes. Let him have a tackle of five lower pulleys, and he will draw up the whole ten at once, with the same ease as he before raised up one; but in ten times the time, that is, in ten minutes. Thus, we see the same work is performed in the same time, whether the tackle be used or not; but the convenience is, that if the whole ten weights be joined into one, they may be raised with the tackle, though it would be impossible to move them by the unassisted strength of one man. Or, suppose, instead of ten weights, a man draws ten buckets of water from the hold of a ship in ten minutes, and that the ship being leaky, admits an equal quantity in the same time. It is proposed, that, by means of a tackle, he shall raise a bucket ten times as capacious. With this assistance he performs it, but in as long a time as he employed to draw the ten, and therefore is as far from gaining on the water in the latter case as in the former."

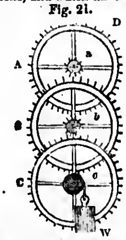
WHEELS may be regarded in the same light as pulleys, to be an assemblage of levers.

There are two kinds of wheels: the first always turn in the same space upon an axis fixed to the centre of the wheel, the journals of which turn in cavities fitted for their reception, and which serve as props; as may be instanced in the wheels of mills, clocks, &c. Wheels of this kind receive or transmit the movement by teeth, or cogs, placed round their circumference.

Those wheels of the other kind which turn upon their circumference, have their centre or axle placed in a direction parallel to the plane on which they move; as may be instanced in the wheels of carts, waggons, and coaches. These have two different movements; the one of their centre, which advances in a straight line; and the other, which consists of all their parts, performing a rotatory motion round the centre. The first kind, or wheels which have but one movement on their own axles, are put in motion by placing on the same axle a small wheel called a pinion, the teeth of which agree or fit into the teeth of another large wheel. In great machines, trundles are frequently substituted for pinions, and perform their office; these are cylinders or spindles, placed parallel to each other, in two plain pieces of wood at the top and bottom. The teeth of the wheel then catch the spindles of the trundle, as they do the cogs of the pinion. The same species of mechanism applies to both; consequently, an explanation of the hooking or catching of wheels and pinions will suffice for both.

This species of wheel is considered as a lever of the first order, the arms of which are the radii of the wheels and pinions, and which have their prop at the axle.

Fig. 21.

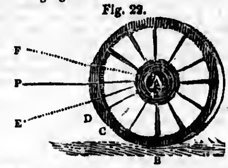


Let A B C, fig. 21, be three wheels of the same diameter, and *a b c* their corresponding pinions; the pinion, or what is the same thing, the cylinder *c*, sustains the weight W; the wheel C, which has the same axle as the cylinder *c*, catches the pinion *b*; the wheel B, which has the same axle as the pinion *b*, catches the pinion *a*; the wheel A, which has the same axle as the pinion *a*, is supposed drawn at its circumference by a rope passing over it at D, to which a power is attached; and the whole system is in equilibrium. In this case the weight W acts by the radii of the pinions, but the power acts by the radii of the wheels. Suppose the radii of the wheels to be four times those of the pinions, and that the first are eight inches, and the other two inches: to preserve an equilibrium, it is necessary that the power should be to the resistance as the product of the arms of the lever of resistance is to the product of the arms of the lever of power; that is, in an inverse ratio of the length of the arms of the lever: these products are found by multiplying the one by the other; that is, the radii of the wheels and the radii of the pinions. The first product will be 512, and the second 8; in which case the supposed power at D ought to be the weight of W, as 8 is to 512, or as 1 is to 64. It consequently follows, that, to preserve the equilibrium, whatever is the diameter of the wheels and the pinions, the power is to the resistance as the product of the radii of the pinions is to the product of the radii of the wheels.

Machines of this form appear capable of giving a great advantage to the force or power over the resistance; this advantage, however, is gained at the expense of time or velocity, when the machine passes from a state of rest to that of motion; because there is a reciprocality betwixt the time lost and the time which is gained.

Respecting wheels of the second order, which have two kinds of motion, such as those of carts, the centre of which advances in a straight line, while the other parts turn round on it, they may be regarded as a lever of the second order, the action of which is repeated as often as there is supposed to be points in the circumference. Each of these points or spokes is the extremity of a radius A B, as represented in the following figure:—

Fig. 22.



These are supported at the end by the ground B; and the other extremity A, charged with the axle which supports the carriage, is at the same time drawn by the power P, which gives it a progressive motion; so that, if the ground were quite level, and the circumference or rim of the wheel devoid of inequalities; if there were no friction between the nave and the axle; and if the direction of the power remained constantly parallel to the plane, then a small force would draw a *very heavy* carriage or carriages, as may be witnessed in one horse drawing on a railway from ten to fifteen tons of coals or other goods; for the resistance which proceeds from the weight rests entirely upon the ground by the radius or spoke A B, or by another spoke which immediately succeeds it. But on common roads these circumstances are seldom or never found to obtain, as roads are never perfectly level, and the wheels of carriages are often so unevenly constructed, besides having the heads of the large nails, by which the rims are attached, left protruding; all of which tend to diminish the animal power employed in propelling carriages and other machines. The consequence is, that, from these causes, the wheels are supported by a radius A C or A D, which is oblique to the direction of the power A P, or to the direction of the resistance A B. Consequently, the weight which is presumed to press at A resists the power, which can only make it advance by causing it to rise as much as the point C or D is above the point B. The animal is therefore obliged to sustain part of the weight of a carriage as if it were placed upon an inclined plane. Even when the circumferences roll upon perfectly level surfaces, there is considerable friction between the axletree and the nave.

These inequalities in the roads have the effect of even changing the direction of the power. For a horse placed higher or lower, in consequence of the unevenness of the road, instead of using his force in the line A P, or parallel to the portion of the plane which supports the wheels, is frequently constrained to employ it by the line A E or A F, which is in an oblique direction to that of the resistance A B, and consequently with diminished power. A single horse may drag a waggon, cart, or carriage, upon a plane with ease, while it will frequently require several to move the same machine up a road or inclined plane.

It has been found by experience, on rough or uneven roads, that to make the horse draw in a rising line is the most effectual, as in the direction of A F; consequently the axle of the wheels should be somewhat lower than the breasts of the horses; as by this means the direction of the power approaches more to the parallelism of each of the small inclined planes which form the inequalities of the road.

Even with the precaution above pointed out, it becomes impossible to overcome some of these obstructions; in which case the next best thing to be resorted to is, to employ larger wheels, as it is evident that small ones are more liable to be entangled and retarded by ruts and hollows in roads than those which are of large diameter, as the radius of the small wheel, which bears against the ground, in rising out of a hollow in the road, is greatly more oblique to the direction of the power than the radius of the greater wheel to the direction A P. Besides, the circumference of a large wheel measures in rolling more of the road than that of the small one, its volutions are swifter, or it makes fewer revolutions in passing over a given distance, which must necessarily save a considerable portion of the friction.

OF THE SCREW.

The screw is the strongest of all the mechanical powers, but must not be accounted a simple one, as it cannot be wrought without the aid of a winch or lever, to assist in turning it. The screw is a long cone or cylinder, as represented below.

Fig. 23.

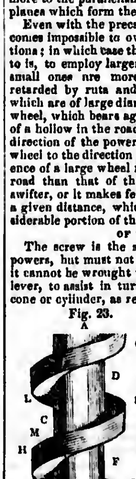
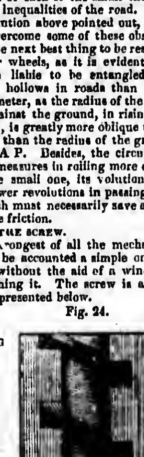


Fig. 24.

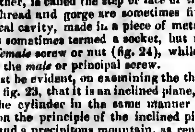


A B is the cylinder, upon the circumference of which is cut a spiral groove or gorge C D E F. The partition G H I J K is termed the thread of the screw, and the distance L M which intervenes between one thread and another, is called the step or face of the screw.

The thread and gorge are sometimes fitted into a cylindrical cavity, made in a piece of metal or wood, which is sometimes termed a socket, but more generally a *female* screw or nut (fig. 24), while the other is called the *male* or principal screw.

It must be evident, on examining the thread of the screw in fig. 23, that it is an inclined plane, and winds round the cylinder in the same manner as a road, formed on the principle of the inclined plane, would wind round a precipitous mountain, as represented at fig. 10. But this will be more easily understood by the following cut, representing part of another screw, where the threads are triangular, or acute, on their surface. The height of this inclined plane is the face or spiral of the screw, or, which is the same thing, the distance of one thread from another, its base is the circumference of the screw, and its length is estimated by that circumference, and the height of the face; for if one of the threads *a b* is developed, it will form with its pace *b c* a triangle *a b c*, and a rectangle at c. of which it is easy to find the side *a*, *b*, since the two others are known, as well as the angle at *c*: hence by a screw turning on its socket, they constitute two inclined planes sliding the one upon the other. See fig. 25, beneath.

Fig. 25.



The threads of screws are differently formed, being made in general to answer some particular purposes Wooden screws have usually angular threads, as in fig. 25, C G F. This form adds greatly to their strength, as their base, which is placed on the cylinder which supports them, is greatly larger. Conical small iron screws ending in a point have also this form of thread; as also those which are fitted for entering wood, in which they form a socket for themselves. Upon this principle also, are constructed drills and gimlets, which enter timber with ease, in proportion to the acuteness of their points. Large metal screws which are used for presses, vices, &c., are generally formed with square threads, as in fig. 23, for the purpose of increasing the friction, by augmenting the surface of each thread; as it not unfrequently happens that the principal effect of screws arises from the closeness of the friction; and as it is found that this form has the effect of preventing the cheeks or chops of vices from swerving backwards, to which they have a natural tendency by the re-action of the metal or other substance which they press between them.

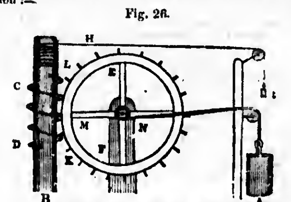
If fig. 25 be attentively examined, it will be evident that the winch E which turns the cylinder must move once round in the time that the thread performs one revolution; and, consequently, if any weight or great power of resistance were applied, the winch must turn once round in the time that the weight would move from one spiral thread to another; for example, from F to H: consequently, the force of the screw will be as the circumference of the whole circle, defined by the lever or winch E by which it is turned, is to the distance between the threads of the screw itself. Supposing, therefore, the threads to be half an inch, and the length of the winch twelve inches, the circle described by the extremity of it, where the power acts, will be nearly *seventy-six* inches, or about 152 times the distance between the threads; whence, a single pound, acting at the end of such a winch, would balance 152 pounds at the extremity of the screw, and as much more as can overcome the friction would turn the winch, and raise up the weight.

The screw is very extensively employed in mechanics. From its great powers in compressing objects, and the great dissimilarity between the speed of the handle and threads of the screw, it is more useful in compressing bodies than any of the other mechanical powers; and the same property admirably fits it for dividing space into an almost infinite number of parts. It is from this cause that it is so extensively used in the construction of many mathematical instruments, such as telescopes, microscopes, &c., where it is necessary to adjust the focus of the eyes of different individuals, by moving the eye-glass a very little nearer or farther from the object-glass. And it is by means of the screw that any degree of compression can be applied to objects. It is also used for raising weights or burdens, or for forcing backwards or forwards certain masses of a determinate quantity. For this purpose, a male and female screw are made use of, one or the other of which serves as a *fulcrum* or prop for the other. Sometimes the male screw is fixed, and the female moveable, or *vice versa*; but in both cases the effect of the screw is the same.

In the application of the screw, one of the two parts is applied to the resistance which is to be overcome, whilst the other acts as a fulcrum or prop to the machine: then, by the act of moving, the socket is made to move upon the screw, or the screw upon the socket. Supposing the machine used to be a handvice, or smith's vice, for example, one of the cheeks is pressed against the other cheek by means of the action of the screw; from which it appears that the power must move one complete round, in order to advance the resistance one pace, or spiral revolution of the screw; that is, the distance of one thread from another. When the power is applied directly to the screw, the space it passes through, or its quantity of motion, is *a c*, fig. 25, which is the measure of the circumference of the screw; and the motion of the resistance is measured by *c b*, which is the width of one space of the screw. It is, however, a common practice to turn screws, more especially large ones, with a lever or winch; hence it follows that *a c* does not measure the motive force of the power, which is, on the contrary, measured by the circumference of the circle, of which the lever D E is the radius. And as it is necessary, in order to maintain an equilibrium, that the powers should be in the inverse ratio of their velocities, it may be established as a general rule in using screws, if we make no account for the friction, that the power is to the resistance as the height of the pace of the screw is to the circumference which the power describes.

The PERPETUAL SCREW differs in many particulars from the common screw. It consists of a cylinder always turning in the same direction, which will be rendered more evident by the following representation:—

Fig. 26.

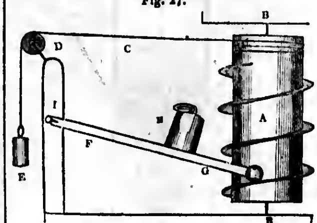


A and B are its two extremities; these being carried upon solid pivots, so that its action is perpetuated—hence its name. The threads C D of this screw, which are usually square, agree with the teeth of a vertical wheel E F, which carries upon its axis a roller or windlass G with a cord, to which is fixed the weight W, which is required to be elevated. A very small force, therefore, applied to a handle, or a light weight I, suspended to a line H, coiled round the cylinder, is sufficient to raise a considerable weight at W. But this operation requires considerable time, from the fixed law in mechanics, which should ever be borne in mind, that whatever is gained in force is lost in velocity.

In order to find the relation between the weight W and the force or power I, it must first be considered that the weight W is counterbalanced immediately by the resistance which the thread C D of the screw opposes to the tooth of the wheel, keeping the direction K L perpendicular to the radius G M. This thread C D, therefore, acts by the radius of the wheel E F, while the weight W acts by the radius or windlass A B; so that, to maintain an equilibrium, the force at M should be to the weight W as G M (the radius of the roller) is to the radius of the wheel G M; hence the relation which the weight W should have to the power I in case of an equilibrium, may be expressed in this manner: the weight is to the power as the product of the radius of the wheel multiplied by the circumference which the radius of the handle describes (if one is used) is to the product of the radius of the windlass, multiplied by the height of the pace of the screw.

The motion of the wheel being exceedingly slow in proportion to that of the handle, it follows that a very small power is capable of raising a considerable weight by means of the perpetual screw, which will be proved as follows:—If a wheel E F, fig. 26, had only nineteen teeth, and a screw which has but one thread, and which, at each round, causes only one tooth of the wheel to pass; suppose the circumference of the windlass G, or axle, to be one foot, and the circumference which the radius of the handle describes, to be five feet: when the wheel E F shall have performed an entire revolution, the weight W will be raised one foot, and the space run through by the power I will be nineteen times five feet, or 95 feet. The speed of the power I will then be to the speed of the weight W as 95 is to one; so that this power, with the effort of one pound, is capable of raising 95 pounds; and if its effort was equal to 30 pounds, it would raise 2850 pounds. If, therefore, the wheel E F had double the supposed number of teeth, that is, 38, or if the radius of the supposed handle were as long again as that which we before supposed, the same power which wrought it would produce a double effect, that is, it would raise 5700 pounds. But without changing the number of teeth in the wheel E F, or the length of the supposed radius of the handle, and if another perpetual screw is placed upon the axis of the wheel, instead of the windlass G, the thread of which ought to catch with the teeth of a second wheel having the same number of teeth as the first, and to which should be annexed the windlass which is to sustain the weight W, then the same supposed power would be capable of raising a weight nineteen times as great; in other words, this power, intrinsically only thirty pounds, would be capable of raising the amazing weight of 54,150 pounds.

Fig. 27.



To enable the reader to perceive the evident connection between the inclined plane and the screw, the accompanying diagram shows that, if instead of the body moving against the inclined plane, the inclined plane be made to move against the body, the same effect is produced. A represents a cylinder, with a spiral plate attached in the form of a screw; and around the top a cord is wound, to the extremity of which is fastened a weight E, and which, by being laid over a pulley, would cause the cylinder to turn on its axles B B.

F G is a rod with a ball at the end, while it turns at the other end on a peg, fastened to the upright post at I. By placing the weight H on the rod F G, the ball leans with considerable weight on the spiral plate; but the weight E causes the cylinder to revolve, and to raise the weight H, although it is much heavier than itself.

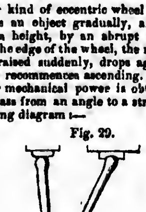
Fig. 28.

The above diagram represents what is termed the eccentric wheel. This is constructed in various ways, but the above is one of the most useful forms. It will be observed, that the axle of this wheel is placed off its centre, and that the wheel is heart-shaped. The use of this wheel is to produce a rising and a falling motion, and is employed in cotton and flax machinery, to effect a roving motion, by gradually raising and depressing the board on which the bobbins are placed, and thus covering the surface equally and gradually with the thread as it is spun. Suppose A B to be the bobbin-board, in its present position it will have nearly gained its highest point, which is, when the point of the heart touches the bottom of the board, after which it gradually sinks, until it has reached the hollow top of the heart at C, when the thread will be gradually wound downwards.

Another kind of eccentric wheel is constructed so as to raise an object gradually, and, when it has reached its height, by an abrupt termination, and hollow in the edge of the wheel, the machinery, which has been raised suddenly, drops again to its lowest range, and recommences ascending.

Another mechanical power is obtained by making two bars pass from an angle to a straight line, as in the following diagram:—

Fig. 29.



It has this property, that the power is greater the nearer it approaches the straight line, and on this account it is well adapted for those purposes where the power is required to increase, as in a printing-press. It is this power which is used by Mr Ritchie of Edinburgh in his presses.

A very simple and ingenious application of the same principle has been invented by Mr James Gall, jun., of Edinburgh, in which the power is much greater, and the machinery more simple, as will be evident from the following diagrams :—

Fig. 30. Fig. 31. Fig. 32.

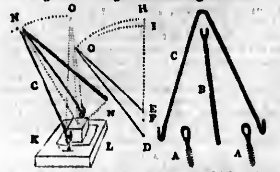


Fig. 32 exhibits the four pieces of which it is composed. A A are two screws, C is a rod of iron bent in the middle and hooked at the extremities, B is a straight bar, with a forked head to support the centre of the bent bar C. In figure 30, K L represents the board into which the screws A A are fixed, so that the hooks of the bar C will enter them, and allow it to turn in the direction N O. Between the two screws is represented a wood-cut, with its face downwards, and placed on a piece of paper with cloth under it. The bar M is then put down on the back of the wood-cut, as represented by the dotted line. Then placing the hand to the top N, and drawing it up to O, when the whole will be perpendicular, the wood-cut is pressed by the middle bar with great violence, sufficient not only to take a sharp and clear impression of the wood-cut, but even to sink the end of the bar M into the wood, or to tear out the screws from the frame.

The nature of this power is exhibited in fig. 31. F G represents the middle bar; D G the bent bar. When the middle bar F G turns on its lower end, it would describe the dotted line G H; but when the bent bar G D is brought up, it would describe the line G I, and therefore the end of the bar D F would be forced down to the point E.

As these two pieces of iron serve all the purposes of the bar, the mechanical power, and the cheeks of a printing-press, we consider this the most ingenious and simple printing-press which has yet been invented.

Having given the mechanical powers in the order in which they are generally placed, we now beg to submit a tabular view of the principles upon which these powers depend, in the manner in which they appear to us naturally to arrange themselves :—

SYNOPTICAL TABLE OF THE MECHANIC POWERS.

MECHANICAL POWERS are methods by which we gain power by losing motion.

- I. By dividing the weight between two or more parts, and giving motion to one part, we gain power.
  - 1. PULLEY. By dividing the weight by suspension on two or more cords.
  - 2. INCLINED PLANE. By dividing the weight between suspension & support.
    - 1. SINGLE INCLINED PLANE.
      - 1. STRAIGHT OR COMMON INCLINED PLANE.
      - 2. CIRCULAR, HORIZONTAL, OR PERPETUAL SCREW.
        - 1. COMMON SCREW.
        - 2. PERPETUAL SCREW.
      - 3. CIRCULAR, PERPENDICULAR, OR ECCENTRIC WHEEL.
    - 2. DOUBLE INCLINED PLANE OR WEDGE.
- II. By varying the velocity between a fixed and a moving point.
  - 1. COMMON LEVER.
  - 2. PERPETUAL LEVER, OR WHEEL & AXLE.
- III. By using only the difference of the motion of two or more bodies.
  - 1. By the combined motion of the extremities of two radii, whose other extremities do not coincide.
    - 1. By making the radii work in *different* circles.
    - 2. By making the radii work in the *same* circle.

OF THE ACCUMULATION OF POWER.

When we have made ourselves acquainted with the influence of the mechanical powers taken separately, or combined, we will perceive that they can only accumulate power, or compress any degree of velocity into a small space. It is this compressed velocity which we call *power*, and this power is again capable of impressing the original degree of velocity upon a body of an equal, or at least nearly equal, size to the first, from which it originally received the impression or impulse; but the *absolute* quantity of motion remains the same without a possibility of augmentation or diminution, by means of levers, screws, pulleys, or wedges. It is by the preserving a small quantity of motion for a certain time that at the end the great accumulation of power has been accumulated. For example, no man can by his own physical power or strength raise a ton weight from the ground, but he may be capable of raising one hundred pounds weight; and by repeating this for twenty successive times, the ton weight will have been raised by him. But even by the assistance of a lever, before a man could raise a ton weight one foot from the ground, with a power or force equal to one hundred pounds, that lever must be *twenty* or *twenty-one* feet long, and a continued force of one hundred pounds must be applied, while he goes up through a space of twenty feet, or, what is the same thing, pulls a rope down through that space. Hence it is evident that the lever only accumulates the power exerted in pulling or carrying the weight of one hundred pounds through twenty feet, and discharges the whole of it upon one foot; consequently any thing which could do this would raise the ton weight as effectually as a lever.

The accumulation of a great power can be effected by means of a long thread, chain, or rope, of sufficient strength; and to this is suspended a heavy weight. The body thus suspended may be set in motion by a degree of power little more than is required for bending the rope or chain, and will vibrate like a pendulum; and, by continuing the impulse as the body returns to the place from whence it was originally projected, it will acquire greater and greater force, or action, as the reversed arches, through which it moves, by becoming continually larger, might be made to act with such amazing force, that the suspended body could overcome almost any force opposed to it. It was upon this principle, that, in ancient times, battering-rams were constructed, for forcing open gates of fortifications, and effecting breaches in walls of garrisons. Still it must be kept in view, from the principles already stated, that the power of one stroke of the battering-ram could never *exceed*, nor even quite equal, the accumulated power of the impulses given to it in order to produce that stroke; because the stiffness of the rope, and the resistance which the weight would naturally meet with in passing through the air, would always diminish to a certain extent that power.

To effect an accumulation of power, various other devices are adopted; such as by using a very heavy wheel or cylinder, made to move upon an axis; either of which may be easily put in motion, and, if long continued, will accumulate to such a degree as to have the effect of raising weights, and overcoming resistances, as could not be effected by the application of the original moving force by itself; but which now becomes easy through the means of these agents, the wheel or the cylinder.

Mr Attwood proved, that, on this principle, a force of twenty pounds, applied for thirty-seven seconds to the circumference of a cylinder of ten feet radius, and weighing 4713 pounds, was capable of giving an impulse—at one foot from its centre—to a musket ball, equal to what it receives from a full charge of gunpowder. Still, however, the cylinder has no absolute principle of motion in itself, and, therefore, can only give that motion which it receives.

An accumulation of motion, however, in heavy wheels, is of great service in the construction of machines for various purposes, rendering them greatly more powerful and easy to be worked by animals, as well as more regular and steady, when set in motion by water, or any inanimate power. It is from this cause that flys, ballast-wheels, and others of a like nature, are usually supposed to increase the power, though, in point of fact, they rather diminish it, and act on a principle totally different.

In machines where flys are used, the first force employed must be considerably greater than what is necessary to move the machine without it, or the fly must have been set in motion some time before being applied to the machine. It is this superfluous power which is collected by the fly, and serves as a kind of reservoir, from which the machine may be supplied when the animal slackens his efforts. It is obvious that this will always be the case with animal power, as they are unable to maintain constant action, and require intervals of rest; and these, even in the very time of their progressive motion, although in many cases this is imperceptible to an observer, but for this an animal's strength would soon be exhausted.

The first efforts of a horse or other animal when applied to a machine are vigorous, and the power exerted very great, by which means he overcomes the resistance of the machine itself, and communicates to the fly considerable power. While the machine is in motion, it yields for a certain period to a smaller impulse, during which time the fly itself acts as a moving power, and the animal in the interim recovers the strength which he has lost. The machine, however, by degrees begins to slacken in its motion, which renders the renewed efforts of the animal necessary. The velocity of the machine in this case would acquire increased rapidity, but for the resisting power of the fly, and the greatest part of the superfluous power being lodged in it; hence the increase of velocity in the machine is hardly perceptible. Thus the animal has time to rest himself until the machine again requires an increased impulse, and so on alternately. The same thing is applicable to any machine which is moved by a water-power, or by means of weight; for although the strength of these cannot be exhausted in the same manner as animal power, still the yielding of the parts of the machine renders the impulse much less after it begins to move; so that the velocity is accelerated for some time, until the impulse becomes so small that the machine requires an increase of power to keep up the necessary motion.

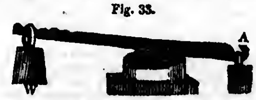
Archimedes is represented on one occasion to have boasted that he could move the earth, provided he could find a place out of it to stand on; and Bishop Wilkins said he would engage to pull up the most stately oak by means of a horse hair; but both of these were vain and extravagant boasts; as, whatever great effects are to be accomplished, a great power must originally be applied; and the great room that an immense lever would occupy, together with the excessive length requisite to make it act with sufficient force, as well as the vast weight necessarily required to give it sufficient strength, must at once show the impossibility of the thing.

COMBINATIONS OF THE MECHANICAL POWERS.

From what we have already said on the virtues of the mechanical powers, it will be seen that none of them are capable of augmenting the actual force of any acting substance; neither can any combination of them effect this: nay, on the contrary, these combinations have the effect of occasioning loss of power by the friction attendant upon their application. This is an obstacle in mechanics which it is not likely will ever be overcome; and the more complicated the machine, the greater must be the loss of power. It must therefore be evident, that, in all mechanical inventions, the simpler their construction the greater must be their effective operations; and that multiplied combinations should never be resorted to, except for the sake of convenience.

When weights are to be raised to a small distance, the lever should always be used, because, in the action of this simple machine, there is less friction than in any other of the mechanic powers. Where bodies have but little elasticity, and are to undergo a long-continued degree of pressure, this machine should always be applied. In this case, the lever of the second kind is the one to be used, which we have given below.

Fig. 33.



It is this kind of lever which is used in pressing cheese, in which case the pressure is required to be long and equable, without any very great exertion of force. A is the point of the lever with a hook, which is put through a staple fixed into a beam. F is the fulcrum on which the lever rests, and which bears upon the cheese-mould, and W is the weight which gives power to the lever.

Where much force is required, screws and wedges are to be used; but these, it must be evident, have both the disadvantage of losing their power of pressure as soon as the materials under their influence have yielded to their force; so that wedges, to have the effect intended, require to be constantly attended to, and driven home, or their power is lost; and, for the very same reason, screws must be frequently turned by means of the lever, to produce a constant pressure. To the first of these are referable the machines called oil-mills, where the pressure is produced by wedges, which are constantly driven home by means of great mallets, lifted by the force of the mill, and allowed to fall, after having been raised to a certain height. To the action of the screw belongs the apothecaries' oil-press, which is constantly turned by means of a long lever, aided by a capstan.

When it becomes necessary to raise a weight to a considerable height, the pulley is resorted to; but then there is great friction. The axis, combined with a single pulley, will generally effect the purpose, and then the friction is less than by more complicated pulleys. Cranes are a combination of these two principles, and are much used in raising packages from vessels, and placing them in warehouses, &c.

It should ever be kept in mind, that whatever a machine gains in power, it loses in time, even if there was no such thing as friction; and, in all cases where a machine gains by complication of the mechanic powers, it will lose a third by friction alone, as no machine hitherto produced has been fitted in all its parts with that accuracy which will free it from friction; and, therefore, the necessity of simplicity is obvious for complication leads to both waste of time and power.

Experience has proved that the best method of obtaining a very great power is by combining a screw with a toothed wheel, which acts in an axle *in perotrochio*, as represented in fig. 26; for by making the threads of the screw very close, and the wheel in which they are to act of a large diameter, we may increase the power to almost any degree we please, without the risk of a great degree of friction. Therefore, upon the principle which we have already pointed out, if space will permit, it will be better to increase the diameter of the wheel without adding another, as a large wheel augments the power without producing any sensible augmentation of the friction. Another thing absolutely necessary is to have the axle as small as it can be made, so that it has sufficient strength to bear the operations of the wheel.

OF THE CENTRE OF GRAVITY.

Dr Gregory defines the centre of gravity of any body, or system of bodies, to be that point about which the body or system, acted upon only by the force of gravity, will balance itself to all positions; or it is a point which, when supported, the body or system will be supported, however it may be situated in other respects.

Or, to render this more plain, gravity is that universal disposition of matter, which inclines or carries the lesser parts towards the centre or greater part, which is called weight or gravitation in the lesser body, but attraction in the greater, because it draws, as it were, the lesser body to it. Thus, all bodies on or near the earth's surface have a tendency or seeming inclination to descend towards its middle part, or centre; and, but for this principle in nature, the earth (considering its form in the universe) could not subsist as it is, for it being nearly round, and suspended in a mighty void or space, and always in motion, what, but this principle, or universal law in nature, of attraction and gravitation, should hinder the stones, water, and other parts of matter, from falling from the surface.

To illustrate this, let us suppose two men standing opposite to each other, on opposite extremes of the globe; and if each of these were to drop an iron ball from his hand, and the balls had sufficient weight and power to displace the other parts of matter of which the earth is composed, so as to make way to the centre, they would there meet, unite together, and remain fixed, and would then lose their power of gravitation, as being at the centre of gravity, and unable to fall, and only retain in themselves the power of attraction.

"The centre of gravity of a body is not always *within* the body itself; thus, the centre of gravity of a ring is not in the substance of the ring, but in the axis of its circumscribing cylinder; and the centre of gravity of a hollow staff, or of a bone, is not in the matter of which it is constituted, but somewhere in its imaginary axis. Every body, however, and every system of bodies, has a centre of gravity."

If a heavy body be sustained by two or more forces, their directions must meet either at the centre of gravity, or in the vertical line which passes through it, as may be observed in the following diagram, representing a painter's palette, whose centre of gravity

Fig. 34.

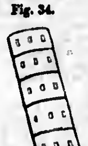
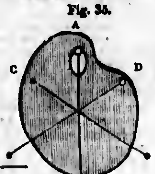


Fig. 35.

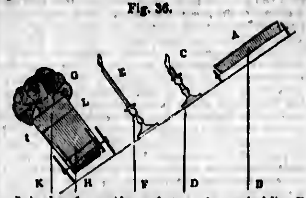


will be found in the following manner:—Supposing it to be hung upon the thumb-hole at A, a perpendicular line from the point of suspension will pass through the centre of gravity, which in this case will be between A and B. Take another point of suspension, as at C, and the line will always cut that line, or, in other words, they will coincide, as may be seen by supposing its point of suspension at D, by which it will be seen all the three lines cut the same point.

A tower, or other object, may be built off the plumb, and still stand, if the centre of gravity be supported; which can easily be ascertained by raising a perpendicular line, or by a plumb-line suspended from its top; and if the vertical line passing through the centre of gravity falls within the base on which it stands, but if that vertical line passes without the base, the tower will fall, unless it be prevented by a prop. There are many instances of walls, steeples, and towers, being built off the plumb, and which have stood for ages.

When the vertical line falls upon the extremity of the base, as at D, fig. 36, the body may stand, but the equilibrium may be disturbed by a very trifling force; and the nearer this line passes to any edge of the base, the more easily may the body be thrown over; the nearer it falls to the middle of the base, the more firmly the body stands, as may be seen at B A, fig. 36.

Fig. 36.

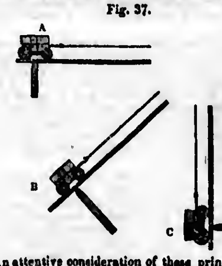


It is therefore evident, that, as the vertical line F cuts at such a remote distance from the base, that the candlestick E could not possibly stand.

It was from due want of attention to this most important principle that coaches were till lately built too high, which subjected them to the continual hazard of being upset, when running on roads or other situations where their sides were transverse to inclined planes, as represented above at H. The centre of gravity being, as above shown by the vertical line K, so much beyond the range of its base, it would be quite impossible for this carriage to move forward without upsetting, and more especially with such a load of luggage G I placed on its top; but if the coach were built no higher than the line at L, the centre of gravity would be in the vertical line H, and therefore it would be less liable to fall, especially as the baggage is placed beneath the carriage, as is now the case with most modern-built stage-coaches, where the base is broad and the gravity low.

In our observations on the inclined plane we did not mention a curious fact which should be borne in mind—that is, that when a carriage of any kind is in motion on the inclined plane, its weight is equally divided between the rope by which it is made to act and its central pressure, which may be seen by the prop supporting the plane at B in fig. 37; and that this balance will continue until the plane assumes a vertical position, as at C, when its whole weight is supported by the rope. Hence it is evident that a rope of half the strength required to support it in this position would have the effect of sustaining it while moving on a plane of almost any inclination. In that part of the diagram A, it will be noticed that the prop is placed perpendicular, in consequence of the plane being horizontal, and hence the weight or gravity is entirely on the wheels of the carriage—that is, pressing perpendicularly downward, and no strain whatever is on the rope, which, under these circumstances, requires to be exactly of the same strength as while on the inclined plane, so as to be able to move it.

Fig. 37.



An attentive consideration of these principles will show that the various motions of animals are regulated consistently with them.

"Thus," says Gregory, "when a man endeavours to rise from his seat, he thrusts forward his body, and draws his feet backward till the vertical line from the centre of gravity falls just before his feet; this enables, or indeed compels him to rise, and, to prevent falling forwards, he advances one of his feet, till the vertical line of direction is brought between his feet, in consequence of which he may stand firmly. In walking, he first extends his hindmost leg and foot almost to a right line, and at the same time bends the knee of his fore-leg a little; by this means his body is thrust forward, and the line of direction from its centre of gravity falls beyond the fore-foot, on which account he is ready to fall, but prevents it by immediately taking up the other foot, and putting it forward beyond the line of direction. After the same manner, he thrusts himself forward by the leg which is now the hindmost, till the line of direction from the centre of gravity be beyond his fore-foot, when he again sets his hind-foot forward, and thus he continues the motion of walking at pleasure. While walking, a man always sets down one foot before the other is taken up, so that at each step he has both upon the ground. But in running, he takes one up before he sets the other down, so that his feet touch the ground alternately for moments of time, and in the intermediate portion he does not touch at all. In walking up a hill, a man bends his body more forward than in walking on a horizontal road; and that the line of direction may be thrown before his feet, in walking down a hill he rather leans backwards, to prevent the line of direction from being too forward, which would occasion his fall."

In using the lever, the utmost attention is to be paid not only to the directions in which the forces are exerted. The want of this has in very many instances been the cause of much error in mechanists while seeking new inventions. One of its most simple principles has been the cause of much disappointment, which is the property of the straight lever, that equal weights, acting at equal distances from the fulcrum or prop on opposite sides, will be in equilibrio; while at unequal distances, the one has more than once been a source of error in unskilful hands.

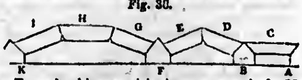
OF ARCHES.

The principle on which arches are built is that of a series of wedge-shaped stones placed in a curved line. However, to give a clear account on strictly scientific principles would occupy a much larger space than we could spare, and indeed would fill a volume. Arches are one of the most important branches of architecture, especially those over broad and rapid rivers, involving difficulties of no ordinary kind, in securing with certainty their durability and firmness, which ought always to be rigidly attended to, where not only the convenience, but also the safety of human beings, are concerned.

By an arch is meant an artful disposition of a series of stones or bricks, the under part of which is shaped like a bow, and their weight producing a mutual pressure, so that they not only support each other, but are by their combined resistance capable of bearing the most enormous weights.

If we conceive an arch in equilibrio to consist of a series of very small hard spheres of polished surfaces touching each other, and centres joined by right lines (being in fact an inverted simple catenary or chain), and that the spheres are so connected that they cannot yield to any other impulsion than that of gravity, it is very plain that the equilibrium will not be disturbed by such inversion of the curve; no part of it will be pushed outward or inward by other parts, but the whole will be supported if the feet are firmly fixed.

Fig. 38.



To render this more plain, let us suppose A, fig. 38, to be an abutment, B a pier, and C a wedge-shaped stone laid between these, it is evident that the greater the pressure which is applied to it, the more firmly it will become fixed between A and B. This is the most simple construction of a bridge, if we except the still more primitive one of a piece of wood or stone laid across a hollow, and supported at both ends from below. Advancing another step, we have only to suppose two wedge-shaped stones D E placed between two piers B F, or two abutments, and it will be evident that no pressure, however great, could force them down. Carrying the principle still farther, we have to suppose an arch composed of three stones G H I, with its sides resting against the piers F K, and it will be observed, that, although this third stone is added, it does not endanger the stability of the arch, being wedge-shaped; and the greater the pressure applied, the greater will be the resistance of the arch. In building arches, the last stone which is inserted, however many there may be, is the central stone H, which is termed the key-stone; as no sooner is it put into its place than the whole are locked firmly together.

In short, to whatever extent arches are built, the same general principle applies; for when we consider the very great quantity of heavy materials suspended in the air, such as is represented in the following cut, and compare the small cohesion which the firmest cement can bestow, we must be convinced that that cement is incapable of keeping the materials of the bridge together; and it cannot possibly be explained by any other principle than the just balance and equilibrium of its parts.

Fig. 39.

In conclusion, there is not an action performed by man in his progress through life, but what has reference to some one or more of the mechanical powers, although he is ignorant at the time by what law this action is performed. The knowledge of the mechanic powers, therefore, it must be obvious, is essentially necessary to every human being; as by our acquaintance how to apply principles so simple, we might overcome, with comparative ease, those obstacles which are daily presenting themselves, and which, without this knowledge, but too often baffle the attempts of mankind to obviate them.

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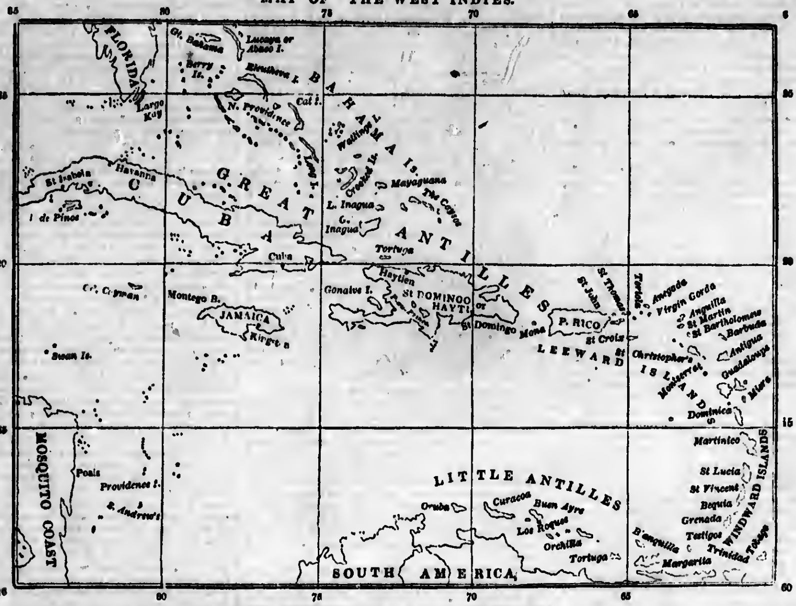
THE WEST INDIES

MAP OF THE WEST INDIES.



GEOGRAPHICAL AND RELATIVE SITUATION.

The name of the *West Indies* is given to a huge belt of islands, stretched in the form of a curve, between the continents of North and South America. They may be, in general terms, described as running in a south-east direction from the coast of Florida, on the former continent, to the Gulf of Paria, on the most north-eastern point of the latter, presenting a sort of convex breastwork to the Atlantic Ocean. They are *nautically* classed by the British under two great denominations—*Windward and Leeward*. The former are the more northern of the group, the latter the more eastern and southern, and include those properly termed the "Carribee Isles." The latter, again, are themselves divided into "*Leeward and Windward*," as will be seen by the diagram prefixed to this article. St Domingo (or Hayti) is the most southern of the Windward Islands; Porto Rico the most northern of the Leeward. Looking at the map, it would seem that these two divisions had derived their distinctive appellations from their relative position to Jamaica. Thus, in returning to Europe from that island, the navigator either holds at first a southerly course across the Carribean Sea, and through the cluster of isles so called, until, having attained the proper degree of southerly latitude, he changes his tack, and slants right across the Atlantic with a side-wind, until he catches the western breeze off the coast of Newfoundland, which enables him to run down upon any desired point of the continent of Europe; or he at once beats direct up to the eastward against the trade-wind, by short tacks, the line of the latter course subtending (to speak mathematically) the angle described by that of the former. These two courses of navigation are respectively termed the *Leeward* and *Windward* passages. It must be observed, however, that the French and Spaniards affix different meanings from the British to these terms, and apply them respectively to the relative position of the various islands.

That portion of the ocean which is thus in a manner separated from the main body of the Atlantic by this huge chain of islands, and contained betwixt them and the respective shores of North and South America (which are connected by the narrow Isthmus of Darien), is also divided into three great basins—the more northern one being called the Gulf of Mexico; the middle one, the Bay of Honduras; and the southern one (as already noticed), the Carribean Sea. The latter takes its name from that class of islands which bound this part of the ocean to the east, and anciently inhabited by a nation of cannibals, denominated Carribs or Charaibs (to be afterwards noticed), and from which Columbus afterwards styled their possessions the Carribean Islands.

The Gulf of Mexico is almost completely separated from the other two basins, by the near approximation of the southernmost point of the island of Cuba to the northernmost part of the coast of Yucatan, South America. The channel between these two points is so shallow that it is supposed they must have been at one time connected.

DISCOVERY—NATIVE INHABITANTS.

These islands were first discovered by Christopher Columbus, when engaged in his adventurous attempt to find out—not a New World, as some historians and geographers assert—but a new route to India by a western navigation, which he was led to think would prove less tedious than by the coast of Africa; and this conclusion would have been found just, if the geography of the ancients, on which it was founded, had been accurate. So firmly, indeed, was the navigator convinced of the truth and certainty of his theory, that even after the discovery of Cuba and Hispaniola (Hayti or St Domingo), he continued firm to his creed, not doubting that these islands constituted some part of the eastern extremity of Asia. Even when the discovery of the Pacific Ocean had proved his mistake, all the countries which he had visited still retained the name of the *Indies*, which he had originally given them; and after the Portuguese had succeeded in reaching India by doubling the Cape of Good Hope, they were called, in contradistinction, the "Indies of the West."* Some of the olden navigators and writers, indeed, in derision of Columbus's assumed title for these islands, designated them *Antila America*, or the Antilles, by which name even some modern geographers distinguish them. But we shall continue to call them by their original designation, by which they are best known.

The boldness and resolution of Columbus, in his first adventurous voyage across the Atlantic, can scarcely be imagined at the present day, even by those who have personally visited these tropical regions; and it is little to be wondered at that it was with difficulty he could restrain his companions from breaking out into mutiny, seizing the vessels, and turning their prows homewards. They had got into an entirely new creation, and the various phenomena they witnessed, and of which they had never before heard—the heat every day becoming more intense, the wind blowing continually in one direction, the variations of the compass, the fish flying in the air—all these things must have struck them with equal astonishment and terror. It was an era of miracles, and the modesty and strict adherence to truth manifested by Columbus in speaking of his wonderful discoveries, renders him a singular exception to the generality of navigators in those early times, and even for many ages after him. The first land discovered by the voyagers was the Bahama Islands, the most northern of the group. He afterwards visited Cuba, Jamaica, and St Domingo; and, in his subsequent voyages, touched at most of the Carribean and Leeward Islands, to one of which he gave his own name—St Christopher's

* Columbus sailed on his first voyage 3d August 1492. In 1494, Bartholemew Dias discovered the Cape of Good Hope; but it was not doubled till the year 1497, by Vasques de Gama.

Respecting the inhabitants found in the West India islands by the early voyagers, it is impossible to trace their origin with certainty, although it is most probable that they must have been the descendants of emigrants from the continents of South and North America, which countries, again, were undoubtedly originally peopled by Asiatics. It was evident, at all events, from the difference which existed in language, personal appearance, and habits, that there were at least two distinct tribes amongst them. The most powerful if not the most numerous of these were the Charaibs, already mentioned, who are by some conjectured to have derived their origin from Florida; by others, from the southern continent. The latter theory seems to be the more probable, from the fact that several similar tribes of Charaibs were subsequently discovered to exist in Guiana by other voyagers, with one of whom Sir Walter Raleigh formed an alliance during his romantic expedition to that coast in 1595.* At the time of Columbus's visit, too, and for ages afterwards, the Charaibs manifested the most implacable hereditary hostility towards the inhabitants of the other islands, whom they believed to be descendants of a tribe of Arouaks, a nation of South America, with whom the Charaibs of that continent were continually at war. These men, indeed, were the constant scourge and terror of their fellow-islanders. They seemed to consider war as the prime occupation of their lives, although amongst themselves they were peaceable, faithful, and affectionate. Like all warlike nations, they were extremely lofty in their sentiments of freedom and personal independence. Neither kings, magistrates, nor laws, existed amongst them. Their frames were extremely robust, muscular, and active; but they disfigured their complexion, which was naturally a clear Spanish olive, with paints and dyes in the most extravagant manner, and even made the most hideous scars and gashes in their cheeks, to render their appearance more terrible to their foes. The children were early initiated into their parents' barbarous habits, being taught to feed on the bodies of the captive Arouaks, and to anoint themselves with the fat of their victims. When a youth wished to assume the duties and privileges of manhood, he was subjected to dreadful bodily tortures, in order to prove his fortitude and endurance of suffering; and still more exquisite tortures were inflicted on him when he aspired to the honour of being a leader or captain. They took as many wives as they felt inclined or able to maintain; and, as in all savage nations, the women were treated with great brutality, and subjected to every species of domestic labour and drudgery. It has been well remarked, that the first decided symptom of a people emerging into civilisation is a display of tenderness towards the female sex. The Charaibs were likewise addicted to that most disgusting and unnatural practice—which seems, indeed, to have been in all ages a custom amongst the savage tribes of tropical climes—namely, flattening the heads of their offspring. This uncouth fashion is, we understand, still kept up amongst the remnant of red Charaibs still existing in the island of St Vincent. Notwithstanding all these barbarous traits of character, however, these savages had, at the time of their discovery, attained astonishing proficiency in many kinds of manufacture. Columbus observed abundance of substantial cotton cloth in all the islands he visited, which the natives possessed the art of dyeing of various colours. Of this cloth they made hammocks, or hanging beds, such as are used at sea; for Europe has not only copied the pattern, but preserved the native name, *amack* or *hamock*. These savages likewise possessed the art of making clay vessels for domestic purposes; beautiful specimens of which are still sometimes dug up in Barbadoes and other islands. Their religion, if it can be so called, was a mere compound of revolting idolatry and superstition, such as has almost uniformly been found to prevail amongst all savage nations; yet it is well worthy of remark, that they entertained those opinions which may be described as the first foundations of true religion—the belief of a Deity, and of a future state of existence; a fact which corroborates the sentiments of the eloquent Bishop Chester, that "such belief is no less conformable to the first natural apprehension of the untutored mind, than to the soundest principles of philosophy."

Such were the Charaibs, to whom the inhabitants of the larger islands—Hispaniola, Cuba, Jamaica, and Porto Rico—presented the most striking contrast in every respect. The latter were indolent and sensual in their habits, but of a peculiarly mild, kindly, and forgiving disposition, affectionate to their wives, and placing their whole happiness in domestic bliss. They were particularly fond of dancing, and various other peaceable amusements and games. Unlike the Charaibean, their government was monarchical. Their kings were called caciques, and their power was hereditary; but there were likewise subordinate chieftains or princes over each district, who were tributaries to the sovereign. They had likewise an established priesthood, although (excepting their belief in a God, and a future state of rewards and punishments) their system of theology was little else than a medley of folly and superstition—the fruits of ignorance and terror. Columbus experienced the greatest kindness from this simple and primitive people, who, when they perceived the avidity of the Spaniards for gold, anxiously supplied them with all of which they were possessed, and afterwards brought them incessant supplies of cloth and provisions. The truth was, they looked upon the strangers as a kind of superior beings to themselves, whose presence was an honour to them, as the negroes in these colonies, even to this day, generally consider their white masters. A remarkable speech has been preserved of an old man, a native of Cuba, to Christopher Columbus, on presenting him with a basketful of fruit, which sufficiently evinces the profound feeling of veneration these simple-minded people entertained for their visitors:—"Whether you are divinities," said he, "or mortal men, we know not. You are come into these countries with a force, against which, were we inclined to resist it, resistance would be folly. We are all, therefore, at your mercy; but if you are men, subject to mortality like ourselves, you cannot but know, that, after this life, there is another, wherein a very different portion is allotted to good and bad men. If, therefore, you expect to die, and believe with us that every one is to be rewarded in a future state, according to his conduct in the present, you will do no hurt to those who do no hurt to you." This remarkable address is, in our estimation, a far more striking specimen of barbarian sentiment and oratory, than the well-known address of Logan, the American chieftain, which consisted chiefly in an egotistical reiteration of the virtues common to savage nations of almost all ages—fidelity towards a foe, and a punctilious observance of the rites of hospitality. It was upon these amiable and hospitable people, nevertheless, that the Spaniards afterwards perpetrated such cruelties as make the blood curdle to contemplate, and which we will require in their due place to notice.

In concluding our notice of these two very different original tribes of West Indians, we cannot help remarking a remarkable similarity betwixt them and the two distinct castes which people the Polynesian, or South Sea islands; those just described resembling (except in the colour of their skin) the pacific and indolent tribe of the South Seas, called Oceanic negroes; while the Charaibs, in their active and warlike habits, bear the closest affinity to the natives of the Georgian and Society Islands.

NUMBER OF ISLANDS—PRESENT POSSESSORS.

No regular official survey having ever been made of the West India islands, it is impossible to state with certainty the actual number of them. It must, however, be immense—a fact which will be evident when we state, that the Bahamas alone are calculated to amount to 500. A great proportion of them, however, are mere barren uninhabited rocks, although furnishing generally fine water, and many of them excellent harbours and roadsteads, which rendered them a convenient rendezvous for ships of war, during the period of hostilities with foreign countries, and for our cruisers, while employed in repressing the slave-traffic.

We shall, therefore, only enumerate the principal colonial possessions in that hemisphere belonging to the British and other European powers, and the free native settlements, with a short historical and topographical sketch of each; and then proceed to give a general view of their appearance, productions, climate, inhabitants, government, trade, &c. And first in point of importance, both as to number and value, are the

BRITISH POSSESSIONS.

1. JAMAICA

is the third island in point of size in the western hemisphere, being inferior only to Cuba and St Domingo. It lies about 100 miles south of the former, and about the same distance west of the latter, between which islands lies what seamen term the "windward passage." The latitude of Kingston, the principal town, is 18° N., and that of the eastmost point of the island (called Morant Point) 17° 56', and its long. 76° 5' W. This island was first discovered by Christopher Columbus, during his second voyage, on the 3d of May 1494, and will continue to be associated with his memory with many painful recollections, having been in a manner the indirect cause of his misfortunes and death. After a slight contest with the natives, he effected a reconciliation with them, and, as the custom then was, took possession of their territories in name of his prince, with the usual formalities. But it was not until his fourth and last voyage, in 1503, that he ascertained any particulars as to the extent and value of Jamaica. This information he acquired under most disastrous circumstances, being forced by tempestuous weather to run ashore the two vessels that survived the storm, at a small harbour in the north side, called from that circumstance *St Christopher's Cove*, to this day. The vessels being too much damaged to be again rendered sea-worthy, and the crew having mutinied and deserted him, Columbus concluded that he must there terminate his miseries and his life. He abode on the island for upwards of a twelvemonth, solitary and half-starved for want of provisions, but was at length rescued and conveyed to his native country, where the disgraceful neglect and ingratitude of his sovereign, together with the hardships he had endured, proved too much for his generous spirit, and he sunk under them—leaving a name which will only be forgotten with the extinction of that world whose boundaries he contributed so greatly to extend. His son Diego, who inherited much of his father's fortitude and firmness, soon after compelled his ungrateful monarch, by legal process, to acknowledge his patrimonial privileges as viceroy and admiral of all the countries discovered by his father, with a right to a share of the mineral wealth found in them; and having himself sailed for Hispaniola (St Domingo), he dispatched Juan de Esquivel with a large retinue to take possession of Jamaica, as deputy-governor. This was in 1509; after which, for many years the colonists were engaged in a perpetual struggle with the natives, whom they at last completely extirpated, not a single native of either sex being left alive when the English took possession of the island in 1655, nor, it is said, for a century before. The traditionary accounts of the cruelties inflicted by the Spaniards upon them, are beyond every thing horrible and revolting. Caves were afterwards discovered literally filled with human bones, supposed to be those of the poor fugitives, who preferred death by starvation to the lingering tortures inflicted on them by their inhuman conquerors; and it is calculated that not less than 60,000 of them were put to death in various ways. They did not perish in silent despair, however, for it appears they succeeded in demolishing the town of Seville, the first founded in the island (by Esquivel), upon the site of which Diego Columbus afterwards (1526) built the town of St Jago de la Vega, still the seat of government in the island, and now commonly called Spanish-Town. From it Diego's son Louis derived the title of Marquis de la Vega, the first and last of his family who bore that distinction. The following is Mr Edwards's account of the manner in which the hereditary sovereignty of this and the rest of their great ancestor's discoveries passed from the descendants of Columbus, and which cannot fail to be interesting to every reader:—His son Diego left three sons and two daughters. His eldest son, Louis, succeeded to his father's honours and extensive claims. Of the daughters, the eldest, Isabella, intermarried with the Count de Galves, a Portuguese nobleman of the house of Braganza. Louis Columbus was an infant of six years of age at the death of his father, but was generally considered as hereditary viceroy and high admiral of the West Indies. The emperor (Charles the Fifth), however, though he treated him with singular distinction, and greatly augmented his revenues, absolutely refused to admit his claim to such extensive authority; and Louis, as his minority expired, instituted, after his father's example, a legal process for the recovery of his birthright. He found it prudent, however, to compromise with the emperor, whereby he transferred all his hereditary rights to the crown, for a grant of the province of Veragua and the island of Jamaica, with the title of Duke de Veragua and Marquis de la Vega. At his death he left no issue to enjoy these possessions and titles; and his brothers also dying without male issue, his sister Isabella, wife of the Count de Galves, became sole heiress of the Columbus family, and conveyed by her marriage all her rights to the house of Braganza, whose property they continued till the year 1640, and then reverted back by forfeiture to the crown of Spain, in consequence of the revolution which placed John Duke of Braganza on the throne of Portugal.

From the continued warfare between the natives and Spaniards, Jamaica was long exposed to the descent of the Buccaneers, who were then roving the southern seas, by whom it was twice taken and plundered between the years 1596 and 1638. In 1655, the Protector Cromwell, in defiance of a treaty of peace then existing between England and Spain, sent out an expedition against Jamaica under Admirals Penn and Venables. They arrived on the 10th May; and so expeditiously and successfully were their operations conducted, that the fleet sailed again for England in the following month, leaving General Fortescue in command of the army. At this time the whole number of whites in the island (exclusive of the army) did not exceed 1500; yet so anxiously did Cromwell encourage British settlers, that, in less than three years afterwards, the population amounted to 4500 whites, and 1400 negroes.* It is curious enough, however, that the first great influx of British settlers consisted of about 3000 soldiers of the disbanded Parliamentary army. "The confusion which overspread England," says Bryan Edwards, "after the death of Cromwell, impelled many to seek for safety and quiet in the plantations. Some of those men who had distinguished themselves by their activity in bringing their unhappy monarch to the scaffold, considered this island as a sure place of refuge. Foreseeing, from the temper which began to prevail amongst all ranks of people in England, especially towards the beginning of the year 1660, that the nation was united in its wishes for the re-establishment of the ancient frame of government, they hoped to find that safety in a colony composed of Cromwell's adherents, which they were apprehensive would shortly be denied them at home."

The negroes, being the slaves imported from Africa by the Spaniards, were still tampered with by their former masters, who, trusting to an insurrection in their favour, had the temerity to make an attack on the island in 1658, but were routed with such tremendous loss, that they never afterwards made any

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* It is a curious and interesting fact, that the descendants of this tribe in Guiana still fondly cherish the tradition of Raleigh's alliance with them, and to this day show the English colours which he left with them at parting.

* Cromwell did not confine himself to persuasion and bribes alone to promote his colonising system. One of his measures for that purpose was a vote of the "Grand Council of State" in England for listing 1000 girls, and as many young men, in Ireland, and sending them to Jamaica!

serious efforts to regain possession of it. At this time the slaves who had co-operated with the Spaniards fled to the mountains, where they assumed the name of *Maroons*;* and their descendants continued for nearly a century and a half in almost constant hostility with the English. Meanwhile, a regular system of government was established, consisting of a governor, council, and house of assembly; and so rapidly did the influx of settlers and the cultivation of the island proceed, that, in the year 1688, it was computed that the annual importation of African negroes amounted to no less than 10,000. The present state of the population and other matters will be afterwards stated under the proper heads.

In 1692 (June 7), Jamaica was visited by a dreadful earthquake, by which it was estimated about 3000 inhabitants lost their lives. Amongst its other devastations, was the swallowing up of almost the whole of the town of Port Royal, situated on the extremity of a narrow neck of land running out obliquely into the sea, and thus forming the magnificent harbour of Kingston, which, however, was not then built. From its situation, which completely commands the entrance to the harbour, it was one of the earliest fortified and most wealthy places in the island. A most remarkable incident took place on this occasion, as recorded by the following inscription on a tombstone, still preserved near the present town of Port Royal:—

"Here lies the body of Lewis Galdy, Esq., who departed this life, at Port Royal, the 22d December 1736, aged eighty. He was born at Montpelier, in France, but left that country for his religion, and came to settle in this island, where he was swallowed up in the great earthquake in the year 1692, and, by the providence of God, was by another shock thrown into the sea, and miraculously saved by swimming, until a boat took him up."

The epitaph somewhat unnecessarily adds, that "*he lived many years after* in great reputation." The seamen preserve the recollection of the above catastrophe by a current joke amongst them: when they experience any difficulty in heaving up the anchor at this station, they say, "*she has got down one of the chimnies of the old town.*" In 1703, Port Royal had again sprung up to be a place of considerable size, when it was reduced to a pile of ashes by fire. Nor is this all. In 1722, Port Royal the *third*, as it may be termed, was totally overwhelmed by the sea, during a tremendous hurricane which devastated the island, when twenty vessels and 400 persons perished in the harbour. Awed by these repeated calamities, which began to be looked upon as direct visitations of providence, on account of the horrid scenes of vice and depravity, which, as being the rendezvous of all the dissolute crews who visited the station, had from the first disgraced it, the greater part of the inhabitants removed to the land side of the harbour, where they laid the foundation of the now populous city of Kingston. The site of Port Royal, which was thus for many years abandoned, became, however, in process of time, again the scene of traffic and business, and was again almost annihilated by fire so late as the year 1815. This ill-fated spot, however, is now once more rising into importance, from its continuing to be the royal naval station, and containing the naval hospital, soldiers' barracks, and other public establishments.

The only other historical occurrence which it is needful to mention here, in reference to this island, is the celebrated Maroon war, which broke out with great fury in the year 1795. These people, as already noticed, continued to be the scourge of the English from the moment they became masters of the island. These savages lived in caves amongst the fastnesses and forests of the highest ridges of the mountains, where they subsisted by hunting and fishing, and upon the wild roots and fruits which there grow spontaneously. They seized every opportunity of making a descent upon the English plantations, where they uniformly murdered every white person, man, woman, or child, who fell into their hands. In short, their war with the settlers was one of extermination. Every expedient was tried either to awe them or pacify them; but, confiding in their almost inaccessible retreats, they rejected all overtures of a friendly nature. At last they became so formidable, that, in 1737, the assembly resolved to import a body of Indian hunters from the Mosquito shore, to assist in suppressing them, and likewise formed all the free negroes and mulattoes of the island into companies for the same purpose. About two hundred Indians were accordingly imported, who, being liberally paid, entered on the service with spirit, and, by their activity and courage in the practice of bush-fighting, and their skill in tracking the fugitives, harassed the Maroons so much that they were soon glad to capitulate. Accordingly, in 1738, articles of peace were ratified, by which the Maroons were declared free for ever, and 2500 acres of land were assigned to them and their descendants in perpetuity. Excepting as respected outrages on the settlers and their property, they were otherwise placed entirely independent of the English; the only conditional services they were required to perform, being to assist in repelling foreign invasions, and in apprehending runaway slaves, for each of whom they were allowed L.3 per head. After this, the Maroons remained tolerably quiet, although their conduct was always suspicious, until the year 1795. At this time they amounted to 1600 men, women, and children, and possessed four villages, or encampments, called Trelawney Town, Accompony Town, Crawford Town, and Nanny Town, all lying on the north side of the island. In July that year, two Maroons, being detected stealing pigs in Montego Bay, were ordered to be publicly whipped. Upon this, the whole body, conceiving themselves disgraced by this ignominious punishment, rose in arms, and, but for a providential occurrence, would have made themselves masters of the whole island. On the very day of the insurrection, the British fleet sailed for England, with all the troops on board except the 83d regiment. Luckily they took the windward passage, and the governor, Earl Balcarres, aware how frequently the vessels were detained in this course by calms during the night, with a strong lee current, dispatched a fast-sailing boat after them, furnished with oars for rowing during a calm, which luckily overtook the last of the war-ships five days after they had sailed! There is scarcely a doubt, that, but for the reinforcement thus miraculously obtained, the whites would have been at this time completely overpowered, as the Maroons prevailed upon a great part of the slaves to join in the revolt; the latter being the more easily persuaded, from the recent successful example of their brethren in St Domingo. In the conflict which ensued, the Maroons were at first completely successful, from their covert mode of fighting in ambuscade. Concealed among the bushes and in the branches of trees, they fired upon their opponents without being themselves exposed—always marking down the officers first; and several detachments of regulars and militia were thus annihilated without the Maroons losing a man. They had retreats in precipices accessible only to themselves, whence they issued to pillage and burn the neighbouring plantations, murdering the owners with circumstances of most atrocious barbarity. They were every day reinforced with fresh numbers of revolted slaves in proportion to their successes, and their force at last became so formidable, that many of the settlers fled from the island, all business was suspended, the courts shut up, and nothing but terror and anxiety prevailed. In this fearful state of matters, and having to deal with a foe against whom the courage and skill of the best disciplined troops could avail nothing, the assembly came to the resolution of sending to Cuba for a supply of the Spanish-American bloodhounds, not, as has been alleged, to hunt down the Maroons, like wild beasts, but to assist in discovering ambuscades, and tracing the savages to their secret retreats. The colonists have been much but most unjustly blamed for this step, which had become not more a measure of necessity than of positive humanity. The Maroons were not an unarmed, innocent, and defenceless race of men, like the ancient natives, but a horde of plunderers and merciless assassins. They had taken up arms without cause, and conducted the war upon the avowed principle of rooting out the English settlers from the island, to which, be it observed, they had originally no more (if not much less) right than the settlers themselves. The speediest method, therefore, of reducing to submission a body of men who had causelessly vowed extermination against all the rest of the community, was unquestionably the most justifiable, and, as the event in this case proved, the most humane. In fact, not a drop of blood was shed after the arrival of the dogs in the island. By the assistance of these canine allies, ambuscades were detected and defeated; the strongholds of the insurgents were discovered, and the passes to them blockaded;* and they were soon reduced to such extremity for want of water and provisions, that they began to open negociations for surrender, through means of some of the revolted slaves whom they dismissed for that purpose. Although now completely at the mercy of their conquerors, the only atonement demanded of them for all their enormities was, that they should ask pardon of the king upon their knees; that they should reside on whatever part of the island might be allotted to them; and surrender up all the fugitive negroes that had joined them; and they were allowed ten days to consider of these terms. That time having expired without their giving any reply, the English commander (Walpole) ordered the troops to advance upon them; but they had only proceeded a very short way, when a general supplication for mercy was sent in, upon no other condition than the promise of their lives. From the fierce and revengeful disposition of these people, it was judged prudent to break up the community. Six hundred of them were accordingly shipped off to Nova Scotia (Lower Canada), where lands were purchased for them at a cost of L.25,000 to the island. The descendants of the others still reside at Trelawney Town, upon the same terms as before the insurrection. This war cost the island nearly a million sterling, independent of the private damage sustained by the owners of slaves and plantations.

From the above period, until the latter end of the year 1831, the internal peace of Jamaica was, generally speaking, little disturbed; but at that time, owing to the exaggerated hopes of the negroes for immediate emancipation, from the accession of the Whigs to office—encouraged, as was alleged, by the Baptist missionaries—an extensive revolt broke out, the details of which must be still so fresh in the recollection of our readers, as to render a recapitulation of them unnecessary. One circumstance, however, may be noticed, as a feature distinguishing the late insurrection from all previous ones, that, although about a million's-worth of property was destroyed by the slaves, not the slightest violence was offered to any white person, beyond a few hours' personal captivity, and there were even very few instances of this.

Jamaica is divided into three counties—MIDDLESEX, SURREY, and CORNWALL. Middlesex is divided into eight parishes, Surrey into seven, and Cornwall into five. The seat of government is ST JAGO DE LA VEGA, or SPANISH-TOWN (in Middlesex). It is situated on the south-west side of the island, about six miles from the sea, and sixteen from Kingston. There is a superb palace here, maintained for the governor or commander-in-chief; and it is here that the house of assembly meet, and the court of chancery and the supreme courts of judicature are held. KINGSTON, although not the seat of government, is, nevertheless, from its importance, considered the capital of the island. It is situated to the south, upon a gentle slope of about a mile in length, which runs right down to the harbour, the finest, perhaps, in the world, and where the largest merchantmen can ride close in to the shore. The streets are built with almost mathematical regularity, like the New Town of Edinburgh. It contains upwards of 40,000 inhabitants, of whom there are 12,000 whites, the rest being slaves and free people of colour. There are excellent markets for butcher-meat, fish, fruits, and kitchen vegetables. On a plain, at the top of the declivity on which the town is situated, is a fine extensive barracks, called Up-Park-Camp; and not far from it, in a conspicuous situation, is a handsome residence for the admiral on the station, called the Admiral's Pen.

MONTEGO-BAY and FALMOUTH—the former situated on the north, the latter on the east end of the island—are both sea-ports of great traffic.

There are innumerable streams and rivers in Jamaica; but only one—Black River—is navigable inland, and which admits the passage of flat-bottomed boats and canoes for about thirty miles.

BRITISH LEEWARD CARRIBEAN ISLANDS.

II. ST CHRISTOPHER'S,

usually abbreviated into *St Kitt's*, is one of the Leeward Islands, and was discovered by Columbus in 1493, who bestowed on it his own Christian name. It was never occupied, however, by the Spaniards, or any others, until an Englishman, Thomas Warner, with fourteen associates, took possession of it in 1623. It is therefore the oldest of the British West Indian settlements, preceding that of Barbadoes by a year. A French ship having been driven in on the coast by stress of weather in 1625, the crew joined the British in an attack on the native Charaibs, whom they totally expelled. They then divided the island betwixt them, which they shared till the year 1629, when they were both driven out by the Spaniards, who, after having laid every thing waste in mere wantonness, departed for Brazil. The English and French then returned, but lived in continual warfare, alternately expelling each other, until, at the peace of Utrecht (1713), it was wholly ceded to the English, and the French possessions sold for the benefit of the British government. In 1733, L.80,000 of the marriage-portion of the Princess Anne (with the Prince of Orange) were derived from the sale of these possessions. In 1782, it was again captured by the French, but finally restored to Britain in the following year. It is about forty-two miles in circumference, and is divided into nine parishes. The capital of the island is Basseterre. The other towns or hamlets are very insignificant. St Christopher's lies in 17° 15' north latitude, and 63° 17' west longitude.

III. NEVIS.

This beautiful little island, consisting only of a single mountain, which rises like a cone out of the sea, green, unbroken, and verdant to the summit, was discovered by Columbus in 1493, at the same time with St Kitt's and other adjoining islands, which lie quite close and in sight of each other. It was first taken possession of in 1628 by a small colony of English sent by Warner from St Kitt's; yet so rapidly did the settlers increase, that in 1640 the population is said to have amounted to 4000 whites and 12,000 blacks. In 1689, half of the population were swept away by a dreadful mortality; nor has it ever again reached the same census. It seems unaccountable, indeed, how it could ever have maintained such a number of human beings, as it is only about 20 miles in circumference. Small as it is, however, it is divided into five parishes. The principal town and seat of government is Charles Town; and there are besides other two shipping places, Indian Castle and New Castle. Its sole produce is sugar. The entire population in 1823 was estimated by Humboldt at 11,000, of whom 9500 were slaves; but in 1825, the slaves were returned at 9288.

IV. ANTIGUA.

This island, the largest of the British Leeward

* The Spanish-American name for *hog-hunters*; so called from the great number of wild swine which abounded in the woods of the West India islands, and South American continent.

* "The caves in which the Maroons concealed their ammunition and provisions, and secured their women and children, were inaccessible to the whites. One place, called the *Cock-pits*, could be reached only by a path 150 feet in almost perpendicular height. Strange as it may appear, this obstacle was surmounted by the Maroons without difficulty. Habituated to employ their naked feet with singular effect in climbing up trees and precipices, they had acquired a dexterity in the practice, which, to British troops, was astonishing, and wholly inimitable."—*Edwards*, vol. i. Appendix, No. 2.

Islands, is situated about 60 miles east from St Christopher's, and was discovered at the same time with the latter by Columbus in 1493. It is 21 miles in length, and 50 in circumference. The most remarkable peculiarity of this island is, that, notwithstanding its considerable size, as compared with some of the others, it is the only one of them that has not a single spring or rivulet of fresh water in it. It was doubtless from this cause that it was found uninhabited by Columbus, and also that it was long left unoccupied by European adventurers after its discovery. Nature, however, presents few obstacles which the avarice or industry of man will not surmount: the lands were found to be fertile, and large cisterns were contrived to retain the water which falls in the rainy season. The water thus preserved has always been found light, pure, and wholesome. The first settlers were a few English families sent from St Kitt's, in 1632, by Warner, who appointed his son governor. The number of inhabitants, however, did not much increase until 1663, when Lord Willoughby, who had obtained a formal grant of the island from Charles the Second, sent out a large body of settlers at his own expense. In 1666, this colony was almost entirely destroyed by a French armament from Martinico, who, with a body of Charaibs, ravaged the island with fire and sword; but it was restored to the English in 1668, by the treaty of Breda. Up to this time, tobacco was the only vegetable cultivated; but, in 1674, sugar-planting was introduced with great success from Barbadoes, by a Colonel Codrington, and the colony thereafter rapidly rose into importance. In 1706, a Mr Parks was appointed governor of this and the adjoining islands, a man whose horrible character and tragical death have few parallels in history. He was by birth a Virginian of low descent, but having succeeded in marrying a lady of fortune in America, he absconded with her money to England. Here he succeeded in getting into Parliament, but was soon expelled for gross bribery. He then entered the army under the Duke of Marlborough, in whose good graces he rose so rapidly, that Queen Anne presented him with a purse of 1000 guineas, and her own picture set in diamonds; and, in 1706, conferred on him the government of the Leeward Islands, of which Antigua was then, as now, the seat of the executive. After his arrival there, he gave unrestrained licence to his brutal passions. Murder, violation, and robbery, he committed openly without shame or scruple; until the whole country rose as one man against him, attacked his house, seized his person, and literally tore him into a thousand pieces! Yet so flagrant and monstrous were his many crimes, that no proceedings were instituted against the colonists, for this act of insubordination, by the home government, who even seemed to approve of it, by promoting two of the principal actors to high official situations. Besides the occurrence of a remarkable drought of seven months, in the year 1789, whereby the whole crops were destroyed, and 3000 head of cattle perished from thirst, there is no other historical fact respecting this island deserving notice.

Antigua is divided into six parishes and eleven districts. St John's, the capital of the island, situated on the north-west, and English Harbour on the south, are the two principal towns. Both are well fortified; and, at the latter, are established a royal naval yard and arsenal, and conveniences for careening ships. Antigua was the first island which ameliorated the negro slave laws, by affording the accused the benefit of trial by jury. The inhabitants are chiefly Methodists.

V. MONTSERRAT.

This is one of the smallest of our British West India settlements, being only nine miles in length, and about as many in breadth. It was discovered in 1493, at the same time with St Christopher's, Nevis, and the other adjoining islands, by Columbus, who denominated it after a mountain in Spain (near Barcelona), to which it bears a resemblance. Like Nevis and Antigua, from each of which it is distant only about twenty miles, it was first peopled by a few English (or rather Irish) settlers, from St Christopher's, by Warner, in 1632. There is little or nothing worth noticing in the civil history of Montserrat, beyond the circumstance of its having been invaded and laid waste by a French armament in 1712. It is extremely healthy, fruitful, and beautiful, with alternate hills and vales, the former covered with wood, and the latter watered by fine streams. Almost the only staple articles cultivated are sugar and cotton.

VI. & VII. BARBUDA AND ANGUILLA.

These are the only others of the British *Leeward* Carribean islands (all included under one branch of government, as will be afterwards noticed) that remain to be mentioned. We have classed them together (although locally far separated), on account of the somewhat singular fact, that because they do not contribute to the annual importations of Great Britain, they have hitherto been left entirely unnoticed, both by government returns of our West Indian possessions, and by our various British geographers, as if unworthy even of a nominal enumeration! We owe the following slight descriptive particulars concerning them, therefore, chiefly to the notes of private visitors.

BARBUDA is situated about twenty miles north-east of St Christopher's, and ten north of Antigua. It is only about twenty miles long and twelve broad. This island was also one of Columbus's discoveries, although there is no other historical notice concerning it down to the time of Queen Anne, when we find it given in a perpetual grant to General Codrington and his posterity, by whom the greater part of it is still owned, and who have all along distinguished themselves for their philanthropic kindness to their negroes, and providing them with the bene[illegible] of Christian enlightenment. The population of the island amounts to about 2000.

ANGUILLA is the most northerly of the *Leeward* Carribee Islands, and lies about 100 miles north of Barbuda, and the same distance N.N.W. of St Christopher's, in the latitude of 18° north, and in the longitude of 64° west from Greenwich. It is thirty miles long, and only three broad, and received its name (signifying in Latin an *eel*) from the peculiar winding shape it presents, being also, for the same cause, sometimes denominated "Snake-Island." It was first discovered by the English in 1650, who found it tenanted only by alligators, and other noxious animals; but finding the soil fruitful, a colony was left on it, who soon multiplied in an amazing manner. It is curious, however, that, for nearly half a century, it was placed under no regular government, civil or ecclesiastical, and the settlers therefore became a prey to every rapacious invader of whatever nation. "Their chief suffering (says one writer) was from a party of wild Irish, who landed here after the revolution, and treated them worse than any of the French pirates who had attacked them before." The new and old settlers, however, afterwards united and harmonised together perfectly well, as is evident from the fact, that they, in 1745, although then only about 100 strong, repulsed a body of 1000 French who came to attack them, and obliged them to retire with the loss of 150 men. In 1796, the latter retaliated in a manner worthy of the atrocities of the Revolution. Two ships of war were sent with 400 picked troops, by Victor Hughes, of "red-hot memory," with directions to burn every settlement, and exterminate the whole inhabitants (British) in the island. These emissaries set about their work in good earnest, and committed the most barbarous atrocities on the defenceless inhabitants, but were happily interrupted by the arrival of Captain Barton, in the Lapwing man-of-war, who brought the French ships to action, sinking the one and taking the other. Since that time the island has remained in undisturbed possession of the British, but has never regained its previous prosperity.

The interior aspect of these two islands is quite different from that of any of our other West Indian settlements, being in many respects indeed quite *English*. The sole occupation of the inhabitants is farming, rearing stock, and cultivating provisions, for which a ready market is found in the neighbouring islands. There are no groups of masts in the bays and harbours; and instead of the laborious bustle, smoke, and noise incidental to the sugar and coffee plantations, there are to be seen only numerous little rural dwellings, surrounded by waving crops of grain, and verdant fields covered with sheep and cattle.

VIII. VIRGIN ISLANDS.

This name was given by the discoverer Columbus (in 1493) to a group of about forty small islands lying to the northward of the *Leeward Carribee Islands*, and between them and Puerto (or Porto) Rico. They extend about twenty-four leagues from east to west, and about sixteen from north to south. They are divided between the British, Danes, and Spaniards, but much the larger and more valuable number belong to the former. The names of these are Tortola, Virgin Gorda (or Penniston, and sometimes corrupted into *Spanish Town*), Joavan Dykes, Guana Isle, Beef and Thatch Islands, Anegada, Nichar, Prickly Pear, Camanas, Ginger, Cooper's, Salt Island, St Peter's Island, and several others of little or no value. Those belonging to the Danes and Spaniards will be noticed in their proper places.

The first possessors of the British Virgin Islands were a party of Dutch buccaneers, who fixed themselves at Tortola about the year 1648, and built a fort for their protection. In 1666, they were expelled by a stronger party of the same profession, who took possession in the name of England; and the English monarch (Charles the Second), availing himself of this circumstance, shortly thereafter annexed it to the Leeward Island government, in a commission granted to Sir William Stapleton. Up to 1773, the government of these islands was entrusted to a deputy-governor, with a council, who exercised in a summary manner both the legislative and executive authority; but, in the latter year, a local legislature, similar to that of the other islands, was conferred on them, with courts of justice, in consideration of the inhabitants *voluntarily* offering to pay an annual impost of 4½ per cent. to the crown upon all the natural productions of the islands. The Dutch had made but little progress in cultivating these islands when expelled; and the merit of agrarian improvement was reserved for a few English settlers from the little island of Anguilla, who removed thither in the year 1694. Their chief and almost their only articles of production are cotton and sugar; and the number of acres under cultivation is about 12,000. The entire population in 1812 was about 11,000; but, as will be seen by the tables subjoined to this article, a great decrease in this respect has taken place since in these, as in all our other West Indian islands.

IX. DOMINICA.

Although classed by geographers among the British *Leeward* Carribean Islands, Dominica may be described as *locally* and legislatively distinct both from them and the British *Windward* Carribean settlements; having a governor and legislature of its own, and being separated from the former by the large French island of Guadaloupe on the north, and from the latter by the French island of Martinico on the south. From its central situation, indeed, as well as its importance otherwise, it seems the best calculated of all the possessions of Great Britain, in that part of the world, for securing to her the dominion of the Charaibean Sea. This fact was entirely overlooked by the British Ministry during the whole course of the American war, when all the faculties and means of Great Britain were directed towards the security of our West Indian settlements, and preventing co-operation between the French and the insurgent colonists; no more than 100 soldiers, officers and privates, being assigned to garrison the island. From this criminal negligence it suffered severely during that contest, and was repeatedly captured by the French. In 1778, an armament of several thousand soldiers arrived from Martinico, who soon made themselves master of the island, after a gallant defence by the British militia, who did not exceed 120 in number. The conduct of the officer left in command of the island (Marquis Duchilleau), towards the English inhabitants, was most disgraceful. He placed them under martial law, forbidding them, on pain of death, to assemble together more than two in a place, or stir out of doors after nine o'clock at night; and several of the principal inhabitants were shot by sentinels placed for the purpose, for disobeying the latter order. Upon the pretence that the English were forming designs to retake the island, he set fire to the capital, Roseau, by which upwards of 500 houses were destroyed, with merchandise to the value of L.200,000 sterling. These continued barbarities ended in the ruin of the whole English inhabitants, who were suffering all the horrors of starvation, when, in 1783, the island was restored to the British government, under which it has since remained. In 1795, the French made an unsuccessful attempt to retake it, the whole troops that landed being either killed or taken prisoners. In 1805, Dominica was again attacked by the French, who burned Roseau, levied L.7000 sterling from the inhabitants; and, after committing many atrocities, departed on the fifth day after landing. Since that time, the island has been undisturbed, unless from insurrectionary movements amongst the runaway negroes, who, about the year 1813, made nightly incursions from the mountains, and threatened the destruction of the whole colony. This dangerous confederacy was at last broken up in 1814 by the death of their chief, named Jacko, who was shot by a party of rangers, after a desperate resistance.

Dominica is 29 miles in length and 16 in breadth; it contains about 190,000 acres of land, and is divided into ten parishes. The *nominal* capital, Roseau, is in the interior; but the great mart of trade is Prince Rupert's Bay, on the south-west side of the island. It is situated on a point of land which forms two bays—Woodbridge's Bay to the north, and Charlotteville Bay to the south. The principal productions are sugar, coffee, indigo, and ginger; it is watered by upwards of thirty fine rivers, besides a great number of rivulets. In the woods are innumerable swarms of bees, which lodge in the trees, and produce great quantities of wax and honey, both of which are equal in goodness to any in Europe. It is precisely the same species of bee as in Europe, and must have been transported thither; the native bee of the West Indies being a smaller species, without stings, and different in its habits from the European.

Several of the mountains in Dominica contain living volcanoes, which frequently discharge vast quantities of burning sulphur; and there are many springs of hot water, some of which are said to be warm enough to coagulate an egg. Mr T. Attwood, in his history of this island, gives a description of a miraculous insect peculiar to it, which he calls a *vegetable fly*. "It is of the appearance and size of a small cockchafer, and buries itself in the ground, where it dies; and from its body springs up a small plant, which resembles a young coffee-tree, only that its leaves are smaller. The plant is often overlooked, from the supposition people have of its being no other than a coffee-plant; but on examining it properly, the difference is easily distinguished—the head, body, and feet of the insect appearing at the root as perfect as when alive." This is a most extraordinary relation certainly; but not more so than the Rev. Nicholas Collins's description, in the American Philosophical Transactions, of a certain zoophyton in the Ohio county, which, he declares, is both vegetable and animal; for, having crawled about the woods in its animal state till it grows weary of that mode of existence, it fixes itself in the ground, and *becomes a stately plant, with a stem issuing from its mouth!*

There are still a few of the descendants of the ancient Charaibs residing in Dominica. They are of a clear copper-colour, with long, black, sleek hair; their persons short, stout, and well made. They live chiefly by fishing in the rivers and the sea, or by fowling in the woods, in both of which pursuits they use their bows and arrows with great dexterity. They kill the smallest bird at a great distance with an arrow, and transfix a fish at a considerable depth in the sea.

BRITISH WINDWARD CARRIBEAN ISLANDS.

X. ST LUCIA.

This is the most northerly of the group of *Windward* Charaibean Islands belonging to Britain, lying about twenty miles south of Martinico. It was first discovered by Columbus, but in which of his voyages is not exactly known, and it remained totally uninhabited by Europeans until the year 1639, when Lord Willoughby arrived with a party of English to colonise it, and succeeded in obtaining a peaceful surrender of the island from the native Charaibs. Few of our West India settlements have undergone so many alternations in ownership as this island. In 1640 (the year after its settlement), the natives rose upon the English, every one of whom they slew, with the exception of a few who escaped to Montserrat. For ten years afterwards, the Charaibs remained the sole possessors of the island; but in 1650, a colony of Frenchmen settled in it. These also, as well as various subsequent settlers, were killed or expelled by the Charaibs. In 1664, the English purchased the island from the latter, and a colony of 1400 men were settled on it; but of these only about ninety remained two years afterwards, the rest being destroyed either by sickness or by the natives. For nearly a century after this period, St Lucia was an almost incessant scene of contest and bloodshed between the English and French, by whom it was alternately taken and retaken, notwithstanding repeated treaties declaring it neutral. By the treaty of Paris in 1763, it was allotted to France, but was retaken by the British during the American war in 1779. It was again restored to France at the peace of 1783, retaken by the British in 1794, evacuated in 1795, reoccupied in 1796, restored to France by the treaty of Amiens in 1801, recaptured by the British in 1803, and has ever since remained under the British crown. These alternations of fortune naturally deteriorated the prosperity of the island, but it is nevertheless one of the most valuable of the group to which it belongs. It is twenty-seven miles long and twelve broad, and contains 203,000 acres, 35,000 of which are cultivated. It must still be fresh in the recollection of our readers, that one of the last victims to the unhealthiness of this island, was the late lamented General Stuart of Garth, who went out as governor in the year 1830, and died a few weeks after his arrival. The cause of this insalubrity is to be attributed entirely to the hitherto uncultivated state of the island, owing to its unsettled condition. The soil is excellent; and there is little doubt of its soon becoming one of the most important of our colonies in that hemisphere, under judicious management. A somewhat fanciful writer on the West Indies* gives the following uninviting account of the capital:—"CASTRIES is one of the dirtiest-looking holes I ever witnessed; my short stay did not permit me to see, and therefore I cannot describe, the houses of note therein contained. I landed on the wharf; and those along the Carenage presented the general appearance of West Indian buildings. My first ride was to the garrison, an excursion which, under the favour of heaven, I will never repeat. It is a jaunt only fit for such as love to risk their bones, and even their important necks."

XI. BARBADOES.

This is the most easterly of all the Charaibean Islands, and was the first settlement which the British made in the West Indies, in 1625. It was found without inhabitants in that year by the crew of the Olive Blossom, of London, who took possession of it by fixing up a cross where James's Town is now built, so called after the first monarch of England of that name. In 1627, Charles the First granted the Earl of Carlisle the whole island, upon his agreeing to pay his rival Marlborough L.300 a-year out of its revenues, thus excluding the rights of Sir William Courteen, an eminent London merchant, under whose patronage the first expedition had been undertaken in the year 1624. About this era it had become fashionable in England for men of high rank and distinction to engage in sea adventures, proclaiming themselves the patrons of colonisation and foreign commerce; and James Hay, Earl of Carlisle, distinguished himself amongst the rest. Courteen afterwards obtained a recognisation of his rights from Charles the First, but these were again set aside at the suit of the Earl of Carlisle, under that system of favouritism which proved the ultimate destruction of the unhappy monarch. Thus, by an act of power, which its repugnancy and absurdity alone rendered illegal, the Earl of Carlisle again found himself lord paramount of Barbadoes; and in order completely to ruin all the interests in the colony but his own, he proceeded to distribute grants to such persons as chose to receive them on his own terms. A society of London merchants accepted 10,000 acres, on conditions which promised great advantage to the proprietor, and these were allowed the privilege of sending out a governor of their own, who superseded Courteen's settlement, and the interests of the latter were cast aside. After this the emigrations from England, during the civil commotions, were so numerous, that, in 1650, it was computed there were upwards of 20,000 British in Barbadoes. "These adventurers," says Lord Clarendon, "planted without any body's leave, and without being opposed or contradicted by any body," and the colony being thus left to its own efforts, flourished without example. After the restoration of Charles the Second, the claims of Lord Willoughby, the Earl of Carlisle, and the crown, again came into competition, and formed the subject of litigation for many years, in which the conduct of Clarendon was thought so reprehensible as to form one of the articles of his impeachment before the House of Commons in the year 1667. Throughout the whole civil war, the island remained faithful to the exiled family; and to punish such stubborn defenders of a ruined cause, an armament was sent out in 1651, by the Parliament, to reduce it to subjection, who inflicted such barbarities on the inhabitants and their property, that they have never since regained their previous prosperity. This is proved by the fact, that, in 1670, there were computed to be 50,000 white and 100,000 black inhabitants, while at present there are estimated only about 90,000 inhabitants altogether.

Barbadoes is divided into five districts and eleven parishes, and contains four towns—Bridge Town, Ostins or Charles Town, St James's, and Speight's Town. Bridge Town is the capital and seat of government.

XII. GRENADA AND ITS DEPENDENCIES.

Grenada is situated between 12° 20′ and 11° 58′ N. latitude; and 61° 21′ and 61° 35′ W. longitude. It is about 20 miles in length from north to south. The face of the country is mountainous, but not inaccessible in any part, and it abounds in springs and rivulets. It was discovered by Columbus in his third voyage, in 1498, being then inhabited by the native Charaibs, by whom it was possessed unmolested until the year 1650, when it was taken possession of by the French from Martinico. By a succession of calamities and revolutions, the narration of which would interest few readers, the prosperity of this island was so much impaired, that, in the year 1700, there were found on the whole island only one hundred and fifty-three persons. From this time forth, however, its prosperity every year increased. In the wars which ensued between Britain and France, it was alternately taken and retaken by each, until, by the general peace of 1783, it was finally ceded to Britain. The name of the capital is Fort Royal, situated in a spacious bay on the west side of the island.

The Grenadines are a chain of small islands, running towards St Vincent on the north, the chief of these being Carriacou and Redonda.

XIII. ST VINCENT AND ITS DEPENDENCIES.

This is a beautiful island, about twenty-four miles long and twenty broad, lying fifty-five miles west of Barbadoes. It was discovered by Columbus, but never taken possession of. It was then inhabited by the native Carribs. From 1672 to 1748, contentions prevailed between France and England respecting the sovereignty of this island; but, in the latter year, it was mutually declared neutral. It remained thus till 1763, when it was assigned to the British. In 1779, it was captured by the French, but restored to Britain at the general pacification in 1783. St Vincent is extremely fertile, and produces sugar of the best quality. In 1812, an awful volcanic explosion took place. The matter thrown out not only covered the whole island more or less, but also many ships at a great distance at sea: it even reached Barbadoes, where quantities of the lighter particles were deposited; and the noise was heard at a distance of 300 miles. In consequence of this calamity, the British parliament voted L.25,000 to the sufferers.

St Vincent has attached to it eight small islands, which it is unnecessary to enumerate.

XIV. TOBAGO.

This is the most southerly of the West India islands, being 120 miles south of Barbadoes, and lying next to Trinidad. It is 32 miles long and 10 broad. It is equal in richness and variety of produce to any of the other islands. In 1748 it was declared neutral, but in 1763 was ceded to the English. It was taken by the French in 1781; confirmed to them in 1783; but retaken by the English in 1793. The principal town is Scarborough. The island contains 204,000 acres, of which only about a 6fth part is cultivated. The military and political history of this island is exactly similar to that of St Lucia, to which we refer our readers.

XV. TRINIDAD.

This island, which measures ninety miles long by fifty broad, lies near the coast of South America. It produces sugar, cotton, maise, fine tobacco, indigo, and fruit, but is said to be unhealthy. It was ceded to the British at the peace of Amiens. The capital is Port d'Espagne.

XVI. THE BAHAMAS OR LUCAYOS ISLANDS.

These are the most northerly of all the West Indian islands, stretching towards the coast of Florida, and forming with it the channel called the Strait of Florida. They were the first land discovered by Columbus in 1492, and amount in number to fully 500. The island which gives the name to the whole is the most northern, as well as the most important of the group. A settlement was established by the British in 1629, in the island called New Providence, and which continued until 1782 to be the seat of government. These islands were long infested by the buccaneers, and they were only expelled by the gradual erection of forts. Since that time the islands have been gradually improving. The chief article cultivated in these islands is cotton, neither sugar nor coffee having succeeded. All sorts of provisions grow in great abundance, and cattle and sheep thrive well.

XVII. BERMUDAS OR SUMMER ISLANDS.

These are a cluster of small islands lying almost in the form of a shepherd's crook, in long. 66° W., lat. 32° 20′ N., and about mid-way between the Bahama Islands and the Banks of Newfoundland. There are upwards of 400 of them, but few of them habitable; and even these so insignificant, that they are generally left out of the list of our colonies by geographers; we notice them here only from their being uniformly enumerated in the government returns.

BRITISH SOUTH AMERICAN SETTLEMENTS.

These settlements, although not properly belonging to the West Indies, naturally come to be noticed here. They are called by geographers British Guiana, extend over an immense space of the great South American continent, and include all the maritime tract between the river Corentin and Cape Nassau, in north latitude 6° 40′. The whole coast (being part of what navigators call the Spanish Main) is so flat, that it is scarcely visible till the shore is touched. The tops of the trees only are discernible; and even they seem to be growing out of the sea; nothing is to be seen but water, and the same monotonous appearance is presented far into the interior. These settlements are properly three in number—Berbice, Demerara, and Essequibo; they are, however, now one united colony, and denominated British Guiana.

BERBICE.

Berbice is situated on the banks of the river of that name, which discharges itself into the Atlantic in 6° 20′ north lat., and 57° 11′ west long. The plantations are situated on both sides of the river, and extend nearly 100 miles from its mouth. The sea-coast extends about 50 miles; and since it fell into the hands of the British, a huge embankment has been raised against the sea along the whole line, on which is a carriage road sixty feet broad, with six-feet parapets on each side, for the convenience of travelling. This colony was captured from the Dutch in 1803, and confirmed to Great Britain at the general peace in 1814. The two principal towns in this colony are Old Amsterdam, and Fort Nassau, or New Amsterdam. The latter may be considered as the seaport, being situated on a point of land on the eastern shore of the Berbice, about a mile up from the sea, the houses extending about a mile and a half along the banks of the river. It has been almost entirely built by the British. Old Amsterdam is also situated on the Berbice, about 60 (and, as some say, 100) miles from its mouth—the river itself being navigable to ships of burden for 200 miles. There runs across the mouth of it, however, a bar of sand, over which, even at high tide, there is scarcely sixteen feet of water. This greatly deteriorates the trade of the river, and the prosperity of the colony; as large ships, rather than incur the danger of crossing the bar, prefer anchoring off the port of Demerara. The principal productions of the colony are sugar, coffee, tobacco, and cotton.

DEMERARA AND ESSEQUIBO.

This tract is of much greater extent than that of Berbice, being, as near as can be ascertained, about 650 miles in length and 150 in breadth. The principal rivers are the Essequibo, the Demerara, and the Pomeroon. The former is one of the largest of the immense rivers which roll down from the South American mountains into the Atlantic. It is composed of three main streams which join together about 70 miles from the sea—Essequibo, the Massarouni, and Cayouni, all of which are great navigable rivers, and are composed of innumerable tributaries. The Demerara is a mere streamlet compared with the Essequibo, although navigable 100 miles into the interior. At its mouth it is a mile and a half broad, and sheltered from every wind; but, unfortunately, as with the Berbice, there is a bar of sand across the mouth, which at low tides is only covered with nine feet of water, and in spring-tides with eighteen. The scenery along the banks of the Demerara is peculiarly beautiful, from the fine regular ranges of plantations on each side; the sugar-estates and coffee-plantations all active and bustling; while crowds of boats passing up and down the river give life and animation to the scene. Every plantation has a wharf or landing-place of its own on the river; and being surrounded with canals or sluices for draining the land, admitting flat-bottomed boats, &c., each is in a manner insulated from the other.

The capital of Demerara is George Town, which is defended by a fort, and situated near the mouth of the river. There are several other towns, or rather villages, which it is needless to enumerate or describe; besides the fort of Zelandia, in the Essequibo, about 40 miles from the sea, and the fort of New Middle-Burgh, situated at the confluence of the Massarouni and Essequibo. This town has considerably increased in extent since the colony has come into possession of Great Britain—it contains a population of 12,000 souls.

* "Four Years' Residence in the West Indies. By F. W. N. Bailey. 1830."

Demerara was colonised by the Dutch in 1626, but it made comparatively little progress until after 1796, when it was captured by the British. Along with Essequibo, it was most inconsiderately restored to the Dutch in 1801, after several millions of money had been expended on it by the British planters and merchants. They were retaken in 1803, and finally secured to Britain at the peace of 1814.

A comparatively small portion of British Guiana is yet cultivated, and an immense field for colonial industry still lies open. The soil, which produces all, and more, than the productions of the West India islands, is far deeper, richer, and does not, as in them, *wear out.* No hurricanes visit this coast, so that the planters are never subjected to sudden damage in their crops, nor the merchants in their shipping. The seasons are more certain than in the West Indies, the genial trade-winds blowing almost incessantly during the whole year. In short, there is a probability that British Guiana may, at no distant period, become of much greater consequence than all the British West India islands put together. The chief inconveniences are a want of good water, which is generally brackish, and the myriads of insects with which this region is infested. The latter, indeed, comprehend every variety incidental to all known tropical climes. Of the eternal buzzing, biting, stinging, creeping, and crawling of these animals, it is impossible to convey any adequate idea to a European, unless the following lively remarks of an *Edinburgh Reviewer*, on the subject of Demerara entomology, may succeed in doing so:—"The *bete rouge* lays the foundation of a tremendous ulcer. In a moment you are covered with ticks. Flies get entry into your mouth, into your eyes, into your nose; you eat flies, drink flies, and breathe flies. Lizards, cockroaches, and snakes, get into the bed; ants eat up the books; scorpions sting you on the foot. Every thing bites, stings, or bruises; every second of your life you are wounded by some piece of animal life nobody has ever seen before, except Swammerdam and Merian. An insect with eleven legs is swimming in your tea-cup, a nondescript with nine wings is struggling in the small beer, or a caterpillar with several dozen eyes in its belly is hastening over the bread and butter. All nature is alive, and seems to be gathering all her entomological hosts to eat you up as you are standing, out of your coat, waistcoat, and breeches. Such are tropics. All this reconciles us to our dews, fogs, vapours, and drizzle—to our apothecaries rushing about with gargles and tinctures—to our old British constitutional cough, sore throats, and swelled faces." In addition to this humorous detail of animal pests, it may be mentioned, that the woods are crowded with snakes, some of them 30 and 40 feet long, and very dangerous.

The ornithology of Demerara comprises all that is rich and rare in formation and plumage. Nature has exhausted her fancy in the combination and contrast of hues in the same individual, from the tiny humming-bird, not larger than a humble-bee, sucking its subsistence from the bosom of the flowers, to the huge pelican and scarlet curlew, standing with their drooping wings in solemn rumination amongst the river mud. Our limits forbid us dwelling on this enticing subject.

The colonial population consists of three classes—whites, mulattoes, and negroes. The slaves were shockingly treated by their Dutch masters, but live in comparative happiness under the English, being well treated in every respect.

FOREIGN POSSESSIONS.

FRENCH.

Previously to the negro insurrection in 1792, St Domingo appertained to the French, and was by far the most valuable colony in the West Indies. Their only possessions now are Guadaloupe and Martinico (or Martinique), and the insignificant islands of Marie Galante and Deseada. These are all situated in the windward Carribean group. Guadaloupe and Martinico are islands of considerable importance and value. In 1827, the population returns were as follows:—Guadaloupe—Whites, 17,257; free-coloured persons, 16,705; negroes, 101,554; total, 135,516. Martinique—Whites, 9937; free-coloured persons, 10,786; negroes, 81,182; total, 101,905.

SPANISH.

A few years ago, the colonial possessions of Spain extended from the frontiers of the United States almost to Cape Horn. Now she has not a foot of land on the whole American continent; and of the islands, is possessed of only two worth mentioning—Cuba and Porto Rico, whose situation has been before mentioned. These, however, are of great value and importance, especially the former, which is by far the largest and finest of the West India islands; only about one hundredth part, however, is supposed to be under cultivation. The capital is Havannah, on the north coast, with a harbour capable of containing the largest fleet in safety. The entrance into it is so long and narrow, that only one vessel can pass at a time. The other principal towns are St Jago (formerly the capital of the island), Puerto del Principe, St Salvador (on the east side), Trinidad (on the south), with Santa Cruz, Baracoa, and Cadiz (all on the north or north-east of the island). There are supposed to exist veins of gold in the island, from the dust being found in the sands of the rivers; and there are also some valuable mines of copper.

DUTCH.

The Dutch possessions in the West Indies are Curacoa and St Eustatius, Saba and part of St Martin—all in the Carribean group. The two former are naturally barren. Curacoa, from its proximity to South America, was formerly a place of great contraband traffic; but since the independence of that continent, it has ceased in a great measure to be an *entrepôt.* It is 30 miles long and 11 broad, and produces sugar and tobacco. Like some of its sister isles, it is entirely dependent on the rains for a supply of water. It was held by the Spaniards until the year 1632, when it was taken by the Dutch, in whose hands it has since remained. The population is estimated at about 30,000.

St Eustatius consists but of one mountain, which is 29 miles in circumference, and cultivated to the very summit. The productions are sugar and tobacco, and the population may be about 15,000. It was first colonised by the Dutch in 1635, and continued for many years a subject of contention between them and the French, by whom it was alternately possessed, until 1781, when it was captured by Admiral Rodney. The booty which fell into the hands of the English on this occasion was estimated at L.4,000,000 sterling. It was restored to the Dutch by the peace of 1795; and after being again captured by the English, was finally secured to the Dutch by the peace of 1814.

Saba and St Martin are too inconsiderable to need further mention.

DANISH.

The Danish settlements, all belonging to the Carribean group, are three in number—St Croix (or Santa Cruz), St Thomas, and St John, of which the former alone is of any importance. It is about eighty-one miles square, and contains about 30,000 inhabitants. The soil is fertile, and well cultivated, producing sugar, rum, and tobacco. St Thomas is about six leagues in circumference, and St John about the same. They are both quite inconsiderable.

SWEDISH.

The only colony belonging to the Swedes is the small island of St Bartholomew, in the leeward Carribean group, and about fifteen miles in circumference. It has only one town and one harbour—Gustavia, and Le Carenage. The population is about 6000.

INDEPENDENT ISLAND.

ST DOMINGO.

To give a proper historical account of this, formerly the finest of all the West India Islands, would require almost a full sheet of our INFORMATION for the purpose; and a mutilated sketch would only serve to confuse our readers' ideas on the subject. We will, probably, soon recur to this interesting topic in the JOURNAL, but are here necessitated to confine ourselves to the following slender particulars:—

St Domingo lies between Porto Rico on the east, and Cuba and Jamaica on the west. It is about 400 miles in length, and 30 in average breadth. It was discovered by Columbus in 1492, who gave it the name of Hispaniola, or Little Spain. It was found possessed by native Carribs, who denominated it Hayti, or "the Mountainous Land." Columbus left a small colony, but these were soon expelled by the natives, on account of their cruelty and rapacity. The French next took possession of it about the year 1650, and, along with the Spaniards, divided the island betwixt them, after subjugating the natives. No particular event took place after this until the French revolution, when, taking advantage of the contest between the royalist and republican settlers, the natives and slaves rose in a body, massacred the whites, and established their independence; Christophe, formerly a slave, was elected chief, and after governing with great wisdom until 1811, was crowned king. In this dignity he formed a court of princes of the blood, dukes, counts, barons, chevaliers, military orders, &c., with all the ceremonials observed in the French court, and reigned undisputed till 1820; but his measures having become too despotic, his subjects rose in revolt, and, after an unavailing contest, seeing his affairs desperate, he shot himself. A republic was then established, and still continues the form of government, consisting of a senate and chamber of representatives, with a chief magistrate, or president, selected for life.

St Domingo has never recovered the devastations of the revolution, and all sorts of commercial productions have declined in an extraordinary degree. Sugar, for example, has fallen off from 141,000,000 lbs. to almost nothing; coffee from 77,000,000 lbs. to 30,000,000; cotton from 7,000,000 lbs. to 600,000 lbs.; indigo from 700,000 lbs. to nothing, &c. Such is the account, at least, presented by recent travellers, who speak of the population as being sunk in sloth and ignorance.

The capital of St Domingo is Port au Prince, on the west side of the island, within a large and beautiful bay. The population of the whole island may be estimated at 800,000, the whole of which are blacks, with the exception of a few white traders and casual residents.

Having now given a brief historical sketch of the West India islands, we now return to give a more minute account of the government, climate, productions, &c. of the British possessions.

GOVERNMENT OF THE BRITISH WEST INDIES.

The government of all the originally British West India islands is exactly alike, consisting of a governor and council, and a house of assembly, the members of which are elected by all the colonists possessed of a freehold to the amount of ten pounds. The governor is also commander-in-chief. Several islands are sometimes included in one government, who send their representatives to the island which is the seat of legislature for the time being. Thus, in the Leeward Islands, St Christopher's, Nevis, Montserrat, and one or two other small islands, send their representatives to Antigua, which is the seat of government for them all; or, in other words, the residence of the governor. The superior and inferior courts of judicature resemble, of course, those in England, the laws being the same; unless as they may be affected by the special colonial enactments passed from time to time. Assize courts are frequently held, to expedite the course of justice. There are, likewise, parish courts, wherein justices of the peace decide summarily in small debt cases. There are offices where all deeds, wills, sales, and patents, are recorded. All persons intending to leave the island are obliged to give notice at the office of enrolment three weeks before they can be entitled to a pass, or to find security for what debts they may leave unpaid in the island; and, for further precaution, masters of vessels are taken bound, under heavy penalties, not to carry off any person without such pass. The procedure of the assembly follows as near as may be the formula of the British legislature, and all their bills have the force of laws as soon as the governor's assent is obtained. The power of rejection, however, is vested in the crown, but, *until rejected*, the laws are valid. The governor can also refuse his assent to all such laws, and can dissolve and call together the assembly at pleasure. His salary is paid partly by the crown, and partly from the island revenues.

Those colonies not originally British are governed in a more arbitrary manner by a governor only, though possessing their former laws, whether French, Dutch, or Spanish.

CLIMATE.

The year may be divided into four seasons:—The first commencing with the mild vernal rains in April or May, which usually last six weeks; the second includes June, July, August—hot and dry; the third includes September, October, and November, which are the hurricane and rainy months; and the fourth, December, January, February, and March, which are the most serene and cool months.

The climate of the West Indies is pretty nearly alike in all the islands. The average of the thermometer in the towns may be set down at 80° during the summer months (from July to November). It often attains to above 90°, but in the mountains it has been known to be so low as 44°, so that a fire at noon is there necessary a great part of the year. The temperature is kept cool by the alternations of the sea and land breezes, the former blowing only during the day, the latter only during the night. Of the latter, which always blows from the centre of the island (be it ever so small), the only scientific account ever given is that of Dr Franklin, which is as follows:—"As soon as the sea-breeze dies away (in the afternoon) the air of the plains, being rarified, ascends towards the tops of the mountains, and is there condensed by the cold, which making it specifically heavier than it was before, it descends back to the plains on both sides of the ridge." It is a singular dispensation of Providence, that in Barbadoes and the smaller windward Charaibean islands, which are without these landward breezes, the sea-breeze (or trade-wind) blows both night and day.

The most delightful time of day in Jamaica is at day-dawn, before the sun has yet begun to pour his effulgence over the hemisphere of the Carribees, and before the land-breeze has died away. The sea-breeze, or "doctor," as it is gratefully designated by the inhabitants of Jamaica, which invariably blows from the south-east, or some other point ranging from south to east, generally sets in about nine o'clock A. M., at first only gently rippling the surface of the ocean, and increasing gradually, until it often assumes the strength of a temporary hurricane. Its coming is hailed by the panting, and literally melting inhabitants, with a degree of thankfulness and a sensation of relief, which can only be known by those whose lot it has been to inhale the oppressive and suffocating atmosphere of these climes.

Were it not for this regular alternation of trade-winds and inland-breezes, the islands of these seas would, to Europeans at least, be perfectly uninhabitable. Let such of our readers, therefore, whose destiny has never led them beyond the cool shores of Britain, conceive, if they can, the sufferings of their brethren in the tropics, when it happens that the 'doctor' absents himself for a whole fortnight at a time.

In the afternoon, the sea-breeze dies away, as it comes—gradually; after which, for a few hours, earth and sea are again locked in a stillness of repose—a syncope of motion, which, to a new comer, has something almost ominous; and as his imagination is generally saturated before his arrival with descriptions of those fearful visitations, the earthquakes—which are there so frequent, though seldom occasioning much damage—he instinctively listens, in that period of profound stillness, for the first rumbling growl preceding the volcanic explosion. Earthquakes, however, have for many years been becoming rarer and rarer in the West Indies—a fact which seems to confirm the hypothesis that these islands having, at one time or other, had their origin in volcanic eruptions, are gradually cooling, and that these fearful visitations will soon altogether cease. There is scarcely a house, however, of many years' standing, in the walls of which several huge cracks are not to be seen—a circumstance which called forth a witticism from a late visitor, who observed, that although the value of West India property was daily falling, the *rents* of the houses were yearly increasing.

The most dreadful scourge of these islands are the hurricanes, which have devastated them all repeatedly from time to time. Between the years 1780–87, a succession of hurricanes desolated Jamaica to such an extent, that, combined with the scarcity of provisions produced by the American war, no less than 15,000 negroes perished from famine. The more mountainous islands also suffer severely from the violent rains, which pour down, as they actually appear to do, in bucketfuls, sometimes sweeping the entire soil, and all growing thereon, from whole plantations, and leaving nothing but the bare rock! Since the gradual clearing of the islands from wood, thunder is much less frequent now than formerly, and seldom does any damage. It is, however, terrifically loud.

PRODUCTIONS.

Having exhibited in the annexed tables the staple articles of commerce produced by the various islands, we think it unnecessary to recapitulate them here, and shall, instead, shortly enumerate the productions, animal and vegetable, which form the principal articles of colonial consumpt—a subject less generally familiar to our readers.

The natural productions of all the West India islands are so uniformly alike, that a description of those in one colony may be regarded as a general enumeration of those peculiar to all. A late writer in our Journal, who was himself a residenter in Jamaica for a considerable time, thus enumerates the more common varieties of animal and vegetable food, both in the seaports and the interior:—"There are few places in the world where people in general *live* better, I believe, than in Jamaica—from the highest to the lowest—the governor to the plantation negro. Food of all kinds is in abundance—flesh, fish, fowl, fruit, and kitchen vegetables. To be sure, the assortment varies in different districts, but all are equally well supplied with some kinds or other. If fresh beef and mutton abound most in the towns, the mountains have a still better supply of pigs, poultry, kid, and game. The beef is seldom good, owing to the universal practice of drawing the oxen in teams for several years; besides, the heat of the climate obliges its consumption, or at least cooking, within four-and-twenty hours after being killed. The mutton is coarse, and, from the appearance of the sheep, one wonders that it is not a great deal coarser. The young kids are much used, and highly prized, and, when properly roasted, look very tempting and tender, but still there is a rankness of flavour about the flesh which bespeaks the future goat, and which I never could reconcile myself to. The pigs, especially those fed on the sugar estates, are the most delicate and delicious, I should think, in the universe. What the acorn-fed porkers of Westphalia may be when young, I know not, but they must be fine indeed to excel their West Indian brethren, educated on the juicy cane roots and plantain stems. The veal I never tasted. As for the fish, there are few places supplied more abundantly, or in greater variety. It would occupy, indeed, a whole page of letterpress to enumerate them; therefore I shall name none. Many of them are large and rich, but their flesh is in general soft and pulpy, nor is there any one of them at all to be compared to our own salmon. One small kind, called the *snapper*, with various other sorts, are to be seen swimming about near the shore of the clear pellucid harbour, and under the numerous quays, in thousands. In the inland streams, the mountain mullet, a fine rich trout, is the prevalent fish. Speaking of fish, I must not forget the shell-fish; but I refer to them only for the purpose of noticing two species—the oyster and the black crab. The former literally *grow upon trees*; that is to say, they adhere to the pendant branches of the willows that grow on the margin of the water, and in this state are brought into market, where they are sold at so much per stick. But, assuredly, unless informed, I should never have guessed them to have been oysters. Their shells generally resemble those of the mussel rather than the pandore. They are very sweet and wholesome, nevertheless. The black crab (which resembles exactly our Scotch *parton*, but smaller, and darker in the colour) is generally considered a great delicacy in Jamaica. The habits of this animal are as great a puzzle to the West Indians as those of the salmon are to the naturalists of Scotland. They are found in all parts of the interior, and it is believed they migrate every year from one side of the island to the other; at least they have often been met with, in hundreds together, slowly traversing the country. At these times it is dangerous to meddle with them, as, should they fix upon a man, mule, or horse, nothing but wrenching their claws off their bodies could make them quit their hold. It is a curious characteristic of this animal, that, during these migrations, nothing can make them swerve from their path. Be the obstacle which comes in their way stone, tree, or precipice, they go direct over it by means of their adhesive claws. Whilst sojourning on the seashore, they burrow in holes like rabbits. The domestic fowls are the common hen, the guinea-hen, the peacock, the turkey, the duck, and, I think, the goose. The first of these are chiefly disposed of to vessels leaving port; but the guinea-hen, although seemingly a more delicate bird, is easier kept, and stands the voyage much better. The turkey thrives uncommonly well in Jamaica. The game, or wild-fowl, is exceedingly limited in variety. The guinea-fowl and the quail are plentiful; but owing to the rank vegetation that covers the country, any thing like regular hunting is impossible. There is likewise abundance of snipes, and also numerous varieties of the pigeon tribe.

Of the fruits in Jamaica I need scarcely speak. They comprise almost every species known in the western tropics. The vine and pomegranate cluster every veranda where the owner takes the trouble to plant them. A large delicious pine-apple may be bought in the market for a fippeny (3d. sterling). The juicy water-melon, which retains its delightful coolness even when exposed, unsheltered, to the burning sun, is abundant, and grows to a very large size. Oranges are in the utmost profusion, and better I never tasted than what I met with sometimes. The tamarinds are literally allowed to rot on the trees. The mangoes are so common that they are little regarded, unless by the negroes, scores of whom are every year carried off from eating them ere they are fully ripe. Besides the fruits I have mentioned, there are the shaddock, the star-apple, the pappaw, the bread-fruit introduced by Captain Bligh from the South Sea Islands in 1793, and a host of others. Wild strawberries are found in the higher parts of the mountains. The English apple, also, grows in Jamaica, but is very dwarfish; nor must I omit to mention the pears, which are not eaten, as with us, as a dessert, but to meals, with pepper and salt! They bear no affinity, however, to the British pear, but have a large stone in the heart of them, and the fruit is of a fat tasteless nature, which few strangers relish. I have eaten the ripe figs from the tree, too; but to my taste they are nothing to be compared in their green to their preserved state. The cocoa-nut tree takes, I believe, fully a dozen years ere it begins to bear. While the nut is green, and before the white kernel, or rather coating, begins to form on the inside of the shell, the cavity is quite filled with a watery liquid of a sweet rich taste, which is reckoned very nourishing. I have taken an English pint of this liquor from one nut, and drunk it too. There is a great similarity of appearance between the palm and the cocoa-nut trees; and although the former is the statelier plant, the branches of the latter excel it in freshness of colour—bright green.

There is no scarcity of kitchen vegetables in Jamaica. The potatoes endeavoured to be raised there are, as in all tropical climes, very bad—small, watery, and waxy. The want of them, however, is amply made up by the yam in the mountains; and in the seaports there is at all times a plentiful importation of potatoes from Ireland, Britain, and America. There are green peas all the year round, and a numerous variety of small delicate beans. A plant called calaloo grows wild, which is much used in the interior, and resembles exactly our spinach in taste, colour, and medicinal properties. Perhaps I should also include the plantain among the vegetables for table use, as it is used instead of loaf-bread at all meals by the planters in the interior. There is a root, too, called the cassa, which in its green state is rank poison, but, when dried in the sun and pounded, makes a white and pleasant cake. One of the greatest treats of the vegetable species which I met with among the mountains, was, 'the garden marrow,' which, when sliced down and fried, bears the nearest possible resemblance to a rich, well-cooked pancake."

INSECTS, REPTILES, BIRDS.

One of the most annoying pests of the West Indies is the myriads of ants that every where swarm as well within as without doors. There are innumerable varieties of them—some black, some brown, some large, and some very small. But, like all the other creations of Providence, these little animals, which, by some superficial writers have been called the "plague of the West Indies," prove of the most beneficial consequence to the health of the island. They are carnivorous, and prevent the accumulation of putrid animal matter. Their scent is remarkably acute, and a dead fly, wasp, or even musquito, will not lie on the floor for two minutes, before a procession of ants will be seen issuing from some distant corner of the apartment, who drag off their prize bodily to their store-house, to be consumed at their leisure.

Perhaps the greatest annoyance experienced by new settlers in these islands is from the bites of the musquitoes, although these animals are not nearly so formidable there, in size or sting, as on the South American continent. In the latter they are so dreadful a plague, that people obliged to sleep out of doors can only find protection from the smoke of rank and green weeds thrown upon a fire to windward of them. In the islands, however, they are bad enough, in all conscience, and a new settler may almost be recognised from the blotched and swelled appearance of his face, hands, and ankles—in short, every part of his person exposed to their venomous probosces. They resemble exactly our British midge, and are in fact of the same family of insects. After a short residence, they cease to be any annoyance to Europeans, who become callous to their stings, and whom, indeed, they cease to fix upon after getting quit of their rich European blood. They do not at all trouble the negroes, whose oily skins are impervious to their stings: they are most tormenting during the night, and, to guard against their attacks, gauze curtains are hung round the bed of every respectable inhabitant in town or country. The process of getting into bed without admitting any of these tiny persecutors, is one requiring great dexterity, and not a little scientific manœuvring, as will be seen by a most humorous description, given by Captain Basil Hall in the third series of his entertaining "Fragments;" and which, although applying to the eastern hemisphere, is equally applicable to the west.

Another of the pests of the West Indies is the *chigre*, a small invisible insect, which enters the skin, and, unless extracted speedily, breeds the most disgusting sores. They abound chiefly on the coffee plantations. After getting into the flesh, they will hatch a colony of young chigres in a few hours. They will not live together, but every chigre sets up a separate ulcer, and has its own private portion of pus. Their presence is known by a sharp itching of the part.

The cockroach is a large and disgusting animal, but harmless. It resembles our cricket in appearance, and abounds in thousands.

One of the most singular of the animal phenomena peculiar to the West Indies, are the fire-flies. The light emitted from their bodies is phosphorescent, and only glows during the night. "I was in the habit," says a late writer in our Journal, on Jamaica, "almost nightly, of enclosing a dozen or more of fire-flies under an inverted glass tumbler on my bed-room table, the light from whose bodies enabled me to read without difficulty. They are about the size of a bee, and perfectly harmless. Their coming forth in more than usual numbers is the certain harbinger of impending rain; and I have frequently, whilst travelling, met them in such myriads, that, be the night ever so dark, the pathway was as plain and visible almost as at noonday. The light they emit resembles exactly the lustre of the diamond, and I have been told that it is no uncommon thing for the Creole coquettes to insert a few of them, confined in pieces of thin gauze, amongst their hair, and in various parts of their dress, just as our belles at home avail themselves of the ingenuity of the paste-jeweller."

There are few poisonous reptiles in the West India islands besides the scorpion, which is very numerous. It lodges principally about old walls, and the trunks of felled and decayed trees; its bite always produces fever, and often causes death. There are many varieties of serpents, but they are almost all harmless. The kind most common in Jamaica is the yellow snake, which is frequently found of seven and eight feet in length. It often comes into the houses; and one of them is reckoned an excellent prize by the negroes, from the great quantity of oil it yields.

One of the most common of the reptile tribe is the lizard, exactly resembling the alligator in shape. These animals are to be seen frisking about in thousands throughout all the interior, especially about the public roads. Some of them are two feet long; and many of the inhabitants consider them a great delicacy when stewed. Their flesh is quite white, and resembles that of a chicken or rabbit.

Amongst the most destructive of the animals which infest the West Indies, is the rat, which is very large in size. The history of this animal is somewhat peculiar. It was introduced into several of the West India islands about fifty years ago, by Sir Charles Price, for the purpose of extirpating the native rat. This it soon did most effectually, but at the same time overran the island itself, proving by a thousand degrees a greater pest than their predecessors. They annually do great damage to the cane-grounds. One of the first animals which attract the attention of a stranger in the West Indies, is the large carrion crow, called by the negroes the "John-crow." It is a large, heavy, sluggish bird, about the size of a British turkey, the head exactly resembling that of the latter. It is black in colour, and in the interior is seen floating at an immense height above every hamlet. Its sense of smell is so keen that it will discern the effluvia from the body of the smallest dead animal at several miles' distance, and has been known to scent the dead bodies in wrecks when the vessels themselves were out of sight of land. They are found so beneficial to the health of the island in thus consuming all putrid animal substances, that a fine of a doubloon (L.5 currency) is exacted for the killing of every one of them. When sickness prevails in a house, these birds perch upon the roof even in the midst of towns, where they will remain for many days, as if waiting for their loathsome banquet—in the same manner as sharks are said to attend sick ships at sea.

SLAVES AND THE SLAVE-TRADE.

So much has been said of late on the subject of slaves and slavery, that we consider it necessary to give only a brief detail of the origin and history of that abominable system, which is now happily in the process of being extinguished for ever. It unquestionably received its first great impulse during the adventurous reign of Elizabeth, and increased thenceforward to a height which is horrible to reflect upon. Even so late as the year 1764, Jamaica alone required an annual supply of upwards of 10,000, although the colonists had long before that begun to manifest a decided dislike to this continued influx of the wretched Africans. We find that, from the middle of last century, indeed, repeated remonstrances were made to the home government by all the colonies against the encouragement given to this traffic; but in vain. In 1774, at a public meeting in Jamaica, resolutions were passed to the effect that the "trade to Africa for slaves was neither consistent with *sound policy, the laws of nature*, nor morality." In the same year the local legislature passed laws restricting the trade; but the merchants in Bristol, Liverpool, London, and the other mercantile ports in England (whom alone the traffic was enriching), raised such an outcry, that the ministry refused to ratify the colonial law. In spite of this want of sympathy in Britain, both for the feelings of the colonists, and the sufferings of the poor Africans, we find the former afterwards doing all in their power to discourage the traffic, and passing laws from time to time for ameliorating the condition of their slaves. A better feeling soon began to spring up in Britain, and, in 1772, the first great blow was given to the system of slavery, by the decision of Lord Mansfield, that "*no man can be a slave after touching the soil of Britain.*" From this time forward, the advocates of the abolition of the slave-trade became every day more numerous and enthusiastic, amongst whom, Mr Granville Sharp and Mr Clarkson were the most indefatigable. The same principles spread also rapidly through other countries, and societies were formed to promote the Christian object. By the commencement of 1788, these exertions had produced so much effect, that the table of the British House of Commons began to be crowded with petitions on the subject, and among their supporters was almost all the array of talent (including Fox, Burke, Whitbread, Pelham, &c.) which then distinguished that assembly. Mr Pitt also became deeply interested in the subject, although, from his official situation, his repeated motions for inquiry, &c., were all so cautiously worded, that he obtained little credit for his good feeling. On the 29th May 1789, the late Mr Wilberforce, who seems, until then, to have taken little *public* interest in the matter, introduced the subject to the house in a speech of three and a half hours long, and concluded by proposing the entire abolition of the slave-trade in a series of twelve resolutions. These were supported by Mr Pitt, Mr Fox, Mr Grenville, &c. The house went into committee, which sat and adjourned from time to time, until the year 1791, when the bill founded on the resolutions was thrown out by an immense majority (amongst the foremost of whom is to be found, curiously enough, the name of Lord John Russell). At the same time, a prospective and indefinite motion for the *gradual* abolition of slavery, proposed by the late Lord Melville (then Mr Dundas), was carried by a small majority. From this time forward, an almost continual struggle was carried on between the two parties, until the year 1805, when Mr Wilberforce again succeeded in carrying his resolutions, that the slave-trade be abolished within a limited period; but the bill founded on them was thrown out by the House of Lords. The death of Mr Pitt in 1806, though it deprived the cause of one of its warmest supporters, brought in a ministry unanimously favourable to it; and, in the same year, a bill was accordingly passed, abolishing for ever the inhuman traffic of importing slaves from Africa, and negociations were at the same time opened with foreign countries for co-operating in suppressing it.

The carrying of this great measure satisfied the friends of emancipation for some time; but, of course, in the eyes of humanity, the act could only be regarded as a preliminary step to the entire extinction of slavery itself. It is needless here to review the various efforts made in Parliament of late years with this view, as the nation may be said to have been perfectly unanimous in the praiseworthy cause, the only difference of opinion being as to *how* and *when* such a measure ought to come into effect. Suffice it to say, that, on the 31st May 1833, a series of resolutions were proposed to the House of Commons by Mr Stanley, secretary for the colonies, of the following purport:—"1. That immediate and effectual measures be taken for the entire abolition of slavery throughout the colonies, under such provisions for regulating the condition of the negroes, as may combine their welfare with the interests of the proprietors.—2. That it is expedient that all children born after the passing of any act, or who shall be under the age of six years, at the time of passing any act of Parliament for this purpose, be declared free; subject, nevertheless, to such temporary restrictions as may be deemed necessary for their support and maintenance.—3. That all persons now slaves be entitled to be registered as apprenticed labourers, and to acquire thereby all rights and privileges of freemen; subject to the restriction of labouring, under conditions, and for a time to be fixed by Parliament, for their present owners.—4. That to provide against the risk of loss which his majesty's colonial possessions might sustain by the abolition of slavery, his majesty be enabled to advance, by way of loan, to be raised from time to time, a sum not exceeding in the whole L.15,000,000, to be repaid in such manner, and at such rate of interest, as shall be prescribed by Parliament.—5. That his majesty be enabled to defray any such expense he may incur in establishing an efficient stipendiary magistracy in the colonies, and in aiding the local legislatures in providing for the religious and moral education of the negro population to be emancipated."

These resolutions, with various alterations and additions during the discussions which followed—the most important of which was the substitution of a *gift of L.20,000,000* for the previously proposed loan of L.15,000,000—were ultimately carried, and a bill founded on them finally passed both houses, and received the royal assent on the 28th of July. It is peculiarly gratifying to know that the accomplishment of this great object seems to have met with cordial co-operation from most of the colonial legislatures, the chief objection being to the apprenticeship clause—several of the islands preferring *immediate emancipation* to the prospective term. Recent accounts have brought the pleasing intelligence of the passing of the emancipation act by the Assembly of Jamaica on the 12th December 1833; and as the other colonies will doubtless follow the example of the principal island, we shall here give an abridgement of the leading provisions of the act:—

"From the 1st August 1834, the slaves, aged six and upwards, are to become apprenticed labourers, without any formal indentures.—The slaves are divided into three classes: Prædial labourers, employed on their masters' lands: Prædial labourers, employed on other lands: Non-prædial labourers.—The apprenticeships to cease in August 1840, and the hours of labour not to exceed forty-five hours in the week. Non-prædial apprenticeships to cease in 1838.—Masters to be liable for the maintenance of discharged labourers above fifty, or those that are disabled.—Apprentices may purchase their discharge, without consent of the master, by paying the appraised value.—The value to be appraised by three justices of peace, who are to order sums advanced on the security of the negro, to be paid out of the purchase-money.—No apprentice to be removed from the island, nor to another estate, if the removal separates him from his wife or child.—An employer's right to an apprentice's labour may be transferred by bargain or sale, but families not to be separated.—The employer bound to supply the apprentice with food, clothes, and medicine.—Children under twelve, now born, to be indentured, and remain apprentices till twenty-one.—Special justices to be appointed for the execution of the act, who shall take cognisance of offences committed by negroes.—There are long regulations as to punishment, which we cannot abridge; but it is enacted that females are not to be flogged.—Sunday markets to be abolished, and prædial labourers to have Saturday free."

Respecting the present condition of the slaves, so much has been written and spoken on the subject of late, that we believe our readers will not thank us to enter on it here. It is satisfactory to know, that, while their moral and intellectual condition is so wretched, they are blessed with physical comforts far superior to the labouring classes of perhaps any country in Europe. To those who wish a faithful picture of the domestic condition of the negroes, we recommend a perusal of Mrs Carmichael's work on the West Indies—and we do this from *personal knowledge* of its strict accuracy and truth.

TRADE.

The present state of commerce in the West Indies will be best seen by the annexed tables; but it is necessary to say a few words in explanation of the great deterioration it has been undergoing for many years, and the consequent falling off in the value of property.

Previous to the American war, and when the trade between the American and West Indian colonies was unrestricted, the latter may be said to have attained the meridian of their prosperity; but when that great mart for reciprocal commerce was shut up, they rapidly declined. Even after the war was settled, all direct intercourse between the two was interdicted; and the planters have ever since been compelled to supply themselves with lumber, staves, flour, and others of their most indispensable articles, by a distant voyage from our British American colonies. This most unnatural system of policy is the main cause of the present depressed state of the West Indies. "All circumstances," says Mr Edwards, "necessarily and naturally lead to a commercial intercourse between our islands and the United States. It is true we may ruin our sugar colonies and ourselves also in the attempt to prevent it, but it is an experiment which God and nature have marked out as impossible to succeed. *The present restraining system is forbidding men to help each other; men who, by their necessities, their climate, and their productions, are standing in perpetual need of mutual assistance, and able to supply it.*" Besides this, the interests of the colonists have been most unjustly sacrificed in many ways to those of the British merchants—as, for instance, in forbidding them to clay (refine) their own sugar, by which a loss is yearly sustained by them of upwards of L.80,000; and this, too, solely for the benefit of a small body—the sugar refiners. Add to all this, that most oppressive duties are imposed on all articles imported into the islands, not coming directly from Britain or a British colony. The revenue thus derived amounted in 1828 to L.75,000, and the charges of collection to about L.65,000.

Under the present system of policy, indeed, it is notorious that these fine islands are every day sinking to ruin. The planters are getting unavoidably deeper and deeper in debt to the merchants (who are their bankers), into whose hands their estates are gradually passing, and these, too, must of course be ruined by having their funds sunk in properties yielding no return. It is to be hoped that the late liberal act of emancipation is only the preliminary to a more liberal system of commercial policy.

VALUE OF EXPORTS AND IMPORTS.

Total official value of imports from the West India colonies into the United Kingdom, and exports to the same from the same, for the year 1829:—

	Imports.	Exports.
Antigua	£255,500	£146,657
Barbadoes	489,214	369,836
Dominica	141,811	27,478
Grenada	359,813	93,015
Jamaica	3,741,179	2,781,483
Montserrat	40,958	8,302
Nevis	78,278	25,228
St Kitt's	192,280	97,234
St Lucia	157,533	51,505
St Vincent	414,548	99,891
Tobago	158,385	51,368
Tortola & Virgin Islands	33,243	5,606
Trinidad	604,001	361,077
Bahamas	17,915	51,524
Bermudas	4,901	24,817
Demerara	1,702,409	509,236
Berbice	325,051	51,587
Honduras	190,795	792,278
Total	£9,067,914	£5,521,169

PRODUCTIONS.

Account of the quantities of the three great articles of sugar, coffee, and rum, imported from the British West Indies into the United Kingdom in the year 1830:—

Colonies.	Sugar. Cwts.	qrs.	lbs.	Coffee. lbs.	Rum. Proof gal.
Antigua	158,611	1	10	242	155,514
Barbadoes	336,881	0	11	334	2,357
Dominica	60,063	0	20	1,016,631	36,321
Grenada	213,100	1	12	28,541	206,233
Jamaica	1,370,347	3	2	19,758,603	3,213,503
Montserrat	20,640	0	17	...	40,075
Nevis	54,236	1	21	1,362	51,243
St Kitt's	133,452	0	22	44	210,706
St Lucia	86,971	0	10	113,517	12,817
St Vincent	261,551	2	0	124	173,262
Tobago	93,471	2	4	...	428,810
Tortola (or Virgin Islands	17,099	3	7	5	...
Trinidad	204,987	0	10	54,602	12,941
Bahamas	...			196,637	...
Bermudas	894	2	13	...	2,987
Demerara	780,286	2	12	3,447,426	1,859,710
Berbice	110,967	2	21	2,816,909	234,618
Total	3,912,026	2	12	27,428,877	6,751,797

POPULATION OF BRITISH WEST INDIAN COLONIES.

Colonies.	Whites. Male.	Whites. Female.	Free Coloured. Male.	Free Coloured. Female.	Slaves. Male.	Slaves. Female.	Total. Male & Female.
Antigua	1,140	840	1,849	2,346	14,066	15,773	35,714
Barbadoes	7,049	7,910	2,098	2,537	37,091	44,811	102,007
Dominica	435	405	1,614	2,046	7,392	8,020	19,838
Grenada	506	206	1,863	2,284	11,711	12,434	28,732
Jamaica	37,152 no census.				158,254	164,187	359,573
Montserrat	157	173	610	804	2,987	3,396	7,406
Nevis	710		2,000		4,574	4,685	11,959
St Kitt's	1,612		3,000		9,198	10,112	23,922
St Lucia	401	461	1,714	2,064	6,980	7,381	18,381
St Vincent	649	452	1,461	1,783	11,583	12,466	27,714
Tobago	265	57	477	687	5,873	6,684	14,042
Tortola (or Virgin Islds.	229	240	558	738	2,810	2,609	7,179
Anguilla	169	203	150	177	1,279	1,605	3,666
Trinidad	2,306	1,805	7,588	8,357	13,141	10,865	44,163
Bahamas	2,042	2,198	1,326	1,618	4,700	4,690	16,499
Bermudas	1,664	2,341	300	430	2,298	2,440	9,251
Demerara	2,110	600	2,630	3,620	37,141	32,396	78,633
Berbice	496	120	463	668	11,284	10,035	23,092
Honduras*	174	76	1,422	844	1,329	799	4,643
							836,537

* This alludes to the settlement of Belise, which is not exactly a colony, but an establishment of logwood and mahogany cutters, permitted, under certain restrictions, by the Spanish government.

MONEY.

What is called West India currency is an imaginary money, and has a different value in different colonies. The following are the values of L.100 sterling, and of a dollar, in the currencies of the different islands:—

	Sterling.	Currency.	Dollar.	Currency.
Jamaica	L.100 =	L.140	1 =	6s. 8d.
Barbadoes	100 =	135	1 =	6s. 3d.
Windward Islands (except Barbadoes)	100 =	175	1 =	8s. 3d.
Leeward Islands	100 =	200	1 =	9s.

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THE AMERICAN WAR OF INDEPENDENCE.

THE American War of Independence is an event not nearly so familiar to the present generation of the British people, as, from its importance, it ought to be. It is one of those transactions which are sufficiently remote to be beyond the personal knowledge of the passing generation, and yet not remote enough to have become a subject for either popular or classical history. Hence, that America did render herself independent of Great Britain, is the sum of knowledge which four out of five persons in this country are found to possess upon the subject. The causes of the war, its transactions, and its close, so happy for America, and so disastrous for Great Britain, are circumstances of which few persons have more than a dream-like notion—though nothing can be more certain than that this war has exercised an influence upon the fortunes and destinies of every modern nation, and even, perhaps, of every civilised man now existing. In our article on British History, the objects and circumstances of the contest were adverted to, but, necessarily, in too brief a manner to convey a full idea of their significance: we shall now endeavour to make our readers acquainted a little more extensively with the affair, by presenting to them a narrative slightly abridged from an American work, the title of which is quoted below;* only premising, that some allowance must be made for a little colouring in favour of the American cause, which was perhaps unavoidable in such a production. The narrative has so many qualities suitable to our purpose, such as simplicity of arrangement, and a certain amusing quaintness of style, that we can easily overlook this fault, as we doubt not the most of our readers will do also.

STATE AND NUMBER OF THE COLONIES.

The colonies which achieved their independence on this occasion were thirteen in number, extending along the eastern shore of North America between the St Lawrence and the Mississippi. Massachusetts, including what is now Maine, New Hampshire, Connecticut, and Rhode Island, were together known, as they are now, by the general name of New England. What is now Vermont was then claimed by New York. The other nine colonies were Virginia, New York, Pennsylvania, Delaware, New Jersey, Maryland, North and South Carolina, and Georgia. The number of inhabitants in all was not much less than three millions. As the colonists, or their ancestors, came, most of them, from England, spoke the English language, and lived, like every other part of the great British empire, under the English laws, it may seem singular, at first, that any thing should have taken place to unite the whole American people in a common cause of rebellion, as the English called it—or of civil war, as they called it themselves. We shall see, however, in the sequel, that, considering the course of policy pursued by the British government, it could not well happen otherwise than it did.

Many of the provinces, or colonies, were settled between the years 1607 and 1666. At first, the British government did not pay much attention to them; but as they increased in wealth and population, they became objects of deeper interest, and the king and parliament passed many laws respecting them. These laws, at a very early date, were framed more for the benefit of England than the colonies. But previous to the year 1760, they were generally submitted to. About that period, the American affairs began to be managed in a more arbitrary manner.

TAXES IMPOSED ON THE COLONIES.

The English thought, as the Americans had become a great people under their protection, in some measure, it would be just, or at least expedient, to derive some profit from them. They began to make laws, therefore, in parliament, about the time we have just mentioned, to regulate the American trade. They required the colonists to carry to the English every thing their rich lands might produce beyond their own wants; that is, if they exported any thing, it must be sent to the English. The country abounded with fine pastures, as it does now. A great many sheep were kept by the farmers, and they were glad to dispose of large quantities of wool. All this they were obliged, by the acts or laws of parliament, to sell to the English alone. They were required, also, to buy of the English whatever foreign cloths or other manufactures they had occasion for. The colonists were not much displeased with these regulations, however. The English merchants, richer than themselves, not only supplied them with their manufactures at moderate prices, but lent them large sums of money, which the Americans used in improving the appearance and increasing the wealth of the country.

On the whole, it is likely that things might have gone on quietly for a long time, had not the British begun to lay duties on the American import trade, which was felt as a grievous interference of the mother country. In the year 1764, this taxing system was re[illegible] as possible, by the most rigorous restrictive measures.

From this time, the Americans, some of them at least, began to question the propriety and necessity of obeying a government three thousand miles over the ocean. They very generally determined, at all events, to purchase as few as possible of the English manufactures, and to make as many and as good as possible for themselves. In Boston, especially, a rich and large town, even then containing more than 10,000 inhabitants, the people were exceedingly dissatisfied with the new laws. They had bought, and used, and sold again, vast quantities of English goods; but they determined, now, either to do without them, or manufacture similar articles for themselves.

They used no more English gloves, for example; the practice of wearing mourning was given up. In fact, there was near 50,000 dollars' worth less of British merchandise sold in this single city, during the year 1764, than during the year previous. Other towns and other colonies soon followed this example. The people every where left off the use of English luxuries, and the merchants, finding themselves generally in debt to the English, and having little gold and silver, as we have seen, to pay them, or to purchase more goods with, gave up the trade almost entirely.

STAMP ACT.

However much the colonies were dissatisfied with all these heavy duties, and vexatious arrangements of commerce, they had not yet disputed the right of the English parliament to make them. They did not consider them as taxes, but as mere regulations. About this time, however, the British ministers proposed in parliament (March 10, 1764), a law for charging "certain stamp duties (taxes on various kinds of papers required to be *stamped*) in the colonies and plantations."

"A large debt had been contracted," said they, "in the course of a war, carried on chiefly to accommodate the Americans, by driving off the French, taking possession of Canada, and killing the Indians on the western frontiers. Troops must still be kept in America, the British government must protect the people, and why should they not pay a part of those taxes which the English pay in the mother country, especially as the money will be used, as it always has been, for their benefit? The tax will be small; and as for gold and silver, no doubt enough will be found. The Americans are well known to be a rich people."

But the Americans thought differently about these things, and began to speak and write as they thought, without much ceremony. "The French war," they said, "was undertaken by the English for their own good, and ought to be at their own cost. As for the future, if they (the Americans) were powerful and rich, as the English pretended, they could certainly protect themselves against the Indians, and the French were conquered already. They were willing, at all events, to furnish the troops that might be wanted for their own defence." But the Americans did not care so much what the tax was for, or what, or how much it was, as they did that it was a new thing; and as the American people had no right to send representatives to the English parliament, where the taxes were voted, they thought it as unjust as it was new.

The stamp act was not passed in parliament until March 1765. Before that time, and while the law was under consideration, all the colonies protested against it, and most of them sent agents to London to reason with the English ministers; but in vain. The act passed in the House of Commons, by a vote of 250 members against 50. Dr Franklin, then in London, wrote the same evening, to an American gentleman, as follows:—"The sun of liberty is set; the Americans must light the lamps of industry and economy." The gentleman answered, "Be assured we shall light torches of quite another kind." The people of Virginia and Massachusetts were among the first to oppose the stamp act. But the same feeling was soon spread over the whole country. The newspapers were still published on paper not stamped, and these were filled with warm discussions upon this subject. The lawyers also agreed to use no stamped paper; a great many public officers gave up their commissions, and vast numbers of the people, calling themselves sons of liberty, agreed to oppose the stamp act, and to assist each other, at all hazards.

DISTURBANCES ABOUT THE STAMP ACT.

These disorders broke out again when the first English ships reached America with their cargoes of stamped papers. The law was to go into force on the first day of November. On the 5th of October, the ships appeared in sight of Philadelphia, at Gloucester Point. All the vessels in that harbour hoisted their colours half-mast high, as a sign of mourning; the bells were muffled, and tolled for the rest of the day; and several thousand citizens soon collected at the State-house. They sent a message to John Hughes, the principal stamp officer, requesting him to resign the office; and after a day or two, finding the mob rather troublesome about his house, he concluded to do so.

Some of the stamped paper reached Boston on the 10th of September, and, by the governor's order, was lodged in the castle, to be defended, if necessary, by the artillery. But on the first day of November, at day-break, all the bells of the town sounded a funeral knell. Two very large effigies were found hanging on an elm-tree, which after this was called "the tree of liberty." The streets were filled with crowds of people. At three in the afternoon, the images were carried about the town, then hanged on a gallows, and cut to pieces. Mr Oliver, who had promised before to have nothing to do with the stamps, was carried to the "tree of liberty," and compelled to promise over again. Almost every body went armed.

Similar scenes were enacted at New York; and by the middle of November 1765, not a sheet of the stamped paper was to be seen. It was all either burned or sent back to England. The Massachusetts people, before this time, had proposed a general meeting, or congress, consisting of representatives from all the colonies. This meeting took place on the 7th of October, at New York, and there petitions were drawn up to be sent to the king and parliament of England. Their object was to effect a repeal of the stamp law. These petitions also complained of the late law of parliament, obliging those Americans, who were to be tried for resisting the stamp laws, to be carried to England for trial.

STAMP ACT REPEALED.

On the 22d of February 1766, the stamp act was

* The Story of the American Revolution, illustrated by Tales, Sketches, and Anecdotes. By Lambert Lilly. Philadelphia, 1831.

repealed by parliament. The king had just appointed new ministers more favourable to America than the old ones. They had heard of the disturbances in the colonies, and began to be alarmed lest something worse might happen. Vast numbers of petitions for the repeal had been offered by English merchants and manufacturers, who were suffering very much from the high spirit and resentment of the colonies. A great number of workmen had nothing to do. The goods lay in the warehouses unsold, and England could no longer get rice, indigo, tobacco, oil, furs, potash, and a great many needful things, as she used to do, from the colonies.

But the repeal took place, and every body was satisfied. The American merchants in London were delighted, and the tidings were received in America with the same joy. The legislatures, or assemblies, of Massachusetts and Virginia, went so far, even, as to vote thanks to Mr Pitt, and other English gentlemen who had done a great deal to obtain the repeal. They resolved to erect a statue of the king, in Virginia. But this feeling lasted but a short space. At the time of voting the repeal, parliament had also voted "that they had a right to tax America in all cases," as they pleased. The colonists soon began to be displeased with this. They had disliked the stamp law, not so much because they were too poor to pay a small tax or duty, but because they thought it unjust, and were afraid, if they paid it, that other and larger ones would be imposed upon them.

NEW DUTIES IMPOSED.

Notwithstanding these forebodings, things might have gone on quietly for a long time, or the discontent might have been altogether allayed, and the colonies continued faithful to Britain, had not parliament, in July 1767, imposed new taxes, to be paid on all tea, glass, and paints, imported from England into America. The Americans now broke out into loud complaints; but it was at Boston that these assumed the most formidable appearance. The Bostonians had such a character in England for being troublesome, that General Gage was about this time, 1768, ordered to station a regiment or two of troops among them. A frigate and four other armed English vessels were kept upon the coast to aid the revenue-men. Meanwhile, as the governor had not yet called together the Assembly, they took the matter into their own hands. Hearing that troops were coming, they agreed to provide themselves with arms, and to invite all the towns in Massachusetts to send delegates to meet at Boston. Deputies met accordingly, from 96 out of 97 towns, in September. They could make no good terms, however, with the governor. The day before they left the city, the troops arrived in the harbour. It being apprehended that the people would not suffer them to land, the fleet, fourteen ships in all, sailed slowly into the harbour, and arranged themselves, with their guns pointed, and crews ready for action, so as to command the whole town. The two regiments landed at one o'clock, and marched into town with great parade. The selectmen were desired to provide quarters or barracks for them, but refused to do so. The governor then ordered them to make use of the State-house; and a large guard was placed in front of that building, now called the City Hall, with cannon at the door.

TUMULTS IN BOSTON.

Feelings of the deepest enmity to England now grew every day stronger, and the people generally agreed to give up the use of English goods entirely. In the spring of 1770, tumults broke out in Boston betwixt the citizens and the soldiery, and continued at intervals throughout the year. The British ministry now saw they had gone too far, yet they hesitated in making reparation. In March 1771, parliament repealed the taxes on glass, paint, and other articles, but retained a duty of threepence a pound on tea. This was a great mistake, and did no good. If parliament had repealed all, and said no more about taxes, the Americans might still have been satisfied; as it was, they began to buy the goods of the English merchants again, tea alone excepted; this they would have nothing to do with. So matters went on during the year 1771. The officers of the revenue were every where despised. In Boston, one of them undertook to seize upon a vessel for some violation of law. He was seized upon himself by the people, for what they thought a violation of law, stripped, carted through the city, besmeared with tar, and plastered over with a coat of feathers.

In 1772, the English government, intending to put down the rebellious spirit of the Americans, made several new laws, which served only to make them more angry; and they now began to think of doing something for themselves in earnest. Committees were chosen in every part of the country, to attend to public affairs, and to write to each other.

In 1773, large ships, loaded with immense cargoes of tea, were sent out to America by the East India Company. But the colonists managed so well in Philadelphia and New York, that not a man could be found to receive the English tea, or have any thing to do with it. A few chests, which one Captain Chamber had brought to Philadelphia, were let down very quietly to the bottom of the river, by some people who went slyly on board the ship. In Charleston, it was landed, and lodged in cellars so damp that it was soon spoiled. The people of Boston took a keen interest in this business. The English factors there, when the tea was first known to be coming, were called upon to give up all concern with it. They made no answer, but withdrew as fast as convenient into the fortress. Captain Hall soon arrived in port with one hundred chests of tea. The people collected in great fury, ordered him to keep it on board, as he valued his life, and placed a guard and a strict watch close by the vessel upon Griffin's wharf. Two other vessels having arrived, they were obliged to anchor by the side of Hall's ship. A town meeting, meanwhile, was summoned; and the people agreed to call upon the governor, and request him to have the ships sent off. But the governor would do no such thing. A great uproar began. A person in the gallery of the hall, dressed like an Indian, shouted the cry of war. The meeting was dissolved in the twinkling of an eye. The multitude rushed to Griffin's wharf. Here were seventeen sea-captains, carpenters, and others, disguised as Indians. It was night, and these persons went on board the three vessels, and, in less than two hours, 340 chests were staved and emptied into the sea. This done, they went quietly home, and the crowd dispersed, well satisfied.

BOSTON PORT BILL.

Early in 1774, an account of these disturbances having reached England, the English government determined, by way of punishing the people of Boston, to destroy the trade of that town, by forbidding all manner of goods to be landed there. Accordingly, the Boston port bill was passed in parliament, March 14, and the news was received in Boston, May 10. Like the other laws, this also did more hurt than good. In a few days after the last bill passed, other laws were made still more severe. They were opposed in England, to be sure, by some; but a large part, both of the parliament and people, supposed, if the Americans were punished and frightened pretty well, as they expressed themselves, they would by and bye be more submissive to the mother country. The consequence was, that not only the people of Boston, but the whole people of America, north, south, east, and west, were more indignant than ever. Town meetings were held, days of fasting appointed, and news of the port bill spread over the whole country. An agreement to stop all trade with England, called the "league and covenant," was signed by immense numbers.

HOSTILITIES COMMENCED.

On the first of June 1774, the port bill was put in force. At mid-day, all business ceased in the custom-house, and no vessel was suffered to enter the harbour. This harsh procedure was the signal for civil war. The people provided themselves with arms, formed companies, and learned, as fast as possible, the business of soldiers; and, being most of them used to hunting, they were good marksmen, especially with the rifle, a most destructive weapon. The country now assumed the attitude of defiance; and, in September, the first American congress, or a collection of deputies from all the provinces, met at Philadelphia. These were the most respectable men of the whole country, and every thing they did and said had a great effect. Among other things, they approved of the conduct of the Boston people; they made an agreement to buy and use no more English goods, and wrote letters to the people of England and America. To the king they complained of the injuries done them, and prayed for redress. They also said, that, if the laws were as they should be, and as they were at the peace of 1763, the Americans would be perfectly satisfied. They did not wish to rebel, or provoke a war, if they could help it; but they would not be trampled under foot. Strangely enough, no particular attention was paid to all this in England. The ministers and the king thought that the Americans should be frightened, or forced out of their rebellious feelings. In 1775, therefore, parliament voted to raise more troops and more seamen. They encouraged the king, George the Third, to go on as he had done; insisted upon maintaining the laws which the Americans complained of; and passed a new law, forbidding them to fish, as they always had done, on the Banks of Newfoundland. On the 2d of February, a vote passed, declaring the Massachusetts people to be rebels; and, as the Americans refused to trade with England, they were forbidden to trade with any other country. But all this only made matters worse than ever.

BATTLE OF LEXINGTON.

The first battle of the American revolution was fought upon the 19th of April 1775, at Lexington and Concord. Stores had been collected at the last-named place, eighteen miles from Boston, for the American army, and General Gage determined to destroy them. Wishing to do it without fighting, he sent out 800 grenadiers and light infantry from Boston, at eleven o'clock in the evening of the 18th, as silently as possible.

It was heard of, however, in the country. By two o'clock in the morning, 130 of the Lexington militia had assembled on the green, at the meeting-house, to oppose them. They were dismissed, but collected again between four and five, at the beat of drum. By and bye, the 800 British troops came marching up the road, Major Pitcairn at their head. "Disperse, you rebels!" cried the major, addressing the militia; "throw down your arms, and disperse!" They did not disperse, however. He now rode forward, discharged a pistol, brandished his sword, and ordered his soldiers to fire. They did so, and three or four of the Americans were killed. The soldiers shouted, fired again, and then proceeded toward Concord. At this place they disabled two large cannon, threw 500 pounds of ball into wells, and staved about 60 barrels of flour. They fired upon the Concord militia, and two men were killed; a skirmish followed, and the English retreated, as fast as possible, to Lexington. The people were coming upon them, by this time, from all parts of the country. The British were fired upon, on all sides, from the sheds, houses, and fences.

At Lexington, where they halted to rest, they were joined by 900 more troops, sent out from Boston under Lord Percy. These brought two cannon with them, and the country people were kept back. They still fired upon the troops, however; and being generally good marksmen, made terrible havock. The regulars, as the English troops were called, reached Charlestown at sunset, and returned the next day into Boston. Sixty-five of their number had been killed, one hundred and eighty wounded, and twenty-eight made prisoners. Of the provincials, fifty were killed, and thirty-eight wounded and missing. There were never more than three or four hundred of the latter fighting at one time, and these fought as they pleased, without order. The regulars were obliged to keep in the main road; but the militia, knowing every inch of the country, flanked them, and fired upon them at all the corners. The news of this first battle produced a tremendous excitement throughout the country. The dead were buried with great ceremony and pomp. Great bodies of militia marched towards Boston. Agreements were entered into by thousands of people to defend the Bostonians to the last gasp. The English forts, arsenals, magazines, and public money, were seized upon by the people; and more money was coined, and more troops were raised.

At this period, the Americans were far from being well trained as soldiers, yet they were brave, and the British committed a serious error in despising them. The English nation was at that time, as it is still, the richest on the globe. They had beaten the French and Spaniards a few years before; they had large armies and navies; and they therefore believed the poor American colonists could no more resist them than so many children. The people of Great Britain, in the present day, deplore the folly which their predecessors committed in thus rushing headlong into a war with the Americans, for, but for this act of folly, the colonies might still have belonged to the mother country.

EXPEDITION TO TICONDEROGA.

In Connecticut it was resolved to undertake an expedition to Tinconderoga, a very strong place on lake Champlain, near Canada. As this place was full of stores, and stood upon the great route by which every thing and every body passed between Canada and the provinces, it was important to conquer it. The Connecticut assembly voted 1800 dollars for the purpose; and powder, ball, and whatever would be needed for a siege, was provided.

The troops assembled with as little display as possible, at Castletown, on the banks of Wood Creek, on the great road to Ticonderoga. Some of these troops were from Connecticut, some from the Boston army, and some were people from the Green Mountains, in Vermont. These latter were called Green Mountain Boys, and were famous for skill in the use of the rifle.

The leaders of the expedition against Ticonderoga were Colonel Ethan Allen and Colonel Easton. They were joined at Castletown by Colonel Arnold, from the Boston army. They marched on quietly, and arrived in the night on the bank of the lake, opposite Ticonderoga. They crossed over and landed on the other side, close by the fortress. They entered it under the covered way, by daybreak, with a tremendous shout. The soldiers of the garrison were roused, ran out half-dressed, and began firing. A hot scuffle, with gun-breeches and bayonets, hand to hand, ensued. The commander of the fort came at last. Colonel Allen ordered him to surrender. "To whom?" said the officer, in great astonishment. "To the American Congress!" said Allen, in a voice of thunder. The commander saw it was in vain to resist, and so he gave up the fort. Here were found 124 fine brass cannon, and a large quantity of ammunition. A hundred cannon more were taken by the Americans at Crown Point, another fort on the same lake, defended by a small garrison.

BATTLE OF BUNKER'S HILL.

Meanwhile, the English were skirmishing with the provincials at Boston. There were some islands in the harbour, where the English found forage for their horses and cattle. The Americans undertook to carry off these cattle from Noddle's Island and Hog Island, and succeeded, after some fighting. They scoured Pettick's Island and Deer Island soon after in the same way. The English were thus put to a good deal of trouble to get food, and were finally so much pressed by the American army, that General Gage found himself obliged to make a new effort against them. The provincials had sent 1000 men, under Colonel Prescott, to fortify Bunker's Hill, in Charlestown. Instead of doing so, however, by some mistake he fortified Breed's Hill, which is nearer the city. The Americans took possession of it in the evening, and worked so well, that, before morning, they had thrown up a redoubt about eight rods square, and so silently, that the British knew nothing of it till day-break. The latter, when they discovered the redoubt, began firing upon the people in the fort; but the Americans worked on, till they raised a breast-work, reaching from the east side of the redoubt to the bottom of the hill. As Breed's Hill commands the city, the British saw they must either be driven off, or drive off the provincials. They therefore opened a tremendous fire from the batteries and armed vessels that floated on all the waters about Boston. Showers of bombs and balls were fired. A terrible battery was raised upon Copp's Hill, opposite Breed's; but all in vain. The Americans worked on, paying little regard to the batteries, and they had finished a trench, or ditch, before noon, which reached to the bottom of the hill.

It was now the 17th of June, and on this day was fought the famous battle of Bunker's Hill. The British were determined to make a great effort. The provincials lay ready for them on the hill. General Putnam, of Connecticut, commanded the whole force. They had muskets, but few of them bayonets or rifles. They were sharpshooters, however, and were brave men as ever breathed.

About noon of a terribly hot day, the whole British camp seemed to be in motion. A vast multitude of sloops and boats started from the Boston shore, covering the water far and wide. The soldiers landed at Moreton's Point, in Charlestown, protected by their batteries behind them. The Americans took this opportunity to protect themselves still more, by pulling up some post and rail fences, which they set before them in two rows, and filled the space between with fresh hay, which they gathered from the hill. The British began to march. The militia left to defend Charlestown retreated. The British entered it, and set fire to the buildings. In a few moments 500 wooden buildings were in flames. The wind blew high, and the fire streamed up, and roared in the most terrible manner.

Thousands of people were gazing at the scene, from the Boston steeples, and waiting with great anxiety for the fate of the battle. There were multitudes, also, on all the high roofs and hills round about. Never was there such a bustle and stir. The English marched slowly towards the redoubt, halting now and then for the cannon to come up and fire. They came, at last, within musket-shot; and the redoubt, which had been as still as the grave, till this moment, blazed all at once with a tremendous volley.

The British were soon thinned off, and compelled to retreat. Many fled for their lives, and threw themselves into the boats. The green field of battle was covered with dead bodies. The officers ran hither and thither, to rally the troops, and after some time persuaded them to march forward again; but the Americans waited for them quietly, and received them once more with a flood of balls. The British now fled down the hill to the shore; and General Howe was alone upon the field; all his officers being killed and wounded around him. General Clinton, who had been watching the battle from Copp's Hill, now came to his aid with new troops. They made a third effort, with more spirit than before. Clinton led on the whole body; the cannon still firing from the ships and batteries, and the flames and smoke of the burning town sweeping over them like the blast of a furnace. The powder of the Americans was now exhausted, and they were compelled to draw off. They retired to Prospect Hill, fighting with their muskets as if they were clubs, and there began throwing up new works. The British were entrenched on Bunker's Hill, and neither army seemed willing to attack the other. Of 3000 British troops, 1054 were killed or wounded. A large part of these were officers. The sharpshooters had taken the poor fellows down like so many gray squirrels. The Americans lost five pieces of cannon. Their killed, of about 1500 engaged in the battle, amounted to 134; their wounded, to 314.

The Battle of Bunker's Hill, as it was called, though fought on Breed's Hill, had no decisive effect; yet it roused the country, showed the Americans that they were able to contend with the regulars, and taught the British that the provincials were not exactly the cowards they had taken them for. The capture of Breed's Hill did them more hurt than good. They were obliged to defend it now, and they had not too many men before to defend the town. Their soldiers were also worn out with fatigue, and were much depressed by the hot weather.

The Americans began now to fortify the town of Roxbury. Their works went up very fast, notwithstanding the continual fire of the British cannon. They had plenty of food, too, while the British were near starving. The latter could get nothing on the Boston islands, or along the Massachusetts coast, but by hard fighting, and very little by that. They were at last obliged to let most of the Bostonians pass out of the town, for they had not provisions enough to keep them alive.

AMERICAN ARMY ORGANISED.

Congress met again at Philadelphia, May 7, 1775. They were men sent from all the colonies but Georgia; and though they had no precise right, by any law, to act for the whole country, yet the whole country were ready to obey them. They chose George Washington, of Virginia, commander-in-chief of the American army, and appointed many other officers to act under him. Among these were Gates, Lee, Schuyler, and Montgomery, of New York; Pomeroy, Heath, and Thomas, of Massachusetts; Greene, of Rhode Island; Putnam, Wooster, and Spencer, of Connecticut; Ward and Sullivan, of New Hampshire. These were some of the bravest and best men of the country.

General Washington went directly to the army at Cambridge. He arrived there on the 3d of July. Though he used no parade, wearing only a small sword at his side, epaulettes on his shoulders, and a black cockade on his hat, he was easily known by his fine figure and noble countenance. He was treated every where with the greatest respect. Having reviewed the army, he found only 14,500 men in a condition for service; these had to defend a line of twelve miles. They were now arranged and trained as well and as fast as possible, no man understanding this business better than General Gates, who was an old soldier, as well as Washington. They had not 10,000 pounds of powder, at this time, in the army, being only nine charges to a man. Had the enemy known this, and attacked them, they must have fled like a flock of deer. Great efforts were made, however, and several tons soon arrived from New Jersey. More also was procured from the coast of Africa, in exchange for New England rum. This was managed so shrewdly, that every ounce in the British forts there was bought up for the American army. The Massachusetts rulers passed a law, also, that no powder should be fired at any beast, bird, or mark; they wished it all to be saved for the war.

Congress took measures for the coining of money, and the raising of troops in all quarters. The people obeyed the directions of congress with alacrity. Every man, from sixteen years of age to fifty, was a member of some militia company; and one-fourth part of the whole, called minute-men, were to keep themselves ready for action, at a moment's notice. Among other military bodies, a company was formed of eighty old Germans, who had most of them fought a long time before in Europe. They were called the Old Men's Company. Instead of cockades, they wore black crape, to signify their sorrow at taking up arms at such an age. The captain was near a hundred years old, and had been in seventeen battles. He had been a soldier forty years. The drummer was ninety-four, and the youngest in the corps was about seventy.

TREATIES WITH THE INDIANS.

About this time, congress took the necessary steps to keep peace with the Indian tribes. But they never employed them to fight against the English, though the English hired them to fight against the Americans. One objection that the Americans had to employing them was, that the Indian way of fighting was entirely too barbarous and cruel to be suffered among civilised people. Another was, that they could not be depended on. They were greedy for wager, [illegible] so deceitful that they could not be safely trust[illegible] A story told of a serjeant, who travelled through the woods of New Hampshire, on his way to the American army will show the character of the Indians:—

He had twelve men with him. Their route was far from any settlement, and they were obliged every night to encamp in the woods. The serjeant had seen a good deal of the Indians, and understood them well. Early in the afternoon, one day, as they were marching on, over bogs, swamps, and brooks, under the great maple trees, a body of Indians, more than their own number, rushed out upon a hill in front of them. They appeared to be pleased at meeting with the serjeant and his men. They considered them, they said, as their best friends. For themselves, they had taken up the hatchet for the Americans, and would scalp and strip those rascally English for them, like so many wild cats. "How do you do, pro?" (meaning brother), said one; and "How do you do, pro?" said another; and so they went about, shaking hands with the serjeant and his twelve men.

They went off at last; and the serjeant, having marched on a mile or two, halted his men, and addressed them. "My brave fellows," said he, "we must use all possible caution, or, before morning, we shall all of us be dead men. You are amazed; but, depend upon me, these Indians have tried to put our suspicion to sleep. You will see more of them by and bye." They concluded, finally, to adopt the following scheme for defence. They encamped for the night near a stream of water, which protected them from behind. A large oak was felled, and a brilliant fire kindled. Each man cut a log of wood about the size of his body, rolled it nicely up in his blanket, placed his hat on the end of it, and laid it before the fire, that the enemy might take it for a man. Thirteen logs were fitted out in this way, representing the serjeant and his twelve men. They then placed themselves, with loaded guns, behind the fallen tree. By this time it was dark, but the fire was kept burning till midnight. The serjeant knew that if the savages ever came, they would come now.

A tall Indian was seen, at length, through the glimmering of the fire, which was getting low. He moved cautiously towards them, skulking as an Indian always does. He seemed to suspect, at first, that a guard might be watching; but, seeing none, he came forward more boldly, rested on his toes, and was seen to move his finger, as he counted the thirteen men, sleeping, as he supposed, by the fire. He counted them again, and retired. Another Indian came up, and did the same. Then the whole party, sixteen in number, came up, and glared silently at the logs, till they seemed to be satisfied they were fast asleep. Presently they took aim, fired their whole number of guns upon the logs, yelled the horrid war-whoop, and rushed forward to murder and scalp their supposed victims. The serjeant and his men were ready for them. They fired upon them; and not one of the Indians was left to tell the story of that night. The serjeant reached the army in safety.

Treaties having been made with the Indians, congress recommended that the 20th day of July 1775 should be observed, in all the provinces, as a day of fasting and prayer; and it was so. The people were every where disposed to implore Heaven to prevent war, and to soften the hearts of their enemies. In Philadelphia, congress attended church in a body. As they were just entering the house of worship, they received news from Georgia, that this province had at last concluded to join in the common cause, with the other twelve. Until this time, the people there had said and done but little, but they determined now to make amends for lost time.

DECLARATION OF RIGHTS.

A declaration of rights was soon after written by congress, and sent over every part of the country. It gave a history of the whole difficulty, from first to last, between England and America, and ended with an account of the burning of Charlestown, the seizure of the provincial vessels by the British, and the hiring of the savages to fight against the Americans.

"We are compelled," said they, "to submit to tyranny, or to take up arms. We have counted the cost of this war, and have determined to be free, as our fathers have been before us, and as we trust our children shall be after us. We declare, before God, that we will defend each other, and the liberty of the whole country, to the last moment of life [illegible] was signed by John Hancock, president, and Charles Thompson, secretary, of congress. The ministers read it from their pulpits in all parts of the nation. It was read in Cambridge, to a vast multitude, and General Putnam assembled his troops on Prospect Hill to hear it. This was followed by a prayer from a clergyman. All the troops cried, three times, "Amen;" the artillery fired a general salute, and the colours were seen flying, with the usual mottoes; on one side, "An appeal to Heaven," and on the other, "He who has brought us over will defend us."

A petition was next drawn up to the English king, and addresses were written to the people of England, Ireland, and Canada. Congress were resolved to leave nothing unsaid, or undone, that offered any chance of restoring peace. The Canadians were persuaded to remain neutral, taking no part on either side. The British general, Carleton, used efforts to make them enlist as soldiers. They were offered two hundred acres of land in any part of America they should choose, at the end of the war. Each married man was to have fifty acres more for his wife, and fifty for each of his children; with a guinea (about five dollars) as a bounty, at the time of enlisting. A few only were persuaded in this way; a good many Indians, however, were hired. They collected at Montreal, in great numbers, in July 1775. Among the rest were six famous tribes, called the Six Nations. They swore, in the presence of Carleton, to fight for the English king; and thus, soon after, the Indian war began.

AFFAIR AT NORFOLK.

It may seem strange, that, during the disturbances in the various colonies, little or nothing should have been done by the English governors to put down the rebellion. The truth is, they had no troops, and not much money, at their disposal; and before they could be supplied, the spirit of independence had gone too far to be repressed. In Virginia, Governor Dunmore, being compelled to leave Williamsburgh, and fearing that it would not be safe for him to remain upon the land, went on board a royal armed vessel. Having collected a fleet, he resolved to harass the Virginians as much as possible, if he could not govern them. He was joined by all the tories, that is, the Americans who favoured the English. He laid waste the coast at various places in the most shocking manner, murdering and burning like a pirate. He burnt Hampton, on the bay of Hampton, among the rest, and undertook to establish his camp there. But the Virginians soon drove him back upon the water. He then declared all the negro slaves to be free, and invited them to join him. A few of them succeeded in doing so. He landed again at Norfolk, where the tories were numerous; and a battle was fought, a few miles from that city, at a place called Great Bridge, with a regiment of Virginia militia and minute-men. The governor had only 200 regulars about him; the rest was a mere mob of black, white, and grey.

The first attack was made by the British on the American entrenchment. The battle lasted some time with a good deal of spirit. At last the British captain was killed, and the troops fell back upon the bridge. The governor did not like fighting; so, during the battle, he contented himself with looking on at a distance. The negroes loved fighting as little as the governor. They found it by no means pleasant to have their flesh cut to pieces with bullets; so, after a few shots, they ran away as fast as they could. The governor also thought it best to retreat, and, accordingly, he and his men went on board of their vessels.

This affair did not serve to sweeten Governor Dunmore's temper, nor did it put him in a better humour to find that his friends the tories at Norfolk had been handled roughly by the people there, after his retreat with his negro allies. He now returned into the bay with a ship of war, and sent a message ashore, declaring, that unless the people furnished him provisions, he should batter the town down about their ears. They refused to supply him; so he gave them notice, in the morning, to remove the women and children; and then, with his own sloop of war, the frigate Liverpool, and two corvettes, he blazed away upon the place, till scarcely one stone was left upon another. The provincials, to disappoint him of his provisions, burnt the whole country round about. Nothing was left for the governor, and so he went away.

PROCEEDINGS IN THE SOUTHERN STATES.

In South Carolina, Governor Campbell arrived at Charlestown from England, about the same time with the news of the Lexington battle. The people were on their guard, and he tried in vain to get the better of them, by inviting the tories to assist him; but the tories were afraid to do so. He began to be frightened a little himself, being a man of less courage than Governor Dunmore; so he said little or nothing for some time. To unmask him, the American leaders sent privately to him one Adam Macdonald, captain in a militia regiment. He called himself Dick Williams, and offered his services to the governor. The latter was delighted, and told him all his plans. Having heard them attentively, Adam went away, and told the whole to the persons who employed him. They immediately sent a committee, Macdonald among the number, to wait upon his excellency, and request him to show his royal commission, if he had any, as governor. He declined this proposal. There were some hints then thrown out about putting him in confinement. These came to his ears, and he retreated, with very little ceremony or delay, to an English corvette, anchored in the harbour. The assembly requested him to return; but he refused. Nothing more was seen of him, or his government, in Charlestown. The tories were numerous in other sections of the province, however, and he mustered them together in great force. The people were alarmed. The militia were ordered out, and the two parties were on the eve of an engagement. But at length the tories were dispersed, and they gave no more trouble at that time.

The provincials in South Carolina continued to be very active. They captured Fort Johnson, on James's Island, in Charlestown harbour, and placed batteries on Point Huddrel. The English ships were at last driven off. The next thing with the people was, to send an expedition after an English vessel laden with powder, which was anchored on the bank, called the Bar of St Augustine, a town on the coast of East Florida. She was taken, and 15,000 pounds of powder were carried to Charlestown.

In North Carolina, the provincial congress raised 1000 regular militia, and 3000 minute-men. The English governor, Martin, disliked the appearance of things, and endeavoured to muster a force of the Irish and Scotch part of the inhabitants. He also fortified his own house, at Newbern, with artillery. The people seized upon his cannon, and he fled to a fort upon Cape Fear River. The provincials marched after him, led on by Colonel Ashe. He retreated on board a vessel, as the other governors had done. Colonel Ashe burned the fort to ashes the same night. The assembly declared the governor a traitor. He answered them in a very long letter, which they ordered to be burnt by the common hangman. A large quantity of ball and powder was found in his cellar and gardens at Newbern.

In Pennsylvania, the people prepared actively for war. A single mill, near Philadelphia, manufactured five hundred pounds of powder a-week. Governor Tryon, after endeavouring a long time to manage the province, followed the example of the other governors.

In other parts of the country, the enemy was not asleep. One Captain Wallace, commanding an English squadron of small vessels off Rhode Island, was doing all the damage in his power, by ravaging the coast, and making prize of the merchant vessels. His chief object seemed to be, to supply himself and his force with provisions. With this view, he made a furious attack upon the town of Bristol, and fired, from morning till night, upon their houses and churches. He bored them through and through, till, finally, the people supplied him and his squadron with fresh meat, and he sailed away.

About this time, a body of American troops were sent from Massachusetts to Rhode Island, under General Lee. He was a man of great courage, and warm temper. He obliged all the inhabitants, whom he went to defend, to take the most terrible oaths, to do precisely what congress should command, and, at all events, to break off all intercourse with the tools of tyranny "vulgarly called," as the oath said, "the fleets and armies of the king." Congress were not much pleased with this manœuvre. It was well meant, without doubt, but it was very rough, and of no real use.

On the 18th of October 1775, Falmouth, now Portland, in Maine, was bombarded by Captain Moet, of the ship Canceaux, of 16 guns. The whole town was consumed. He had formerly received some affront in the place, and revenged himself in this way. He sent the people word at night that he should destroy the town in the morning; they removed their furniture, and he went to work early the next day with his cannon. The town had been twice sacked by the Indians, but never suffered so severely before.

EXPEDITION TO CANADA.

The most important affair of this year was an expedition to Canada. The provincials had done so well upon lake Champlain, that the scheme of another expedition in the same quarter was much approved of. Congress hoped, that, if Canada was invaded at once, many of the inhabitants would join the Americans. Three thousand men, commanded by Generals Montgomery, Wooster, and Schuyler, were fitted out. Boats were built for them on the lake, at Crown Point, and the sum of 50,000 dollars was collected to pay the expenses. Governor Carleton, of Canada, entrenched himself with a strong force at the entrance of the river Sorel, which leads out of the lake, and which the Americans would be obliged to pass. The latter took possession of an island in the lake, at the mouth of the river, and from that place planned an attack on Fort St John, where the governor was. This fort stood on the left bank of the Sorel, and commanded the passage to Canada. The Americans moved on without cannon to a swamp within a mile and a half of the fort. They defeated a body of Indians who attacked them in crossing a small river, waited for reinforcements, and laid siege to the fort.

Farther north, on the Sorel, was a small fort called Chambly. The English had no idea of the provincials passing St John to fall upon Chambly; but they did so, took the garrison prisoners, obtained 124 barrels of powder for the siege of St John, and sent the colours they had captured to Congress. Other detachments scoured the country between the Sorel and the St Lawrence; the Canadians supplying them every where with arms and provisions.

Just at this time Colonel Allen and Major Brown undertook an expedition against the city of Montreal, which stands on an island in the St Lawrence. Allen found boats ready for him at Longueville, and crossed the river in the night, below Montreal. Here Brown was to have joined him with his troops, but missed his way, and Allen was left, with a small force, in the neighbourhood of the city. It was just sunrise. The murmur of the city was heard at a few miles' distance, and by and bye the roll of the English drums came upon the ear. The Americans now saw that they were discovered. Before long, a column of British infantry came marching down the bank of the river. There was an almost breathless silence in Allen's small band as they came up. Even Allen himself stood fast, and gazed at them. "To the boats! to the boats!" cried a dozen of his soldiers; "there's a thousand of them." "Silence! every man of ye!" roared Allen, brandishing a huge horse-pistol. "The first man that turns his back upon the red coats, shall smell gunpowder." They were satisfied with this arrangement, on the whole, examined their rifles, and stood ready for the onset. "Stand your ground, boys!" shouted Allen. A party of British soldiers was moving towards them from the main body, at double quick time. "Let them come!" cried a tall, fine looking hunter at his side; "let them come!" He brought his rifle to his eye, as he spoke. "Fire!" shouted the British officer, and instantly the hunter dropped dead at the feet of Allen. His hardy followers shrunk back. They were sprinkled with the blood of the poor hunter. "Fire! fire!" shouted Allen, with a voice of thunder. They fired, and a hot skirmish commenced. Several of the English fell, and several of the Americans; others fled. Some defended themselves behind rocks and trees. Allen was at last left alone, surrounded, and compelled to surrender. He brushed a few tears away for the fate of his friend the young hunter, and marched on with the English. He was kept a prisoner more than two years, and then was exchanged for some English officer, whom the Americans had taken. The irons put upon him were so fastened about him, and so heavy, that, for a long time, he could lie down only on his back. A chest was his seat by day, and his bed by night. He was sent to England, to be tried as a prisoner of state, not as a fair and open enemy, but as a rebel. At this time, all the Americans were called rebels, and the English used to speak of hanging great numbers of them when the war was over.

We left the Americans besieging Fort St John, on the left bank of the river Sorel. They continued the siege, while the expeditions were going on against Fort Chambly, and against Montreal, as we have described them. After the capture of Allen, however, Governor Carleton, who had gone to Montreal, collected about 800 Canadians, Indians, and English regulars, and started off from that place, intending to raise the siege of St John, and compel the Americans to abandon it. But the Americans were always on the watch. They thought it probable that the governor would set out about this time, and were ready for him. He embarked his 800 men in a large number of boats, and undertook to cross the St Lawrence, precisely where Allen had crossed it, at Longueville. But Colonel Warner, with 300 Green Mountain sharp-shooters, and a few cannon, lay among the bushes on the river bank, as the governor's boats came over. The Americans waited quietly till they were fairly within reach, and then poured out upon them a tremendous volley of grape-shot. The governor's party retreated in great haste, with some loss of lives; and nothing more was seen of them. News of this defeat soon came to Major Preston, the British commander of the besieged fort of St John. He began to think it a desperate case with him, and so concluded to surrender to the American general, Montgomery. This he did on the 3d November 1775. He had held out like a brave man, the siege having lasted six weeks. The Americans found in this fort seventeen brass cannon, twenty-two iron ones, and a large quantity of balls and bombs. The powder had been used to the last kernel, and the provisions to the last morsel. The capture was an important one. St John, standing on the Sorel, which leads from lake Champlain to the St Lawrence, commanded the passage to and from Canada, and was therefore called the key of Canada.

The next movement of the Americans was to take possession of the mouth of the Sorel, where it empties into the St Lawrence. The point of land which is formed by the meeting of the two rivers, was fortified with batteries, which swept the river in such a manner, that no English vessel could pass, without being bored through and through. As the St Lawrence is wide here, the Americans provided a fleet of boats and floating batteries, to guard the other side, and thus completely stopped the passage up and down that river. Just at this time, Governor Carleton had left Montreal, which stands farther up the St Lawrence from the sea, with a fleet of English ships under his command, and without having heard of these fortifications. What added to the difficulty of his situation, was, that, the very day after he left Montreal, another body of Americans, under Montgomery himself, appeared under the walls of that city, and called upon the people to surrender. This detachment had marched across the country from Fort St John. The land is flat and marshy, and their journey had been slow and difficult. It gave them great satisfaction to have reached Montreal just as the governor had gone off with his force. The city, having no defence, was compelled to surrender. General Montgomery treated the people so well, that they supplied him with some clothes for his troops. These were very much needed. It was now the middle of November, and they were weary of a long, cold march. Some of the soldiers, during this severe journey, would have gone back to their snug homes in Vermont and the other provinces; but General Montgomery divided the clothes among them, and encouraged them to proceed.

Governor Carleton was now unpleasantly situated on the river, with Montreal, in the possession of Montgomery, above him, and the fortifications at the mouth of the Sorel below. If he could have been taken, all Canada would have been easily conquered; but he contrived, one dark night, to pass through among the floating batteries, in a small boat, with the oars muffled. Thus he escaped safely to a town on the northern bank, called Trois Rivieres; and from that place he went to Quebec.

The English fleet, which the governor had left behind, surrendered to the Americans in a day or two, with a large number of soldiers and officers aboard. General Montgomery left garrisons in Montreal, and Forts Chambly and St John, on the Sorel, to keep the Indians in awe, and marched on to Quebec, with a small force of three hundred men.

ARNOLD'S EXPEDITION TO QUEBEC.

While these things were going forward, General Washington, in his camp at Cambridge, had conceived the plan of sending an expedition against Quebec, by way of a rough wild route, known only to the backwoodsmen and hunters. This was through the district of Maine. He selected Colonel Arnold to command the expedition—a rash but brave man, who had assisted, as we have seen, in the capture of Ticonderoga and Crown Point. Fourteen companies were put under his command; three of riflemen, and one of artillery, under Captain Lamb, being among the number. In all, there were about eleven hundred men. A few others joined them of their own accord; and among these volunteers was Aaron Bur, afterwards vice-president. He was then twenty years of age.

Maine is crossed, from north to south, as a map will show, by the river Kennebec, rising in the mountains between Maine and Canada, and emptying into the Atlantic Ocean, not far from Casco Bay, near a town now called Bath. On the other side of the same mountains, and close, therefore, by the small upper streams of the Kennebec, another river rises, called the Chaudiere. This empties into the St Lawrence, nearly opposite Quebec. In crossing these mountains, between the sources of the two rivers, on the two sides, it is necessary to pass very steep and wild places, over marshes and torrents. No human being dwelt there then, and nobody lives there to this day. Such was the route Arnold and his brave soldiers were to travel. He left Boston in September 1775, and arrived at Newburyport, near the mouth of the Merrimac. The vessels that waited for him here conveyed him and his men to the mouth of the Kennebec. With a fresh south wind they sailed up the river fifty miles, to a town called Gardiner. Here were two hundred batteaux ready for them. These were long, light, flat boats, much used by the Canadians, hunters and others, in shoal waters. Having laden these with his arms and provisions, Arnold proceeded up the river to Fort Wester, on the right bank. Here he divided his corps into three detachments. The riflemen, under Captain Morgan, moved on forward, as a vanguard, to explore the country; to sound the fords, that is, ascertain where the river might be crossed easily; and to look out for the portages. These are places where the river ceases to be navigable, on account of shoals, falls, or rocks. The lading of the boats must therefore be carried forward upon the banks by hand, or by beasts of burden. The batteaux are then carried on also, till the river becomes deeper and smoother.

Arnold's second detachment marched the next day after the first, and the third detachment the day after that. The current of the river was rapid, the bottom rocky, and often interrupted by falls. Every hour, the water entered some of the batteaux, and damaged the provisions and arms. At every portage—and these occurred very often—the boats were to be unladen, and carried on the shoulders of the troops. In places where the river was rapid, yet free of rocks, the batteaux were hauled up slowly by soldiers on the banks, who dragged them along with ropes. The army, however, advanced, and at length they had wild mountains to cross, steep precipices to climb, vast shady forests to pass under, and quagmires to wade through. They had also deep vallies to traverse, where the pine-trees were tossing over their heads in the stormy wind, and where the river was rushing and foaming over the rocks with a noise like the ocean. They were sometimes a whole day in travelling four or five miles, with their baggage laced on their backs, and axes in their hands to hew a road through the wilderness. Some of the men died at last with weariness; many others fell sick; and all of them were at length sorely pressed for food. Many a young soldier, as he lay down at night, hungry and tired, on his pillow of green boughs, thought of the warm bright fireside where a mother was weeping for him. But these thoughts were vain. They rose in the morning, and pressed on patiently, brave men as they were.

By the time they had reached the source of Dead River, a branch of the Kennebec, their provisions were almost exhausted. The soldiers were living, or rather starving, now, upon the poor lean dogs they had taken with them, and even this food was a luxury. At this place, Colonel Enos received orders from Arnold to send back the sick to Boston. He took the opportunity to return himself, with his whole detachment. He was afterwards tried for this desertion, by a court-martial, and acquitted, for the reason that the men must otherwise have starved. But Colonel Arnold continued to march on. For thirty-two days, not a single human dwelling was met with. The army arrived at last upon the mountains, between the Kennebec and the Chaudiere. The little food still left was divided equally, and then the troops were directed to look out as they could for their own living. They discovered, finally, with inconceivable joy, the sources of the Chaudiere, and the first log-houses of the Canadians. These people received them well, and assisted them. Arnold addressed a proclamation to the Canadians, waited for his rear-guard to overtake him, pressed on, and arrived, November 9, at Point Levy, nearly opposite Quebec. The people of the city were as much amazed at the sight of him and his men as if they had been so many goblins. The English colonel, Maclean, had heard of their coming, however, by a letter, which Arnold had given to an Indian on the Kennebec, to carry to General Schuyler. The Indian gave it to Maclean, and the latter removed all his batteaux from the Point Levy side of the river to the other bank. The wind blew a gale, too; and so the city had time to prepare for defence.

All the people of Quebec were immediately armed, and brought within the walls—soldiers or not soldiers, English, French, Scotch, and Irish, regulars and marines. The wind moderated, and Arnold undertook to pass the river on the night of November 13. The same day, Montgomery had taken Montreal. One hundred and fifty men remained to make ladders for scaling the city walls. The rest succeeded in crossing the river. The banks being very steep here, Arnold and his men marched down upon the edge of the river towards Quebec, and climbed the Heights of Abraham, close by the city, and almost overlooking it. Here he waited for his 150 ladder men, and hoped that the city would surrender. They were prepared for him, however; and Maclean not only refused to receive the message requiring him to surrender, but fired upon the bearer of it. Arnold had no cannon, and only six charges of powder to each man. Hearing, therefore, that Maclean was about to sally out upon him, he retired twenty miles up the river, to Point au Trembie. He [illegible] on his march, the ship in which Governor Carleton was sailing down to Quebec, and heard, when he reached the point, that he had left it but a few hours before.

General Montgomery arrived here, and joined Arnold on the 1st December 1775, after a weary march from Montreal. The weather was excessively cold, and the roads were blocked up with snow. His force was about three hundred men; and never were people more delighted to see each other than were these three hundred and the little band of brave fellows who had followed Arnold. Montgomery had brought clothing for the latter, and they stood in great need of it indeed.

ASSAULT OF QUEBEC.

The soldiers now marched in company, and arrived in sight of Quebec on the 5th. A summons was sent to Carleton to surrender, but he ordered his troops to fire upon the bearer. Montgomery then planted a battery of six cannon within 700 paces of the walls. They were laid upon banks of snow and ice; the pieces were small, and the fire had little effect. The snow had now fallen in huge drifts, and the weather was excessively cold. A council of war was called. An immediate assault on the city was resolved upon. Two detachments, under Montgomery and Arnold, were to attack the walls of the lower part of the town. This taken, the rest would probably submit without fighting. On the last day of the year 1775, between four and five in the morning, in the midst of a heavy snow-storm, the American columns advanced. An Irish captain, going his rounds upon the walls of the town, observed the guns fired by the Americans as a signal, and at once caused the drums to beat, and roused the garrison to arms. Montgomery, with his detachment, passing along under Cape Diamond, came to a small battery of cannon. The guard threw down their arms and fled. The Americans had nearly taken possession of it, but the road was impeded with immense masses of snow. Montgomery with his own hands opened a path for his troops. Two hundred of them came up at last, and rushed on. Just then, a cannonier, who had fled on seeing the Americans halt, returned to his post at the little battery, and, taking a match, which happened to be still burning, fired a cannon charged with grape-shot. The Americans were within forty paces. Montgomery dropped dead upon the spot, and his troops soon fled.

Arnold had made an assault, meanwhile, at another point; but he soon received a musket-ball in the leg, which splintered the bone; and he was carried off to the hospital, almost by force, as he was unwilling to quit the field. Captain Morgan, with two companies of riflemen, now advanced upon the battery. His sharpshooters killed many of the English through the embrasures. The guard fled. Morgan rushed forward, and some prisoners were taken. But here the courage of his troops failed them. Morgan alone stood firm. As the morning dawned, he rallied his riflemen with a voice of thunder, and they rushed forward. A detachment sallied out upon them, at this moment, from the walls; and the English captain summoned them to lay down their arms. Morgan aimed a musket at him, and shot him dead. The English retreated; a hot skirmish ensued. Some ladders were planted against the walls, but a terrible fire was poured down upon the men who attempted to ascend them. A detachment of the British now assaulted the Americans on another side, and they were compelled at last to surrender.

Arnold, with his remaining force, retreated three miles from the city, and entrenched himself. His subsequent operations we shall notice by and bye. Governor Carleton kept within the walls of Quebec, satisfied with waiting till reinforcements should reach him from England, in the spring. So ended the famous assault upon Quebec.

PROCEEDINGS AT BOSTON IN 1776.

Having given some account of the most important events of the year 1775, the first of the war, we come now to 1776. In the winter and spring of this year, Boston was still surrounded by the American army under Washington. The British in the town, meanwhile, were reduced to great extremity. For fuel, they used the timber houses, which they pulled down for the purpose. They were in want of food, and some armed ships were ordered to Georgia, to buy up rice; but the people of that province opposed them with so much success, that of eleven vessels, only two got off with their cargoes.

The Old South Church, in Washington Street, was entirely destroyed inside, and used as a riding-room for a regiment of dragoons. The pulpit and pews were taken out, and the floor covered with earth. The framework of one pew, carving, silk-furniture, and all, was taken out, and used for a pig-sty. The North Church, so called, was entirely demolished.

All this time, notwithstanding there was much suffering in the town, the English officers and the loyalists contrived to pass the time, when they were not fighting the Americans, in dancing, and other amusements. They had a small theatre, and, in the evening of February 8th, were acting a farce, called "The Blockade of Boston." One figure, meant to ridicule Washington, was rigged out in the most uncouth style, with a large wig and a long rusty sword. Another character was an American serjeant in his country dress, with an old gun on his shoulder, eight feet long. At the moment this figure appeared, one of the British serjeants came running on the stage, and cried out, "the Yankees are attacking our works on Bunker's Hill." The audience took it for part of the play, but General Howe knew it was no joke, and called out, "Officers, to your alarm-posts!" There was some shrieking and fainting among the ladies, of course.

The American army, at this time about Boston, was but little better provided for than the English. Many fell sick with fatigue and exposure. They had provisions enough from the country to be sure, while the English troops were said to be living wholly on salt meat, and the Boston loyalists upon horse-flesh. But the whole number, in January, was reduced to less than ten thousand; and these, having enlisted for a few months only, were every day going home. At one time there were hardly men enough to man the lines. As for powder, they had but four rounds to a man, and but four small brass cannon, and a few old iron pieces, full of holes, with the woodwork broken off. They were fitted into logs, like the barrel of a gun into the stock, and lifted up and down, and wheeled about in this way, but to some good purpose. The British kept up a continual cannonade in return; firing about two thousand shot and bombshells, it is said, in the course of a few months. But the whole of this firing killed only twelve Americans.

We have mentioned the miserable condition of the American army in the early part of the year 1776; but they soon after received five brass cannon, small arms of all kinds, cargoes of provisions, &c. These were all captured from the British off the coast by American privateers. Privateers are armed vessels fitted out by private individuals.

PROCEEDINGS IN BRITAIN.

In England, the year 1776 opened with new resolutions, on the part of the ministry, and the majority of parliament, to continue the war. The party called the whigs were violently opposed to it; but the tories, the ministry, and king, regarded the Americans as rebels, and resolved to spare no pains to punish them severely. They found it difficult to enlist soldiers in England, for the war was unpopular with the lower classes. Recruiting officers were sent about, the royal standard was raised in all the cities, and large bounties and wages were promised; but to little purpose. In Scotland, some thousands were raised; and a bargain was made with some of the small states of Germany, for about seventeen thousand German troops. These were called Hessians, because a part of them came from Hesse.

BOSTON EVACUATED.

In the meantime, the American army at Boston began to form plans for seizing upon the town, for taking the British garrison prisoners, and for destroying their fleet in the harbour; but they kept quietly in their quarters till March 1776, the British now and then sallying out on the American lines. At this time the red ground of the American flag was changed, and in place of it thirteen blue and white stripes were inserted, as an emblem of the thirteen colonies that were united in the struggle for liberty. These stripes are still retained in the national flag.

There was something of the same feeling in congress as in the army. Stimulated by the conduct of the king and parliament, they resolved, from this time, to follow up the war at all hazards. Hearing that an attack would be made upon New York, they urged General Washington to press, as closely as possible, the siege of Boston, so that the British might not be able to spare troops to send against New York. He wished to attack the town at once, but most of his generals opposed this plan, and he concluded to fortify the Heights of Dorchester, which command the entire city on the south side. Heavy batteries were opened from the American works in Cambridge, Roxbury, and Lechmere Point. The bombs fell into the town every hour, and houses were constantly set on fire by them. All this was to employ the British upon that side, while the Americans, on the night of the 4th of March, secretly marched over Dorchester Neck. The frost rendered the roads good; and such was the silence of the march, and the tremendous roar kept up by the batteries, that two thousand troops passed over, with three hundred loaded carts, and nothing was known of it till morning. Had the British suspected this manœuvre, they would have taken measures to prevent it. By four o'clock in the morning, two fortifications were raised upon the two heights. A terrible cannonade now opened from the British forts, and the shipping, upon the American fortifications on Dorchester Heights. But few men, however, were killed; and the Americans worked on in high spirits, taking no notice of the cannon-balls, as they came, ploughing the ground about them.

General Howe saw that he must either leave the town, or dislodge the Americans from the heights. He resolved upon the latter; but a long storm, and a very high sea, prevented his troops from crossing over. He finally concluded to give up the town, and transport his whole force to Halifax, in Nova Scotia. Knowing that his shipping might be prevented from passing out of the harbour by the American fortifications, he prepared a great mass of stuff for setting fire to the town, and then proposed to Washington and the selectmen, that if his troops were suffered to pass safely, the town should be left standing. This was agreed to. He had 150 carrying vessels, called transports, in the harbour; and he embarked on board these, with all his force, on the 17th of March, taking with him 1500 of the American loyalists.

CANADIAN CAMPAIGN OF 1776.

From this time the war on both sides assumed a more determined character. A strong English force was sent to relieve Carleton, in Canada. Arnold's whole force before Quebec now amounted only to 3000 men. Many of these were sick with the small-pox. General Thomas died of the disease. The river was clear of ice, April 1776, and English reinforcements were expected every day by the governor. An attack was made upon Quebec, but it failed of success; and Arnold was now obliged to break up his camp and retreat, leaving his baggage behind. Governor Carleton pursued, till the Americans reached the mouth of the river Sorel.

About the last of May, English forces arrived at Quebec, amounting to 13,000 men, commanded by Burgoyne, Phillips, and a German general, called Reidesel. Arnold, meanwhile, was skirmishing with the Canadians and Indians about Montreal and the Sorel. In a short time he went down the St Lawrence to Trois Rivieres, where there was a large body of English. He expected to surprise them in the night, but was misled by his guide; and when he arrived, late in the morning, the enemy was drawn up in battle array. A skirmish began, and the Americans were defeated. They fled over a wild, swampy country of woods, leaving many prisoners behind them; and having crossed the St Lawrence, at last arrived at fort St John, on the Sorel. The English pursued them to this place. Arnold's force was too small to resist a siege. He therefore set fire to the magazine and barracks, and retreated farther south to Crown Point. The English, having lost their batteaux, could pursue him no farther, and soon after returned to Quebec.

The Americans, under Arnold, had suffered exceedingly in the retreat. They sometimes waded in the water to the waist, and dragged the loaded batteaux up the rapids by main strength. Two regiments, at one time, had not a single man in health; another had only six, and a fourth only forty. On the first of July, they reached Crown Point; and thus ended the courageous but unfortunate expedition to Canada.

During the summer of 1776, Crown Point was taken by the British, and the Americans, now commanded by General Gates, withdrew to Ticonderoga. A fleet was built on the lake, at Skeensborough, consisting of a sloop, three schooners, and six gondolas, which are large flat vessels. They carried, in the whole, more than 100 guns, and more than 400 men. Arnold commanded the fleet.

By the month of October, the British had collected a much larger naval force; and as nothing could be done, by way of invading the provinces from Canada, till lake Champlain should be cleared of the Americans, they sailed up the lake, and engaged them. The two fleets fought till night. Arnold then very skilfully made his escape, and, in the morning, not an American vessel was to be seen. The British fleet followed on, however, and found them again off Crown Point. Some of the American vessels escaped to Ticonderoga. Seven of them remained. They were attacked, and the action continued some hours. Arnold was determined that his vessels should not be taken. He contrived, therefore, to run them on shore, and there they were blown up. He did not leave his own vessel till she was wrapped in flames. Lake Champlain was now in the power of the British; but Gates and Arnold had prevented them, strong as their force was, from invading the provinces farther south. It was now too late in the season to attempt it.

DEFENCE OF FORT MOULTRIE.

Boston, which had been entered by the American army on the 17th of March, was no longer disturbed by the enemy. The British, finding that the provinces of North Carolina and Virginia were too strong for them, determined to make an attack upon the city of Charlestown, in South Carolina.

Admiral Parker and General Clinton reached Charlestown harbour on June 28, and, with eleven large vessels of war, commenced a tremendous attack upon Fort Moultrie. This stood upon Sullivan's Island, six miles from the city, and was built of a kind of wood called palmetto, so spongy and soft that the balls were buried in it, and no splinters were thrown off. The fort was defended by sixty pieces of cannon. Ship after ship poured in their tremendous broadsides. The whole harbour seemed to be but a sheet of flame. The Americans aimed well, and every shot had its effect. Some of the English vessels were soon stranded. The Thunder, after firing more than sixty bombs, was disabled. The Bristol was almost destroyed, and a great number of men were killed. The fire of the fort suddenly stopped. Their powder was exhausted. The enemy thought themselves sure of the victory, and the ships moved nearer, with their flags flying, and their drums beating. But the Americans were soon supplied from the shore, and the battle lasted, hotter than ever, till seven in the evening. The English drew off in the night, and the enterprise was abandoned. This defence of Fort Moultrie was one of the most gallant actions of the war. The British plan now was to direct the whole English force upon the province of New York, and to make it, with the city of New York, the centre of all their operations in America. From this point they could march south upon the southern provinces; here they could receive stores from England by water, and provisions from Staten and Long Islands; and here they could ascend the Hudson, and meet Burgoyne, in his route south from Canada.

DECLARATION OF INDEPENDENCE.

The revolution had now reached a point from which it could not turn backward. The feelings of a great part of the people were alienated from England, and a deep hostility was planted in their bosoms. They had originally asked for justice, and that was denied. Oppression followed, and that they resisted. Then came the British armies, with fire and sword, to consume their dwellings, and shed their blood.

A high-spirited people were not likely to look on these things but with resentment. Their love and respect for England were originally very strong. These, indeed, lasted up to the period of which we are now speaking. But now all thoughts of reconciliation were abandoned. The people no longer asked for redress; they cast off their allegiance to the king, and determined to be free; the "spirit of '76," which is often alluded to, was the earnest voice of a nation, resolving that they would risk every thing for independence.

In June 1776, congress had chosen five of their members to consider the great question, whether the provinces should declare themselves a *free and independent nation*. These were Jefferson, Adams, Franklin, Sherman, and Livingston. They reported in favour of so doing; and congress agreed with them. Independence was solemnly declared on the fourth day of July. The declaration was written by Jefferson, and signed by John Hancock, president. It was then signed by every other member of congress. The people received and read it with great joy. Independence was proclaimed, with great parade, at Philadelphia, on the 8th. Cannon were fired, the bells rung, bonfires were kindled, and the people seemed to be mad with joy. On the 11th, the declaration was read to each brigade of the American army, then assembled at New York, and received with prodigious peals of applause. The same evening, the statue of George the Third, erected in 1770, was dragged through the streets by the "sons of liberty," and the lead it was made of was melted into musket-balls. An immense multitude at Baltimore received the declaration in the same manner, the air ringing with shouts and the roar of cannon. The king's effigy was made the sport of the populace, and burnt in the public square. In Boston, the declaration was read from the gallery of the State-house to an immense crowd, gathered from all quarters. Men, women, and children, assembled to hear it, and every moment the air resounded with the shouts of the multitude. The troops were drawn up, splendidly dressed and armed, in King Street, which from that time was called State Street. The bells rang, the people shouted, the cannon thundered and blazed, and the striped banners waved from the steeples, till the whole air [illegible]d to be alive. In the evening, all the ensigns [illegible] English lions, sceptres and crowns, whet[illegible] painted, were torn in pieces, and burnt [illegible]t.

Such was [illegible]laration of independence, and such the manner [illegible]ich it was received by the Americans. They had now declared themselves to the world as a free people; but ere their freedom could be established, they had yet to pass through a long, bloody, and desolating war.

AMERICANS RETREAT FROM NEW YORK.

General Washington now occupied New York and Long Island, which lies a few miles from the city, with seventeen thousand troops. On the 22d of August, the English landed, in great force, on the island, and a very hot battle was fought among the hills and woods. A whole regiment of fine young men from Maryland were killed, some cannon were lost, and the Americans retreated to the northern part of the island. Here the stormy weather kept the enemy from attacking the camp again. But, fearing an assault every moment, the Americans concluded to pass over to the island of New York, and join the rest of the army. This was done in the night of August 29. They kindled up circles of bright fires in their camp, to deceive the enemy, and started off in their boats at eleven o'clock in the evening. The fleet of boats moved off from the shore like an army of ghosts. Not a word was said—no drums beat—no bugles rang—no colours waved in the breeze. A fair wind favoured the troops; they crossed the water like birds. In the morning, at eight, when the fog cleared up, which had covered them in the passage, and the sun shone out bright and warm upon the green shores, the wooded hill-tops of the islands, and the smooth surface of the bay, the American army had vanished. The camp was deserted, the fires had gone down, and nothing was seen but a few distant boats which had come back for the cannon.

Previous to the retreat of the Americans, several skirmishes were fought between the two armies. Two forts, one belonging to the English, and the other to the Americans, were within half gun-shot of each other, and were only separated by a small creek. It was at last agreed between the British and American officers, that the sentinels should not fire upon each other as they went their rounds. So they became very civil. "Give us a quid of your tobacco, my good friend," cried the English guard to the American sentinel. "Oh, certainly," said the latter. He drew his twisted roll from his pocket, and tossed it across the creek to the Englishman, who gnawed off a quid, and threw it back again.

The British army now pressed the Americans with great activity; the latter were driven back from point to point. They left the city of New York at last, and the British entered it. A few days after, a terrible fire raged in the place, and consumed more than a thousand houses. The British supposed the inhabitants had set it on fire, and were so angry as to throw some of them into the flames.

DISTRESSES OF THE AMERICAN ARMY.

Washington now retreated into the back country. The British secured the Province of New York with their troops, and covered all the shores with their vessels. Several strong forts were taken, together with their garrisons. Nothing could be done to oppose them. The Americans were now much discouraged.

General Washington, with his army, marched into New Jersey, and attempted to harass the British army there, under Cornwallis. But they were too strong, and Washington was obliged to retreat night and day; over mountain and valley, he fled before them. The time the militia had enlisted for was short, and many of them went home. Whole companies deserted, and the army was so small in December, that Washington knew every man by his name. They were so nearly naked and ragged, too, and looked so miserable, that their own countrymen would not join them. Large numbers went over to the enemy; but Washington remained firm and undismayed. While other minds were shaken with doubt and fear, he remained steadfast and resolved, looking deeply into the future; and placing his trust in Heaven, he seemed to penetrate the clouds that shed their gloom upon the land, and to see beyond them a brighter and a happier day.

He always appeared before his soldiers with a smile, and fought or fasted with them, as necessity required. He inspired all around him with courage, and wrote many letters to congress, entreating them to make great exertions to send him assistance. Accordingly, they endeavoured to rouse the country, by representing to the people the necessity of an immediate increase of the army.

This appeal was not without its effect. Philadelphia, in a very short time, furnished Washington with a regiment of 1500 men, who were resolved to support him to the last. They had been accustomed to the gay company and high living of the city; but they shouldered the musket, slept with a mere blanket around them, on the frozen ground, or in sheds and barns; and suffered every thing with the poorest of the army.

The British now withdrew into winter-quarters. They occupied the villages for many miles, up and down, on the eastern side of the Delaware, with their army. Washington was below them, on the other side. But they were tired of pursuing him; and they believed that his army would soon dwindle away, and the whole country be conquered. They scarcely took the trouble to set guards at night; but Washington watched them like a lynx. On the night of December 25th, he crossed the Delaware, again, with a large part of his army. The night was dark, stormy, and cold. The river was crowded with broken ice, rushing together, and sweeping down upon its swift current. But, notwithstanding these difficulties and dangers, the river was passed by the American troops, and they marched on to Trenton. They entered that place at eight in the morning. A large body of Hessians were stationed there. They were completely surprised; but they fought bravely for a short time. Five hundred cavalry made their escape; but some fine cannon, and more than a thousand prisoners, were taken by the Americans. Cornwallis, who lay a few miles off, thought so little of the American "ragamuffins," at this time, that he mistook the noise of the cannon at Trenton for thunder.

The British army were amazed at this unexpected event. They moved and marched about, but to no purpose. Washington started off for the mountains of New Jersey. The British were close upon his rear. They encamped so near him one evening, that they thought it impossible for him to escape. They put off attacking him, however, till the next morning.

The Americans kindled up their fires, as usual, and marched off at one o'clock, without noise. They reached Princeton at daybreak, and fell upon the British there so suddenly and so fiercely, that sixty of them were killed, and three hundred taken prisoners. Their commanding officer had had some fears of an attack, and had written to the commander of the British army, a day or two before, for a reinforcement. "Don't be alarmed," was the answer; "with a corporal and six men you may scour the whole country; don't be alarmed." They found themselves mistaken, however, as we have seen.

Washington now formed a camp at Morristown. Militia came to him from all parts. The spirits of the people were raised. They had imagined that nothing could conquer the Germans, and were afraid of them as of wild beasts. Indeed, these soldiers had acted like wild beasts. They had ravaged the country like so many highwaymen, plundering, burning, and murdering. But the people found now that they were men, and that they could be killed and captured, as large and fierce as they looked, with their immense swords like scythes, their tall caps, and shaggy whiskers. The British themselves treated their prisoners with cruelty. Hundreds were confined in the New York prisons. They were often insulted as rebels. A party of them was once brought before General Howe to be tried. An English gentleman pleaded their youth in their favour. "It won't do," said the general; "hang up the rascals! hang them up!" They were only carted through the streets, however, seated on coffins; halters were tied about their necks, and the British soldiers hooted at them.

BRITISH EMPLOY THE INDIANS.

While these things were going on, late in the year 1776, at New York, Sir Peter Parker secured the coasts of Rhode Island with a large squadron, and overran the whole province. Meanwhile, a man of the name of Stuart was sent by the British among the

Indians in the high wild lands back of Virginia, and the other southern colonies. The Cherokees were persuaded by him to make war; and they rushed in upon the settlements of the whites, burning the villages, and scalping men, women, and children. But a large American force soon marched into their own country. Their wigwams were burnt to the ground, and their corn-fields trampled under foot. They were frightened at last, and begged for peace.

It once happened, during the expedition against the Indians, that, the Americans having marched a long way among the hills, Major Pickens was sent ahead with twenty-five men, as a scouting party, to examine the country. One morning, as he and his party waded through the tall grass on the bank of a stream called Little River, more than two hundred Indians came rushing out on a ridge of land just above them. Never was such a horrid noise heard as the Indian war-whoop. The woods sounded with it far and wide. The Indians were dressed in the most frightful manner, with their faces painted, long feathers on their heads, guns swinging in their left hands, and tomahawks raised in their right. "Let us scalp them," cried the Indian leader to his men; "they are too few to shoot." But Major Pickens was prepared for their onset. His men were sharpshooters, and each man had his rifle. He ordered them not to fire until he did, to take sure aim; and, having fired, to bury themselves in the grass, and load their rifles. The Indian chief soon came up within twenty-five yards of the little band, yelling and shaking his tomahawk. Pickens stretched out his rifle, took a deliberate aim, and shot him dead. The twenty-five brave riflemen now fired. The Indians fell on all sides. They yelled more than ever, with fury and terror, dropped their tomahawks, and fell back among the trees. Even there the rifles were too sure for them. Not an Indian could show himself over a log or a rock, but a bullet instantly whistled through him. One of them was seen running his gun through the roots of a fallen tree. A rifleman aimed at him as coolly as if he had been a wooden mark, hit him precisely in the nose, and laid him flat on his back. Another Indian lifted the dead body, and was running off with it—for the Indians never leave the dead—when another rifleman fired, and killed him. Dozens of them were picked off in this way, and the rest fled.

A few such skirmishes as these made the Indians soon tired of fighting the Americans, to which they had been instigated by the British. The next year, when an attempt was made to set them upon the white inhabitants along the frontiers, they replied to the British emissaries, that "the hatchet was buried so deep that they could not find it."

ACTIONS IN 1777.

In the spring of 1777, General Howe amused himself by sending out detachments from his camp to ravage various parts of the country. On the 26th of April, Governor Tryon embarked at New York with a detachment, sailed through the Sound, and landed at Fairfield, Connecticut. They marched through the country in battle array, and reached Danbury in twenty hours.

As they came, the few militia who were there fled at full speed. The British began to burn and demolish every thing except the houses of the loyalists. Eighteen houses were consumed, and 800 barrels of pork and beef, 2000 barrels of flour, and 1700 tents, were carried off or destroyed. But the militia now began to muster from the country round about.

At Ridgefield, General Arnold blocked up the road in front of the British, who were now returning. He had with him about 500 men. These brave fellows, who had marched fifteen or twenty miles in the rain, kept up a brisk fire upon the enemy, as they came on, and stood their ground, till the British formed a lodgment upon a hill at their left hand. They were then obliged to give way. The British rushed on, and a whole platoon fired at General Arnold, who was not more than thirty yards distant. His horse was killed. A soldier advanced to run him through with his bayonet; Arnold shot him dead with his pistol, and escaped. The British lost more than two hundred men, but made good their retreat to the Sound. Congress presented General Arnold with a fine war-horse, richly dressed, for his gallantry.

By way of retaliation, on the 24th of May, Colonel Meigs, an American, crossed the Sound with 170 men in whale-boats, and fell upon the enemy at Sagg Harbour, on Long Island. They burned twelve vessels, destroyed a large quantity of forage, killed six men, and brought off ninety prisoners, without losing one of their own men. They returned to Guilford, having been the distance of ninety miles in twenty-five hours from the time of their departure. Congress ordered an elegant sword to be presented to Colonel Meigs.

Washington, in the meantime, with an army of fifteen thousand men, was so strongly entrenched among the hills, that Howe dared not attack him. The summer was therefore spent in marching to and fro in New Jersey, without effecting much. But in July, the British mustered a force of sixteen thousand men at New York, which they soon after left, with a large fleet. An attack was expected every where upon the coast; but no one knew whither they were bound. Having been off at sea with high winds for a long time, they entered Chesapeake Bay at last, and landed at Turkey Point.

They left that place, September 3, and, marching towards Philadelphia, came up with Washington's army at a place called Chad's Ford, on the river Brandywine. On the 11th they had a warm skirmish, and the Americans were driven back. Congress removed to Yorktown, Virginia; and Howe entered Philadelphia, in great triumph, September 26.

The Americans were defeated again at Germantown on the 4th of October. The battle began early in the morning, when nothing could be seen farther than thirty yards. During the whole action, which lasted nearly three hours, the firing on both sides was directed by the flash of each other's guns. The smoke of the cannon and musketry, mingled with the thick fog, rested over the armies in clouds.

Washington retired into winter quarters, at Valley Forge, sixteen miles from Philadelphia. His army might have been tracked, by the blood of their feet, in marching, without shoes or stockings, over the hard frozen ground. Thousands of them had no blankets, and were obliged to spend the night in trying to get warm, instead of sleeping. They erected log-huts for lodgings. For a fortnight, they nearly starved. They were sometimes without bread and without meat. A person passing by the huts of these poor fellows in the evening, might have seen them, through the crevices, stretching their cold hands over the fire, and a soldier occasionally coming in or going out, with nothing but a blanket on his shoulders. "No pay, no clothes, no provisions, no rum," said they to each other. But they loved Washington and their country too well to desert them in these trying times.

Having seen Washington's army in their winter quarters at Valley Forge, we shall now follow the northern army, under Gates, and the English under Burgoyne, through the campaign of 1777. The latter intended to break his way from Canada, up the river Sorel, through lakes Champlain and George, and the river Hudson, to New York. He had under his command one of the finest armies ever seen.

The Americans were driven before him, from Champlain almost to Albany. Burgoyne pressed after them, but his route lay through the woods, and the Americans cut large trees on both sides of the road, so that they fell across it, and blocked it up entirely. The country was so covered with marshes, and crossed by creeks, that the British were obliged to build no less than forty bridges; one of them was a log bridge, extending two miles across a swamp. July 30, Burgoyne reached Fort Edward, on the river Hudson. He had with his army a large number of Indian warriors, and they ravaged the country in the most horrible manner. One of them murdered a beautiful American girl, Miss M'Rea. She was the daughter of a loyalist, and was to be married to a young English officer. The latter sent two Indians to guide her across the wood from the fort to his own station. They quarrelled on the way, which should have special charge of her. They became very angry, and one of them, to terminate the dispute, sunk his tomahawk in her head, and ended her life.

SURRENDER OF GENERAL BURGOYNE, AND AID PROCURED FROM FRANCE.

The spirit of the whole country was greatly excited by these things, and an army of thirteen thousand men was collected under General Gates, to oppose Burgoyne. Meanwhile, a British force, under General St Leger, had crossed Lake Ontario, from the St Lawrence, and laid siege to fort Schuyler, on the southern side. General Herkimer marched northward with eight hundred militia, to relieve it. He fell into an ambuscade, however, in the woods, and was killed. In his last moments, though mortally wounded, he was seen sitting on a stump, still encouraging his men. They stood firm, and several of the British Indians fell at their first fire. The rest were so enraged that they turned upon the loyalists and the British, and murdered several of them. The battle was heard at the fort, and two hundred and fifty of the Americans came out to reinforce the detachment. The British were wholly routed. The Indians fled, howling like wild beasts, and left their kettles, blankets, tomahawks, and deer-skins behind.

About the middle of August, Burgoyne sent five hundred Hessians and one hundred Indians, under Colonel Baum, to take possession of a collection of American provisions, at Bennington, Vermont; but General Stark was there, luckily, with eight hundred New Hampshire and Vermont militia. Colonel Baum, finding this force greater than his own, threw up temporary breastworks for defence, and sent to Burgoyne for reinforcements. Several skirmishes now followed, in which the Americans had the advantage. Animated by success, they at length ventured to make a general attack upon the breastworks of the enemy. They were without cannon, and destitute even of bayonets. The Hessians, too, fought very bravely for two hours. But they were now opposed by still braver men. The Americans rushed into the very flash of their cannon and musketry. They could not be resisted. Multitudes of the enemy fell before their keen and well-directed fire. Baum himself was killed, and most of his detachment either lost their lives or were taken prisoners.

The Americans, not expecting another enemy, had dispersed themselves after the battle. Suddenly, a reinforcement of several hundred British troops, under Colonel Breyman, arrived at Bennington. The Americans were now near losing all they had gained. But it happened that a regiment, under Colonel Warner, reached the place soon after. These, with the militia, immediately made an attack upon the enemy. They fought till sunset, when the British retreated, and, under cover of the night, the greater part effected their escape.

In these two engagements, four hundred of the enemy were killed and wounded, six hundred were taken prisoners, and two hundred and fifty dragoon swords, eight loads of baggage, and twenty horses, fell into the hands of the Americans.

By the middle of September, the American army under Gates was within three miles of the great army of Burgoyne, on the Hudson. The latter was now severely pressed for provisions, and undertook to march on towards Albany. The Americans met him at Stillwater, on the 19th; a fierce battle was fought, and the British could advance no farther. They pitched their camp on the plains of Saratoga, three miles above the village, within cannon-shot of the American lines. General Clinton was at this time attempting to force a passage up the Hudson, from New York, to reinforce Burgoyne. Spies and scouts were constantly on the alert, and hot skirmishes now took place every day between the two armies at Saratoga. September 23, a cannonade was kept up, with a tremendous roar and blaze, for three hours. The field was strewn with the killed. An English captain, with forty-eight men, had the command of four fine cannon. He fought till thirty-six of his men were killed. His horses being shot down at last, the cannon were left to the Americans.

Some of the American soldiers, during these skirmishes, often placed themselves in the boughs of high trees, the country being wild and woody, and played with their rifles upon the rear and flank of the enemy. The British officers were picked off like birds. Burgoyne himself once narrowly escaped. His aid-de-camp General Philips was delivering a message to him, when he received a rifle ball in his arm. His saddle was furnished with very rich lace, and the sharp-shooter had taken him for Burgoyne.

October 7, the whole British line was driven back by a tremendous charge. The German lines stood firm to the last, and Colonel Brooks was ordered to attack them. He galloped towards them at the head of his regiment, waving his sword; and Colonel Arnold rushed on with him. Arnold was wounded, and carried off. Brooks kept on, and the Germans were driven back. Colonel Cilley, of New Hampshire, captured a cannon with his own hands, and was seen astride upon it, in the heat of the battle, shouting to his soldiers. In this battle, Burgoyne had a bullet pass through his hat, and another through the edge of his vest.

On the 18th of October 1777, the whole British army under Burgoyne surrendered to General Gates. There were nearly ten thousand men, including Indians; forty cannon, seven thousand muskets, and a vast quantity of tents and cartridges. The whole country was filled with rejoicing. The thanks of congress were voted to Gates and his army. One of the main effects of the victory was, that the French now concluded to fight with the Americans against England. Treaties between the two nations were signed, February 6, 1778, and a fast-sailing schooner from France reached Casco Bay in Maine, in about a month, with the news. It occasioned prodigious joy in congress, in the army at Valley Forge, and over the whole country. A French fleet arrived on the coast early in July. General Clinton knew they were coming, and therefore thought it necessary to remove to New York. He left Philadelphia on the 18th of June, and marched through New Jersey towards the latter place.

As soon as Washington heard that Clinton had left Philadelphia, he broke up his quarters at Valley Forge, and followed hard after him. A hot battle was fought on the 28th near Monmouth court-house. It did not cease till the evening. Washington slept upon his cloak under a tree, expecting more fighting in the morning; but the British marched off in the night. Sixty of their soldiers were found dead on the battle-field without wounds. Fatigue and the excessive heat had killed them.

BRITISH MINISTRY CONDESCEND TO TREAT.

The intelligence of Burgoyne's surrender occasioned dismay among the British ministers. They now introduced a conciliatory bill into parliament, exactly like one which the celebrated Mr Burke had some time before failed in passing. It appointed commissioners to go to America, and offer to give up all power of taxation over the colonies, and every thing, indeed, but the authority of the king, provided they would return to their allegiance. These commissioners, however, although they did all they could to produce an impression in America, found every effort counteracted by congress. They offered more than had been asked by the Americans at the beginning of the war; but the Americans had since then been much exasperated by the barbarities of the British army—had declared their independence—and, having good prospects of successfully resisting Britain, were not inclined to go back in their career. The commissioners therefore returned without doing any good.

No other great battles were fought during the campaign of 1778. The armies only molested each other by sending out small detachments. Little also was done on either side during the year 1779. The

British main army, under General Clinton, was at New York; and the Americans, under Washington, were among the Highlands, above that city, on the river Hudson. In the spring, a British force was sent to ravage the coast of Virginia. They destroyed every thing in their way—villages, shipping, and stores. The Virginians sent to the British general to ask, "what sort of war this was." He replied, that "all rebels must be so treated." A month or two afterwards, Governor Tryon was sent to commit similar havoc in Connecticut. Colonel Whiting had mustered the militia at Fairfield. Tryon came to that place, and commanded him to surrender. He gave him an hour for consideration; but, before that time had elapsed, his soldiers set the town on fire, and a great part of it was laid in ashes. At New Haven, all possible damage was done. The harbour was covered over with feathers, poured out from the beds of the people. Desks, trunks, closets, and chests, were broken open; the women were robbed of their buckles, rings, bonnets, and aprons. East Haven was afterwards burnt, and Norwalk shared a similar fate.

TREACHERY OF GENERAL ARNOLD.

General Lincoln commanded in the southern provinces during 1779, the British holding possession of Savannah. He besieged them there with the help of the French fleet, but was driven off. Prevost, the British general, himself, met with the same bad luck in besieging Charlestown, South Caroline. The people resisted him nobly, with some assistance from Lincoln, and the siege was abandoned. But Prevost ravaged the country, burning and plundering without mercy.

During the year 1780, nothing of great consequence was done in the northern provinces. The two armies lay near each other, the British being in New York, and the Americans on the Hudson; but no battles were fought.

The most important event of this year was the treason of Arnold, one of the American generals. He commanded a very strong fort at West Point, sixty miles from New York, on the North River. He undertook to deliver it into the possession of the British. Major Andre, a young British officer, went on shore in the night from a British ship in the river, to arrange the business with Arnold. The two officers met privately at some distance from the fort. Arnold agreed, for a certain sum of money, and other considerations, to surrender the fort, with the garrison, cannon, and ammunition, into the hands of the British commander. In settling the details of this business, Andre was detained till the next day; and then the boatmen refused to carry him back. He had to return by land, and to pass by the American camp, on his way to New York. He was furnished with a horse, and exchanged his uniform for a common coat. He thought himself already out of danger, when, as he trotted quietly on through the woods, he was stopped by three Americans, who were scouting between the outposts of the two armies. "Who goes there?" cried the first, seizing his bridle. Andre was frightened, and asked the scout where he belonged. "Below," answered he, meaning New York. "So do I," said Andre, deceived; "I'm a British officer, in great haste; don't stop me." "Are you, indeed?" said the scouts; "then we'll see about that!" They found his spy-papers in his boots. He offered them his gold watch, horse, and purse, if they would release him; but they told him they knew their business too well. He was carried to the camp, and, though a brave and accomplished young man, yet he was condemned and hanged, according to the usages of war, as a spy. Even the Americans shed many tears for this unfortunate officer.

CAMPAIGN OF 1781.

Congress continued to make great efforts to supply the army, though the paper money they had issued was worth so little that a soldier would give forty of their dollars for a breakfast, and a colonel's pay would hardly find oats for his horse. The merchants of Philadelphia raised a large sum of better money, however, and sent it to the army. The ladies of that city furnished a large quantity of clothing. But the British, all this time, were overrunning the two Carolinas. They had taken Charlestown, on the 11th of May 1780, after a long siege, and a brave defence by General Lincoln.

Generals Marion and Sumpter gave the British great trouble during this campaign. Small parties of the mountain militia joined them, and they swept down upon the enemy, wherever they could find them in small parties. The farmers' wives furnished them pewter spoons and platters, to make into bullets; and they forged swords of scythes and the saws of sawmills. In October, sixteen hundred of these mountaineers mustered together to attack a British force under Major Ferguson, who had encamped not far from the mountains. For weeks they had no salt, bread, or spirits; they slept upon boughs of trees, without blankets, drank only from the running streams, and lived upon wild game, or ears of corn, and pumpkins, roasted by their great log-fires in the woods.

With the year 1781, on which we now enter, the war drew rapidly toward a close. It was carried on almost entirely in the southern provinces. General Greene was appointed to command the American forces in that quarter. At the time of his arrival, they were a miserable half-starved militia, of three thousand men. They marked the frozen ground with the blood of their bare feet, and lived half the time upon frogs, taken from the swamps, wild game, rice, and wretchedly lean cattle. But they were soon reinforced; and small parties, under Sumpter, Marion, Morgan, and others, often annoyed the forces of Cornwallis. Colonel Washington laid siege to a strong blockhouse near Camden, defended by a British colonel, and a hundred loyalists. He had no cannon, and few men; but he carved out a few pine logs in the shape of cannon, mounted them on wheels, and summoned the loyalists to surrender. They were frightened at the appearance of his big cannon, and surrendered. Not a shot was fired upon either side.

On the 17th of January, Colonel Morgan, with eight hundred militia, was attacked at a place called the Cowpens, in South Carolina, by Tarleton, a famous British officer, with eleven hundred men and two cannon. The enemy rushed on with a tremendous shout. The front line of militia were driven back. Tarleton pursued them, at full gallop, with his troopers, and fell upon the second line; they too were giving way. At this moment Colonel Washington charged Tarleton with forty-five militiamen, mounted, and armed as troopers. The whole line now rallied under Colonel Howard, and advanced with fixed bayonets. The British fled. Their cannon were left behind; three hundred British soldiers were killed and wounded, and five hundred were taken prisoners; eight hundred muskets, seventy negroes, and one hundred dragoon horses, also fell into the hands of the Americans.

General Greene was now driven back by Cornwallis into North Carolina. The latter pursued him through the province, over mountains and swamps, and arrived at the river Dan just as Greene had crossed it. Cornwallis now found it necessary to turn about; and so he marched back, and Greene soon followed him with new forces.

Sumpter joined him at Orangeburg, having received orders to do so during his hasty retreat before the enemy. It seems Greene could find no man in his army who would carry the message to Sumpter. A country girl, named Emily Geiger, at last offered her services, and was sent. She was taken by the British, and confined for the purpose of being searched. She, however, ate up the letter which she carried, piece by piece. They released her, to go home, as they supposed, but she took a roundabout way, reached Sumpter's camp safely, and delivered her message in her own words.

CONCLUSION OF THE WAR.

The Americans were defeated near Guilford court-house on the 15th March. But Cornwallis retreated soon after. He had suffered great loss, and his army was small. A militia colonel cried out in this battle, as the British were marching up, "they will surround us." He was frightened himself, and frightened his soldiers so much, that they gave way, while the enemy were one hundred and forty yards distant. Colonel Washington, at the head of his troopers, nearly captured Cornwallis in this battle. He was just rushing upon the British general, when his cap fell from his head. As he leaped to the ground for it, the leading American officer behind him was shot through the body, and rendered unable to manage his horse. The animal wheeled round, and galloped off with his rider; and the troop, supposing it was Washington's order, wheeled about also, and rode off at full speed.

Fort Watson, between Camden and Charlestown, surrendered in April, with 114 men, to General Marion. The fort was built on a mound of earth thirty feet high; but Marion, with his mountaineers, had raised a work which overlooked it in such a manner, that not a man in the fort could show his head over the parapets, or scarcely point his musket through a hole in the walls, but the riflemen above would shoot him. Greene was again defeated at Camden on the 25th of April, by nine hundred English, under Lord Rawdon.

But in a month or two the British lost six forts, and that of Augusta was among them. Here there were three hundred men as a garrison, who almost buried themselves under ground, while the Americans were building up batteries within thirty yards, which swept the fort through and through. Greene and all his officers, and all his men, fought nobly the whole season. "I will recover the province," said the general, "or die in the attempt." It is remarkable, that although his force was much inferior to that of Cornwallis, and though he was frequently defeated, yet, by his admirable manœuvres, the result of the campaign was entirely favourable to the Americans, and injurious to the British.

Greene attacked the enemy at Eutaw Springs, 8th of September, and completely defeated them, killing and capturing eleven hundred of their best soldiers. In pursuing the enemy, one Manning found himself surrounded by them. He seized upon a small British officer, and, being himself a stout man, placed him on his shoulders, and retreated, the English not daring to fire at him, The little officer was horribly frightened, but Manning took good care of him.

The war was closed by the capture of Cornwallis at Yorktown, on York river, Virginia. He had left Carolina, and now expected to overrun Virginia. But in September, the Americans and French, under Washington, surrounded him from all quarters on the land; while the French fleet, riding in Chesapeake Bay, blocked up the mouths of the rivers, and kept the English fleet from coming in.

It was impossible for Clinton, with all his forces at New York, to reinforce Cornwallis. Washington had kept him in fear all summer, and made him believe, till the last moment, that he was to be besieged in New York. It was not till August 24, that Washington left his camp on the Hudson, and marched through New Jersey and Pennsylvania, to the head of the Chesapeake. The French Admiral De Grasse, who had just arrived, carried the American forces down the bay to Yorktown.

The army passed through Philadelphia, on this march, in the most splendid style. The line was more than two miles long. The streets were crowded with spectators; and the windows, to the highest stories, were filled with ladies, waving their handkerchiefs, as the gallant troops passed by. It was a magnificent spectacle. There was Washington, with all his generals; the French Count Rochambeau, with all his; General Knox, with one hundred fine cannon; and the whole army, pressing on with proud steps and a noble confidence. The music was beautiful; every body thought they would conquer; and, just at this time, news came that the French fleet had arrived in the Chesapeake. The city rang with the shouts of the immense multitude.

By the 7th of October, Cornwallis was completely besieged; and surrendered on the 19th. His army, of about seven thousand men, marched out, at two o'clock, and passed between the American line on one side, and the French on the other, stretched out for more than a mile. They were dressed in their most splendid uniforms, with fine music, and colours flying. The English marched, carrying their colours bound up, with a slow and solemn step. The English general rode up to Washington, at the head of the line, and excused the absence of Cornwallis, who pretended to be sick. Washington pointed him politely to General Lincoln, and the latter directed him to a large field, where the whole British army laid down their arms, and were led away prisoners. No man distinguished himself more, during this siege, than Lafayette, a noble young Frenchman. He had before fought bravely for the American cause.

After this capture, the English gave up all hopes of success. No fighting of any consequence took place after this upon the land.

The British troops were wholly withdrawn from the United States of America in the following season. Britain had for some time been greatly embarrassed by the hopeless contest she carried on in America. All the European powers that were jealous of her—France, Spain, Holland—had taken advantage of her difficulties to commence war against her, and her expenditure of men and money was so great, while her success was so small, that the people began to be very clamorous. The unfortunate king, his ministry and parliament, were at last obliged to give in. A treaty of peace, in which the independence of the United States of America was acknowledged, was settled by the British and American ambassadors at Paris, in November 1782. The 3d of November 1783 was fixed upon by congress for the final disbanding of the American army. On the day previous, Washington issued his farewell orders, and bade an affectionate adieu to the soldiers who had fought with him in the great struggle, which was now over.

Soon after taking leave of the army, General Washington was called to the still more painful hour of separation from his officers, greatly endeared to him by a long series of common sufferings and dangers. The officers, having previously assembled in New York for the purpose, General Washington now joined them, and, calling for a glass of wine, thus addressed them: "With a heart full of love and gratitude, I now take my leave of you. I most devoutly wish that your latter days may be as prosperous and happy as your former ones have been glorious and honourable." Having thus affectionately addressed them, he took each by the hand, and bade him farewell. Followed by them to the side of the Hudson, he entered a barge, and, while tears flowed down his cheeks, he turned towards the companions of his glory, and bade them a silent adieu. This great man had no ambitious views for himself. After heading the movement which had achieved the independence of his country, he retired contentedly to his country seat in Virginia, leaving the people to form themselves into an independent republic.

CONCLUSION.

Thus ended the American War of Independence: the imprudence of the British punished by the dismemberment of their empire and an addition of a hundred millions to their debt—the constancy and sufferings of the Americans rewarded by the triumphant accomplishment of all their wishes. The example of America, it is well known, operated powerfully in bringing on the ensuing revolution in France, by which the whole aspect of society in Europe has been affected; and the model which she continues to hold up, of a complete system of ultra-popular institutions, exercises at the present hour an influence of which it would be difficult to rate the amount, or calculate the issue.

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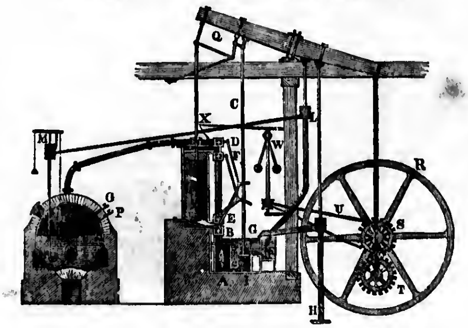
THE STEAM-ENGINE AND LOCOMOTIVE MACHINES.

REPRESENTATION OF WATT'S STEAM-ENGINE.



The steam, which is under the piston, is allowed to escape into the condenser A by the cock B, which is opened by the rod C, while at the same time the steam is admitted by the cock D into the upper part of the cylinder; when the piston has descended, the cocks E and F act in a similar manner in letting out the steam from above, and admitting it under the piston. The jet is supplied by the water of the cistern G, which is pumped up at H from a reservoir; it is drawn out, together with the air that is extracted from it, by the air-pump I, which throws it into the cistern K, from whence the pump L raises it to the cistern M; and it enters the boiler through a valve, which opens whenever the float N descends below its proper place. The pipes O and P serve also to ascertain the quantity of water in the boiler. The piston-rod is confined to a motion nearly rectilinear by the frame Q; the fly-wheel R is turned by the sun and planet wheel S T; and the strap U turns the centrifugal regulator W, which governs the supply of steam by the valve or stop-cock X.

INTRODUCTORY.

The Steam Engine is a compound machine, which exerts a moving force, and is the *first moving power* to communicate motion to other machines, mills, or engines, by which various useful operations in the arts and manufactures are performed. The mechanical force of the steam-engine is obtained from the expansion of water, which is converted into an elastic vapour, called steam, by the agency of heat, and, from the subsequent contraction or condensation of that steam, again into water, by means of cold.

In treating of the steam-engine as a first moving power, or machine, it must be separated from the secondary machines, to which it communicates power and action. A first moving power must in all cases be *itself* endowed with that mechanical energy or force which will give motion to some secondary machine, so as it may overcome the resistance occasioned by the operation which is to be performed by it. It must be distinctly observed, that the engine, or first mover, does not actually *produce* the power with which it operates, but is adapted to collect and concentrate the force which arises from some natural cause, so as to derive motion from that cause; and it must be provided with parts, to diminish such motion or force, and transmit it, in a suitable manner and direction, to the purposes required of the secondary machine with which it is to be connected, and which it is destined to move.

A familiar example of a secondary machine, and its first mover, may be instanced in a common hand-pump, which is erected over a well to raise water for domestic purposes. The man who works the handle of the pump by the force of his arms, is the first mover, because, by his muscular force, he communicates the power and motion necessary to impel the pump, which is only the secondary machine, though it performs the required operation of raising the water. Were a steam-engine to be applied for this purpose, it would be substituted for the man; and, instead of his muscular strength, the steam of boiling water would be applied in the steam-engine in such a manner as to produce motion in its parts, and those moving parts would be adapted to communicate their motion to the handle of the pump, to elevate and depress it alternately, and raise the water.

In the like manner, the steam-engine may be applied, as the propelling power, to turn a grindstone, turning-lathe, malt-mill, flour and meal-mill, cotton and flax mills, or in fact any other piece of machinery which used to be driven by the power of water, wind, or animal force.

"The steam-engine," says Mr Farey, "is an invention highly creditable to human genius and industry; for it exhibits the most valuable application of philosophical principles to the arts of life, and has produced greater and more general changes in the practice of mechanics, than have ever been effected by any one invention recorded in history. The axe, the saw, and other simple tools used by carpenters and smiths, as well as the spade, the plough, and the application of horses and oxen to draw burdens, were invented in such early ages, that they were considered the production of the demi-gods; but, for a long time after the simple implements and machines were invented, men were obliged to perform all labour by their own personal strength. The most degrading labour of hewing wood and drawing water fell to the lot of slaves; whilst thrashing and grinding corn, as well as spinning and weaving, were the constant employment of the female sex. The next advance towards our present state of improvement was the employment of horses and oxen. According to Diodorus Siculus, Minerva was worshipped under the name of Boormia, for having first taught the yoking of oxen to a plough, and horses to the levers of mills for grinding corn." It will thus be seen that animal power was first employed in performing all kinds of work.

The next inventions which were thought of were the application of the natural elements to aid man in his labours. Water and wind were employed as the moving powers of mills, and other machines. In addressing the female sex on this subject, Antipater of Thessalonica thus speaks of the power of water:—"Women, you have hitherto been employed to grind corn; for the future, let your arms rest. It is no longer for you that the birds announce by their songs the dawn of the morning. Ceres has ordered the river nymphs to move the heavy millstones, and to perform your labour." But this important invention had one very great drawback, that of the want of waterfalls, except in remote, and often inconvenient situations; and the agency of wind as a first mover is still more uncertain and unequal in its effects: so that some more efficient power was still wanting that might be more immediately within the command of man; and it was not till the admirable invention of the steam-engine in the eighteenth century, that this very effective and convenient power was discovered; and such has been the progress in the improvement of this grand invention, that, in less than a century from its first discovery, it has reached a high degree of perfection, and has been universally adopted in all the purposes of art and manufacture. "In one place we find the miner employing it to drain water from the deepest chasms of the earth; whilst, in another, it sets the wind's uncertainty at defiance, and conveys our packets across the ocean with a precision that would formerly have been deemed chimerical.

Amongst the last uses to which the steam-engine has been applied, is to that of printing, and in this instance its results are perhaps more remarkable and useful than any other of its applications; for, by this means, printed sheets of paper can be multiplied to an extent, and with such facility, that no other means hitherto thought of could perform.

If we look back for a century, and reflect on the extent of our mercantile and maritime intercourse with other nations, we will at once be able to judge of the importance of this noble invention, and the extraordinarily rapid progress of its improvement. The amazing increase of productive industry, the widely-extended magnitude of our commerce, and our pre-eminence as a nation, have all been effected by the aid of this new power; and, but for this important discovery, there is every human probability that Britain, instead of increasing in wealth and prosperity during the last century, would have been sinking in her importance and welfare; because the mines of coal, iron, copper, lead, and tin, which have in all ages formed so considerable a portion of British wealth, were, at the beginning of last century, nearly exhausted and worked out to the greatest depths to which it was practicable to draw off the water by aqueducts and the simple machinery which was then known and used; and, without the aid of the steam-engine, it is more than probable that fuel, timber, and all the useful metals, would have long ago become so scarce in Britain, that they would have been inadequate to the necessities of so dense a population. But the steam-engine has enabled us to penetrate into the rich and nearly inexhaustible treasures with which our island abounds, and consequently secured to us for ages that pre-eminence for which we have long been famed. To Britons, therefore, this inestimable and native invention must ever be regarded with just pride and veneration; and we feel confident that there are few individuals in this great country, who will not enjoy deep satisfaction by tracing the history and progress of the steam-engine.

For more than fifty years after the invention of the fire-engine, as it was first called, its operation was almost entirely applied to the raising of water—such as draining of coal and metallic mines, and supplying towns with water; and, in several instances, the water which it raised was applied to driving water-wheels, in place of natural waterfalls. It is within the last forty-five years that the steam-engine has been brought to its present high state of perfection, and, in place of animal force, and the natural powers of water and wind, has now been applied to every species of machine which was driven by their agency. So high, indeed, is the state of perfection arrived at, that self-acting machines have been invented, which are driven by the engine, without the agency of human labour at all. Every day brings forth some new and remarkable invention, and it is impossible to say to what length the power of steam may not be carried.

It has been successfully employed in propelling vessels, and even carriages; and the latter have been moved at such a velocity as to be nearly equal in speed to the winds themselves.

A noble author, in discoursing on the modern steam-engine, says it is "stupendous alike for its force and its flexibility; for the prodigious power which it can exert; and the ease, precision, and ductility with which its force can be varied, distributed, and applied. The trunk of an elephant, that can pick up a pin, or rend an oak, is nothing to it. It can engrave a seal, and crush masses of obdurate metal before it; draw out, without breaking, a thread as fine as a gossamer, and propel a ship like a bubble in the water. It can embroider muslin, and forge anchors; cut steel into ribands, and impel loaded vessels against the fury of the winds and waves. It would be difficult to estimate the value of the benefits which these inventions have conferred upon the country—there is no branch of industry that has not been indebted to them; and in all the most material, they have not only widened most magnificently the field of its exertions, but multiplied a hundred-fold the amount of its productions. It is our improved steam-engine that has fought the battles of Europe, and exalted and sustained, through the late tremendous contest, the political greatness of our nation. It is the same great power which enables us to pay the interest of our debt, and to maintain the struggle in which we are still engaged, with the skill and capital of countries less oppressed with taxation. But these are poor and narrow views of its importance; it has increased indefinitely the mass of human comforts and enjoyments, and rendered cheap and accessible all over the world the materials of wealth and prosperity; it has armed the feeble hand of man, in short, with a power to which no limits can be assigned; completed the dominion of mind over the most refractory qualities of matter, and laid a sure foundation for all those future miracles of mechanic power which are to aid and reward the labours of after generations. It chiefly is to the genius of one man (Mr Watt), that all this perfection is owing; and certainly no man ever before bestowed such a gift on his kind. The blessing is not only universal, but unbounded; and the fabled inventors of the plough and the loom, who were deified by the gratitude of their rude cotemporaries, conferred less important benefits on mankind than the inventors of our present steam-engine."

One of the most remarkable properties of the steam-engine is the immense power which can be brought into action within so limited a space. Several of these are of *one hundred and twenty horse power*, which is equal to the strength of upwards of *one thousand men* acting together. One of these engines is capable of raising water from a depth of *twelve hundred feet*, and will draw within the space of twenty-four hours a much greater quantity of water than could be accomplished by nearly four thousand men during the same space of time, with all the power these are masters of, and these working successively to relieve each other when tired; and then all would be bustle, confusion, and irregularity, while this gigantic machine continues its unvarying and steady motion, exerting its mighty power within the least possible limits, and aided only by two men to supply it with fuel. In short, it does what could not be performed by human agency by any other means, as it would not be possible to get such numerous bands of men to give their united force at one time.

It will be here necessary to inform those of our readers who are unacquainted with mechanical powers, what is the strength at which man is estimated. After much comparison, it has been found that the power of an ordinary man is equal to the raising of a weight *of three thousand seven hundred and fifty* pounds avoirdupois, or *sixty* cubic feet of water, one foot high per minute; which force he is capable of continuing for the space of several hours in a day.

The mechanical powers, especially that of a steam-engine, are now, however, always estimated by the horse power, which is *thirty-three thousand* pounds, or *five hundred and twenty-eight* cubic feet of water raised one foot high per minute; so that a horse-power is equal to eight and an eighth part of a man; consequently, *one hundred and fourteen* horse-power is equal to the force of *one thousand men*.

But it must be evident that no horse, however powerful, can exert this maximum of his strength for any length of time. The average strength of effective horses is reckoned at *twenty-two thousand* pounds, or equal to *three hundred and fifty-two* cubic feet of water raised one foot per minute.

There is hardly a department of mechanical manufacture in which the steam-engine is not now employed—namely, to the pumping of water, grinding of corn, sawing timber, grinding cutlery, rasping logwood, expressing oil from seeds, rolling lead or copper into sheets or pipes, drawing wire, twisting ropes or cables, fulling and scouring woollen cloth, grinding coffee, pepper, and other spices; and also in the various details of making steam-engines themselves; in short, there is scarcely a purpose to which they may not be employed with advantage. They are now manufactured of all sizes, from one man's power to that of one hundred and twenty horse-power.

There is perhaps no department to which the engine is applied where it performs such varied and complicated work as in the manufacture of cotton. The bales of raw cotton are brought to the mill-door in carts; the power of the steam-engine is immediately applied to them, and they are thereby lodged safely within a warehouse for the raw material; the engine next drives the machinery which spins the delicate fibres of cotton into threads; through the medium of power-looms, it weaves these threads into cloth; it then assists in the operation of bleaching, dyeing, and printing ornamental patterns in colours upon it, and afterwards glazes, presses, and packs up the printed cloth into bales, stows these in a warehouse to be ready for the market; and, lastly, when these are to be disposed of, it removes them from the warehouse, and again places them on the carts, to be sent to their final destination.

This gigantic power has relieved man of many of his most severe employments, and there is no knowing to what length it may not yet be carried. The celebrated astronomer Biot, while engaged in his operations for determining the figure of the earth, spent some time in Great Britain, and visited the principal mercantile towns and manufactories in the kingdom. He was greatly struck with the extensive use of the steam-engine; and in giving an account of his voyages and observations to the French Academy of Sciences in 1816, he makes the following remarks:—"I next visited the most industrious counties of industrious England: I saw there the powers of nature employed in the service of man under every supposable shape, and man himself reserved for those operations which mind alone can direct or perform."

Before the use of the steam-engine, all mills and manufactories were driven either by wind or water, although the former power was seldom used for manufactories. The consequence was, manufactories behoved to be placed in country situations where there were natural falls of water. This proved in many instances very inconvenient, from the difficulty of not only finding hands to work these, but also extremely expensive in erecting houses for their accommodation; besides, if these falls were remote from towns or seaports, the transporting of the raw material and bringing back the manufactured goods, entailed a heavy expense, and thereby greatly circumscribed the profits. Another evil was, that, as all waterfalls are naturally limited in their power, any increase of machinery, or augmentation of the establishment in times of prosperity, became impracticable. But since the invention of the steam-engine, all these evils can be avoided; and the consequence is, that the great bulk of our manufactories are carried on in populous towns, where fuel is easily come at, and where work-people can be easily procured, and as easily lodged, and the great expense of carriage is rendered unnecessary. And then the steam-power has this advantage, that it can be increased to any extent at pleasure, by additional engines, or replacing small ones by those of greater power. In most country situations where the proprietors have been successful, or those situated not far from markets, steam-engines have been added where additional power was required, and also for obviating defects that all waterfalls are liable to; such as giving additional power in dry seasons, as also in frosts and floods, where the water cannot act, or only in a partial manner.

We cannot better illustrate the wonderful effects of the steam-engine as a moving power, than when applied to a cotton-mill. An immense building is erected, and so adapted as to receive all the spinning-frames which it is intended to contain without any loss of space; that is, the number of horse-power of the engine to be applied is determined upon, and it is now distinctly known how many spindles, or frames with a given number of spindles, can be driven by a horse-power. The immense quantity of light and easy work which can be produced in this way is really astonishing. For the sake of simplicity of numbers, we shall suppose that a cotton-mill has been erected, the machinery of which is to be propelled by a steam-engine of *one hundred* horse-power, which is equal to the combined strength of *eight hundred and eighty men*; and this power gives rapid motion to *fifty thousand spindles*, on which the cotton threads are spun, each spindle producing a separate thread. Besides, the engine drives a great quantity of preparing machinery, which, by a succession of operations, fits the fibres of the cotton for being ultimately spun into threads by the spindles. This consists in shaking and beating machines, for removing the dust and dirt; it is then put through large carding machines, consisting of a variety of cylinders covered with leather, which is thickly studded with wire teeth; these being opposed to each other, lay all the fibres in a parallel direction, in bands of a certain breadth, called slivers, which are again twisted into thick loose threads, called roves, and finally spun into threads on the spindles. Now, to attend on the operations of a mill of this extent, *seven hundred and fifty* persons are all that are necessary, a great proportion of which are women and children, whose physical powers, taken in conjunction with that of the steam-engine, can produce as much thread as *two hundred thousand* people could do without machinery! that is, every individual employed performs the work of *two hundred and sixty-six* individuals! Each spindle in a mill will produce from *two thousand one hundred* to *two thousand five hundred* yards of thread in a day of twelve hours, upwards of a mile and a quarter in length; so that a mill of the size we have just been describing, will produce the astonishing quantity of *sixty-two thousand five hundred* miles of thread every twelve hours; which is more than sufficient to reach twice and a half round the globe. Equally wonderful results are effected by flax spinning-mills; and, also, in the production of spinning woollen yarns, from which the finest cloths, shawls, and stockings, are manufactured.

It would be impossible to give any estimate of the number of steam-engines which are employed in Great Britain, with the extent of their horse-power, as there is hardly a week passes without one or more new ones being erected for various useful purposes; but we may mention, that, in London alone, there are upwards of *three hundred*, whose united power has been estimated, in round numbers, at upwards of *fifty thousand* men or *six thousand* horse-power, in *continual* operation. In Manchester, nearly the same quantity of horse-power is employed in the different manufactures. In Leeds, it has been estimated at about *two thousand four hundred* horse-power. In Glasgow, there are about *one hundred* engines; besides those in all the other great manufacturing districts, which, if united, would be nearly equal to the entire physical strength of Britain.

The revolutions which have been wrought in our mercantile enterprise, within the last forty-five years, by means of the improved state of the steam-engine, exceed all calculation; it has relieved mankind of the more fatiguing and animal part of labour; and has increased the animal power of the nation, without requiring a greater quantity of animal food, which must inevitably have greatly raised the price of the necessary aliment of man, in a country where hardly sufficient corn can be raised to supply its population; and, in short, it has as effectually changed the system of industry for the useful arts, by which society is upheld, as the invention of gunpowder, and the consequent use of fire-arms, did the mode of warfare three centuries ago.

To the steam-engine, and the use of coal as a fuel, may be attributed in a great degree the height to which Great Britain has arrived as a mercantile nation. Before the invention of this moving power, we were undoubtedly pre-eminent among states for our physical energies and bold national enterprise, but to trace these is more the province of history than of science.

HISTORICAL ACCOUNT OF THE STEAM-ENGINE, AND ITS PROGRESSIVE IMPROVEMENT.

The steam-engine, as it now exists in its various improved forms, did not attain its present excellence till after repeated efforts had been exhausted upon it by men of genius; and even yet it is doubtless susceptible of improvements which the imagination cannot adequately contemplate. The fundamental principle of the steam-engine, namely, the power which steam has of pushing upwards any body it comes against when confined in a close vessel, must have been known in remote times; but the practical utility of this principle was only gained after a means had been invented of causing the said body to descend immediately to its original position; and so, by alternate ascending and descending, a uniform motion was gained. To show how this extraordinary principle of action in steam was gradually developed, is now our purpose.

At what precise period the expansive power of steam was first observed, is not known. The Egyptians, Greeks, and Romans, were well acquainted with the eolipile, an instrument used for the illustration of natural phenomena. This was perhaps one of the earliest attempts at natural philosophy. The eolipile is a hollow ball of metal, with a long pipe attached to it; which ball, filled with water, and exposed to the fire, sends out, as the water heats, at intervals, blasts of cold wind through the pipe. This instrument is particularly described by Vitruvius, who flourished about thirty years before the birth of Christ. He, however, seems to have had no idea of the use of steam as a moving power. The earliest account we have of the eolipile being applied to useful purposes, is by L'Orme, in his Treatise on Architecture, published at Paris in 1567, wherein he proposes to place this instrument over a fire, to assist in impelling smoke up a chimney. But this instrument has never been rendered applicable as a mechanical power.

In the year 1663, the Marquis of Worcester published a work, entitled "A Century of Names and Scantlings of Inventions," wherein he describes a mode of applying the pressure of steam to the raising of water to considerable heights. This he termed "a fire water-work;" and he also describes another machine, or engine, which he calls "a water-commanding engine," for which he obtained a patent, thereby securing to himself the profits arising from the invention.

In the sixty-eighth Scantling he describes the fire water-work as "an admirable and most forcible way to drive up water by fire, not by drawing or sucking it upwards, for that must be, as the philosopher calleth it, *infra spharam activitatis*, which is but at such a distance, but this way hath no bounder if the vessel be strong enough; for I have taken a piece of a whole cannon, whereof the end was burst, and filled it three-quarters full of water, stopping and screwing up the broken end, as also the touch-hole, and making a constant fire under it; within twenty-four hours it burst and made a great crack; so that, having a way to make my vessels so that they are strengthened by the force within them, and the one to fill after the other, I have seen the water to run like a constant fountain-stream forty feet high. One vessel of water rarified by fire driveth up forty of cold water; and a man that tends the work is but to turn two cocks, that, one vessel of water being consumed, another begins to force and refill with cold water, and so successively, the fire being tended and kept constant, which the self-same person may likewise abundantly perform in the interim between the necessity of turning the said cocks."

In 1683, Sir Samuel Morland proposed to Louis the Fourteenth of France a new method of raising water by steam, which was closely allied to the invention of the Marquis of Worcester. In the Harleian Collection of Manuscripts in the British Museum, this fact is recorded; and, in adverting to the power of steam, his principles are explained in the following terms:—"Water being converted into vapour by the force of fire, these vapours shortly require a greater space (about two thousand times) than the water before occupied, and, sooner than be constantly confined, would split a piece of cannon. But being duly regulated according to the rules of statics, and by science reduced to measure, weight, and balance, then they bear their load peaceably (like good horses), and thus become of great use to mankind, particularly for raising water."

Although Morland had evidently a pretty distinct idea of the expansive force of steam, yet his researches regarding that moving power led to few practical and useful results.

In the year 1695, Dr Papin conceived an idea of employing the expansion and contraction of steam to form a partial vacuum under a piston for raising water, and making the pressure of the atmosphere on the upper side of the piston the moving power. It is, however, curious, that neither this gentleman nor Savary, a rival in the same cause, were ever able to turn this excellent idea into any real use; but there can be little doubt that the real discoverers of the atmospheric engine took advantage of, and benefited by, the suggestion.

Captain Thomas Savery, in July 1698, obtained letters-patent for the direct application of the steam-engine to raising water. In the same year he exhibited to the Royal Society a model of his engine, and the experiments made, gave universal satisfaction to that learned body, which are the first on record obtained for this purpose. That gentleman, in 1699, published a pamphlet, entitled "The Miner's Friend," which came to a second edition, with additions, in 1702. A peculiarity of this engine was, that it had two steam-vessels at first, which he afterwards simplified by having only one. Where the water had not to be raised above a height of forty feet, this engine seemed pretty effective; but for greater depths, a more powerful engine was wanted.

In the year 1698, Dr Dennis Papin, professor of mathematics at Marbourg, whose new ideas we before noticed, in 1695, performed many experiments with the object of raising water by the power of fire, but tended to no useful purpose. After the publication of Savery's engine in 1705, Papin made several improvements on his own ideas; but no doubt, for these he was indebted to what had been achieved by Savery. After all, Papin did no more than repeat the experiments of the Marquis of Worcester. He proposed an absurd plan of introducing red-hot irons into the cylinder; which idea had but one redeeming quality, namely, that of having been instrumental in giving the idea that the water raised by the engine might be applied to driving a water-wheel; and thus suggesting the possibility of its application to the propelling of machinery.

M. Amontons, in 1699, published a description of a machine designed to be moved by the expansive force of heated air, which was afterwards to be condensed by the contact of cold water; but this was never of any real use.

The next invention that attracted any attention was that of Thomas Newcomen, a smith of Dartmouth. This person, in conjunction with Captain Savery, and John Cawley, a plumber of Dartmouth, obtained a patent for an improvement on the engine of Savery, the novelty of which consisted entirely in condensing the steam below an air-tight piston, in a cylindrical vessel having an open top. It seems probable that this idea was founded on the invention of Papin, and that Newcomen was at this time in correspondence with Dr Hook, who is known to have been well acquainted with the engine of Papin. Its mode of effecting the object was, however, totally different, as it consisted in letting in steam below a piston, which was at first condensed by applying cold water to the outside of the cylinder; but it was soon discovered that an injection of cold water thrown into the interior was a far more effective method. This, however, is said to have been discovered by accident, and not from the effect of reasoning on its consequences. The piston was kept tight by a quantity of water on the top of it; and while they were working the engine from outside condensation, they were surprised to notice the engine make several very quick strokes, and discovered that it was owing to a hole in the piston letting down water condensing the steam: and thus the useful application of the jet was discovered by accident.

Till this time, the valves were opened and shut by the hand of a person in attendance on the engine, when a boy of the name of Humphrey Potter, in order to obtain some respite from this incessant application, set his wits to work, and contrived, by attaching strings and catches to the working beams, effectually to open and shut them in a more regular manner than he could do by his personal labour. This led the way to still more effectual improvements, and advanced it still nearer to a self-regulated machine. It was about the year 1712 that it reached this state, and was employed in various places. At this time it was called the atmospheric engine.

The credit, therefore, which seems due to Newcomen is, for the admission of steam below an air-tight piston attached to the impelled point of a lever properly counterpoised—its quick condensation by a jet of cold water, which is essential to gain effect—and the mode of clearing the cylinder of air and water after the stroke—are all an addition to the principles and mechanism in use before that time, and all of which are entirely the improvements of Newcomen and those who acted in concert with him.

Little seems to have been effected in improving the engine for some years afterwards, till one Henry Beighton, an engineer of Newcastle-upon-Tyne, in 1721, inserted a curious table of calculations of the powers of steam-engines, in the almanack conducted by him, entitled the "Lady's Diary." To this ingenious person we are also indebted for improvements in the arrangement of the parts of the atmospheric engine, as well as the method of fixing, and the mechanism for opening and shutting the valves. To him also we are indebted for a discovery of the fact of steam heating a large proportion of water in condensing.

Leupold, a German, in 1720, collected mechanical inventions, and first suggested the rude idea of a high-pressure engine with a piston. This engine was also curious on account of its having a force passage-cock for the admission and emission of steam.

The engines now in use were principally those made with the improvements of Beighton; and for some years no material alteration was made on them; they were generally adopted in the coal works and copper mines.

In the year 1736, Jonathan Hulls, December 21, obtained a patent for the application of steam as a propelling power in navigation, which seems to have been the first idea of what may be strictly termed a steamboat; from the application of which mankind now reap so many advantages. He published a description of this boat, illustrated by a plate, in 1737, under the following title:—"A Description and Draught of a new invented Machine for carrying Vessels or Ships out of or into any Harbour, Port, or River, against wind or tide, or in a calm." This very rare pamphlet is to be found in the British Museum, as well as in the hands of several engineers; and proves, beyond a doubt, that the application of steam to navigation was suggested many years before it was used. The pamphlet of Mr Hulls is evidently the production of a strong and well-cultivated mind, and his views, like those of many other ingenious men, merited a better fate then they met with at the time.

In the year 1739, Bernard Belidor wrote an excellent sketch of the history of the steam-engine; and from his inquiries he infers, that of the three European nations most advanced in science, each gave birth to a man of science to participate in the glory of the important discovery of the steam-engine (these he conceives to be Papin in Germany, Savery in England, and Amontons in France); that each of these individuals was at one and the same time engaged in investigating the means of employing the action of *fire* for moving machines; but he admits the first intelligible suggestion of the idea to have been by the Marquis of Worcester. This historical sketch is closed by Belidor, with the assertion that all the fire-engines which had been constructed out of Great Britain had been executed by English artisans.

We come now to the year 1741, when John Payne made the first direct experiment for determining the density of steam; and from a series of experiments performed by him, he came to the conclusion, that one cubic inch of water will form *four thousand* inches of steam. Mr Payne afterwards made an ingenious but unsuccessful attempt to introduce a new mode of generating steam, which was done by a cast iron vessel of the figure of a frustrum of a cone, four feet diameter at bottom, to which was attached a semi-globular end of copper, whose diameter was about five feet and a half, with a small vessel inserted inside, which he called a *dispenser*, with pipes round the side fixed to it, while the bottom rested on a central pin, on which it constantly revolved, so that it might spread the water it received from above through an iron pipe. The end of this pipe passed up through the head, and was enclosed very tightly; at same time it was easily moved with a circular motion, so that the water might be showered round on the sides of the red-hot cone in a very exact manner. This vessel being kept at a dark-red heat, expanded 6.5 cubic feet of water and steam in an hour. By experiments which he afterwards made at Wednesbury and Newcastle-on-Tyne, 112 lbs. of pit coal will, by this mode, expand twelve cubic feet of water into steam. But all this tended to no useful purpose; and although similar experiments have been lately revived, yet they have proved abortive; and we have described his experiments rather that they may be avoided than followed.

Up to this period, a person was required to be in constant attendance to open and shut the cocks of Savery's engine; but the defect was at length remedied by a Frenchman of the name of Gensanne, who invented a self-acting apparatus, in the year 1744; and another method was afterwards communicated to the Royal Society by De Moura, a Portuguese, whose description was accompanied with a model. The peculiarity of his invention was a float within the receiver, composed of a light ball of copper, which was fastened to the end of an arm made to rise and fall by the float, while the other end of the arm was fastened to an axis; so that, when the float moved up and down, the axis was turned round either the one way or the other.

In the year 1751, Francis Blake read a paper before the Royal Society, on the best proportion for the cylinders of steam-engines, which is well worthy attention, not only from its value as a theoretical inquiry respecting the proportions of engines, but also on account of the result he obtained. He justly remarks, that it is evident from mechanical principles, that as the contents of the cylinder remain the same, the quantity of water discharged at each lift will in all cases be equal; and this equality is obtained by only adjusting the distance of the centre of the piston from the fulcrum of the beam. It is also obvious that the excess of the column of atmosphere above that of water, is equal to a weight on the piston driving it to a depth of about five feet within the cylinder; by the present construction acceleratedly, till friction and resistance from the uncondensed steam which remains in the cylinder, even after the injection, and is increased in elasticity, while its bounds are diminished, shall equal the force which gives it speed, and that thereafter the piston may be retarded the rest of the way. Independent of friction, and notwithstanding this diminution of force by the remainder of the steam within the cavity of the cylinder, we can demonstrate the ratio of the velocities, and the times of descent of the pistons, in cylinders of equal altitudes, to be precisely the same as if the resistance were nothing; from which we can without difficulty arrive at some conclusion in this matter by a little calculation.

In the year 1757, Keane Fitzgerald, taking into consideration the means of saving fuel in places where it was expensive, thought of agitating the water in the boiler by means of a stream of air, on the plan of Dr Hales; but he did not seem acquainted with the difference of forming steam and accelerating evaporation. Dr Hales, however, having applied to him regarding the working of ventilators for mines by steam-engines, and a rotatory motion being indispensable, Fitzgerald invented one which rendered the steam-engine applicable to the purpose, which was by means of a *fly-wheel*.

William Emerson, in 1758, published a short and distinct account of the atmospheric engine, and the method of computing its power, as far as statical equilibrium between the power and the resistance is concerned.

James Bradley next attempted to improve the construction of the boiler of the steam-engine, by forming it of wood and stone, and inserting a cast iron fire-place and chimney in the internal part of the boiler, so as it might be surrounded on all sides by the water of the boiler. He imagined by this method the heat of the fuel would be rendered more effective. He obtained a patent for this invention in 1759; but it was constructed on an erroneous doctrine, and never came into general use.

To the celebrated Dr Joseph Black of Edinburgh we owe the first investigation of the combination of heat with bodies in the solid, liquid, and gaseous state; the heat so combining with them, he proved, was insensible to the thermometer, and hence he gave it the name of *latent heat*, which he first taught publicly in 1762. He found that the quantity of heat required to convert boiling-hot water into steam exceeded five times the quantity which made water boil. He also showed that different bodies required different quantities of heat to produce the same change of temperature, and denoted this property by the phrase *capacity for heat*, for which the term specific heat is now used.

The next considerable improver of the steam-engine was John Smeaton, who, although not possessed of an inventive genius, had, nevertheless, the faculty of selecting the best methods known in his time, and, by making experiments on these, turning them to advantage. In 1765, he constructed a portable atmospheric engine, for the purpose of trying different methods of acting. After this, he superintended the erection of several large atmospheric engines; and from his nice mechanical knowledge, and accuracy of experimenting, gradually brought them to such a state of perfection, that there has been nothing of the same kind more elegantly constructed even in modern times.

The most important of Smeaton's inquiries are those which belong to the load upon the piston, whereby he discovered that engines were calculated to carry a load from one pound to more than ten to the square inch, and that those which were lightly loaded were expected to go with greater velocity. On these principles, it was supposed that an engine carrying five pounds to the inch must necessarily go at a rate double to that of one carrying ten pounds to the inch, the area of the cylinders being equal, so that the power might be equal. He demonstrated, however, that in engines, as in other machines, the maximum of their power cannot be exceeded, even by the greatest efforts of human ingenuity.

Although John Blackey attracted some notice at the time he lived, yet his inventions soon turned out worthless, and merit no attention.

We come now to speak of James Watt, a man who did more for improving the steam-engine, than all who either preceded or who have followed him. This great genius was born in 1736, and died in the year 1819. He appears to have commenced his mechanical researches on the steam-engine in the year 1764. These consisted in a series of experiments on the elastic force and bulk of steam. He continued his experiments with remarkable success, and they terminated in the discovery of what has been emphatically called Watt's Steam-Engine, the finest present ever made by science to the arts. Watt found the atmospheric engine involved in a dilemma, on account of the prodigious waste of steam essential to its very principle. For, after the piston had been impelled upwards by the elastic force of the vapour, before a vacuum could be formed below it, it was necessary to introduce a jet of cold water to condense the steam, and thus the force of the atmosphere acting above the piston would cause it to descend again to the bottom of the cylinder. But, in doing this, the cylinder was necessarily cooled to about 100°, and, in the subsequent ascent of the piston, an immense waste of steam ensued; for the elastic vapour, on being admitted under the piston, was condensed by the cold cylinder, and also by the water of condensation, so that both required to be heated up to 212°, the boiling point of water, before the ascent could be completed. Now, the question arose, Did the force gained by the increased perfection of the vacuum more than compensate for the waste of fuel in producing the vacuum? This was found not to be the case; and, consequently, the cylinder not being cooled to so low a temperature, the piston worked in a very imperfect vacuum, and with a diminished force. The great problem then forced itself upon the attention of Watt, *to condense the steam without cooling the cylinder*.

It was not long before the happy conception of *cooling in a separate vessel* flashed upon his mind. This was the first step in that brilliant career of discovery which has immortalised his name; and he himself informs us, that, at the moment the notion of "separate condensation" struck him, all the other details of his improved engine followed rapidly, so that in the course of a day his invention was complete, and he proceeded to submit it to experiment. It would be tedious, perhaps unnecessary, minutely to point out the successive stages of the discovery, and the ingenuity and skill with which he overcame and obviated every difficulty which arose in his progress: we shall therefore give an account of his engine as it is represented in the frontispiece; for although improvements have been made since his day, they are trifling compared with the vast stride to perfection which the steam-engine took under his plastic hands.

The boiler, which is the grand magazine of steam for the use of the engine, is situated upon the extreme left in the woodcut on the first page. It is indispensably necessary for the working of the machine, that there should always be a sufficient supply of steam, and that it shall always be of the proper quality, that is, that it shall always be of a proper pressure, or that it shall always possess a certain degree of elasticity. To accomplish these ends, various remarkably ingenious contrivances have been resorted to. To ascertain the level of the water in the boiler, two guage pipes O and P were used in the earlier steam-engines, and which are still in many cases continued. The pipe O, it will be observed, has its lower aperture a little *above* the proper depth at which the water should be, and the other pipe P has it a little lower. Cocks are attached to their upper ends, which can be opened and shut at pleasure. If the lower ends of both the pipes be immersed in the water, the steam, which exercises a great degree of pressure upon the surface of the water within the boiler, forces it up through both O and P; and if this be found to be the case, which is easily done by opening the stop-cocks, then there is too much water in the boiler, and some must either be let off, or the supply must be stopped for a time. If, however, steam should issue from both the orifices instead of water, then there is too little water, and an additional supply must be poured into the boiler. Lastly, if water flow from P, and steam from O, then the water in the boiler is at its proper level. This ingenious contrivance was the invention of Savery. But there is another method which merits our attention, both from its efficacy and from its universality of use. A weight N, half immersed in the water of the boiler, is supported by a wire, which, passing steam-tight through an orifice at the top, is attached to a flexible string or chain, and works upon a wheel fixed on the top of the tube, with which the reservoir M is connected. At the extremity of the chain, a counterpoise weight is seen suspended in the air, and this weight is just sufficient to balance the floating weight in the boiler, when the weight is *half immersed* in water. By this contrivance the boiler is made to feed itself with water. In the bottom of the cistern M there is a valve which opens upwards and communicates with a feed-pipe, which descends into the boiler below the level of the water in it. The stem of the valve is connected with a lever, instead of a wheel, which turns upon a point. When the water is at its proper level, the valve is closed. The moment the water in the boiler decreases in quantity, the float-weight sinks, and the descent of the end of the lever to which it is attached, raises the other end with which the valve is connected, and this admits the water down through the feed-pipe into the boiler. So nicely is this part of the machine adjusted, that instead of a sudden rush of water, and then a sudden cessation of its flow, it is made to descend in a small continued stream, just sufficient to supply the consumption arising from evaporation.

In connection with the boiler there is a valve, called a safety-valve, which secures it from accidents that might result from the steam becoming too strong. This valve, which works in a tube passing into the boiler, opens upwards. It is loaded with a weight equal to the strength which the steam is intended to have above the atmospheric pressure; for, even in condensing engines, the steam has a pressure above that of the atmosphere. When the pressure exceeds what is wanted, the valve is forced upwards, and the elastic vapour rushes out, and thus the boiler is prevented from bursting. There is another safety-valve, similar to the one we have described, but it opens *downwards* instead of *upwards*: this is to prevent injury to the boiler when the steam within it is suddenly condensed, and thus forming a vacuum. Were not the air admitted by means of a valve of this kind, on the occasion of a vacuum being formed, which frequently happens, the sides of the boiler would be crushed together by the atmospheric pressure. Connected with the boiler there is another piece of apparatus, called the *self-acting damper*. By a contrivance similar to that by which the boiler is supplied with water, this damper is made to regulate the production of steam, by rising and falling in a flue connected with the fire-place. When the steam is low, the damper rises, and a full draught is obtained, which increases the intensity of the fire. When the steam is too strong, the damper is made to fall, and the fire is thus checked. The steam is also regulated by an instrument called a *steam-guage*; and, taking every thing into account, there are so many contrivances for the prevention of accidents connected with the steam generator, that it seems far more wonderful that they ever do happen, than that they do not happen.

It will be observed, that, from the top of the boiler, a large pipe proceeds to the right, and passes into the body of the machinery, over the top of the cylinder. The cylinder is represented by that upright vessel below the letter X. It is closed at the top, and the piston-rod (to which the piston is attached, and moves within the cylinder steam-tight), being very accurately turned, runs in a steam-tight collar, furnished with a stuffing box, and constantly kept air and steam tight by a constant supply of tallow or wax. There is an outer cylinder called the *jacket*. The space between the outer and inner cylinder is constantly filled with steam. The supply of steam to press the piston up and down is regulated by means of valves, situated at the top and bottom of the cylinder. Engineers have exercised much ingenuity upon the method of working the valves, and many elegant contrivances have been suggested, but those of Watt still remain almost in universal use. In order to comprehend the action of the several systems of valves, the reader is to understand, that, when the piston is pressed up to the top of the cylinder, as it appears in the woodcut, the steam from below it is to be withdrawn, and steam above it communicated. The cylinder is deprived of its steam in the following manner: A (situated at the bottom of the cut) is the condenser which communicates with the cylinder by means of a pipe, which is provided with a valve B, and a rod C. I represents the air-pump, which draws off the water, air, or other fluids collected in the condenser. The rod of the air-pump piston, it will be perceived, is connected with the working-beam, and is here wrought by the engine itself. When the cylinder, piston, and the air-pump piston, have arrived at the top of their stroke, let the lower exhausting-valve B, and the upper steam-valve D, be opened, and the two other valves E and F closed; then the steam rushes through the valve B into the condenser A, and a vacuum is produced below the piston: at the same instant, the steam, rushing through the steam-valve D upon the top of the piston, supplies the place of air which was formerly employed in pressing the piston down to the bottom of the cylinder: on its arrival there, let the valves formerly opened be closed, and the lower steam-valve E, and the upper exhausting-valve F, be opened; then the steam which fills the cylinder above the piston, now passes off through F into the condenser, leaving a vacuum as before: at the same time, steam from the boiler is admitted through the lower steam-valve F below the piston, so that it presses the piston to the top of the cylinder, and thus the nice process of ascending and descending goes on.

The opening and shutting of the valves was formerly effected by means of the air-pump. Thus: the valves which are to open and shut together are connected, as will be observed from the woodcut, by means of jointed rods. From these rods there shoots off a lever, which reaches to the rod of the air-pump, and these levers are moved by pins attached to the air-pump, in such a situation as to move the lever, and produce the desired effect exactly at the proper moment of time. But this method of working the valves is now superseded by another. The stems of the valves are perpendicular, and move in steam-tight sockets in the top of the valve-boxes. The stem of the upper steam-valve D is a tube, through which the steam of the upper exhausting-valve F passes, and in which it moves steam-tight, both of these stems moving steam-tight through the top of the valve-box. The other valves are similarly circumstanced. The motion which works the valves in pairs is not communicated by the rod of the air-pump, but is received from the axis of the fly-wheel. This axis works an apparatus called an *eccentric*, the principle of which it is impossible to explain sufficiently in this place; but we refer the reader to an able work on the subject, where it is lucidly shown, namely, Lardner on the Steam-Engine, p. 101.

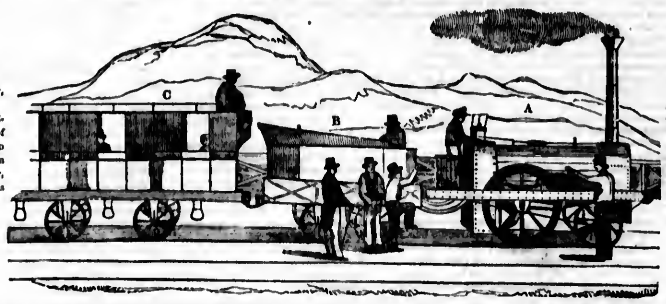
Into the condenser A, which is a close cylindrical vessel surrounded with cold water, there is inserted a tube, the inner end of which is pierced with holes like the *rose* of a watering-pot; it is provided with a cock, which is situated in the cold cistern on the outside, and through which, when open, the water passing rises in a jet in the inside of the condenser, and there condenses the steam at the moment when it has been admitted by the opening of the valves above described. The water thus admitted, and that which has been formed by the condensation of the steam, as well as any vapour which may exist, are all withdrawn by the air-pump. The latter is connected with the condenser at the bottom by means of a pipe supplied with a valve which opens into the pump. The air-pump piston, we have already observed, moves air-tight. It is provided with a valve at the top, which opens outwards or upwards. Now, the manner in which it works will be seen at a glance. Supposing the piston at the bottom of the pump, as it rises, no air can pass *down* through it, for the valve opens only *outwards*, and consequently a vacuum is left below it. Hence, the water and vapour collected in the condenser push open the valve which connects the condenser and the air-pump at the bottom of these two vessels, and enter the air-pump. They cannot return from the latter into the condenser again, because the valve opens only *outwards*. On the descent of the pump-piston, the fluids which occupy the lower part of the pump force open the piston-valve, and make their escape; neither can they return into the pump, because the piston-valve opens *outwards* also. The hot water which is thus drawn out is collected in the cistern K, from whence it is raised by the pump L, and, being conducted by a pipe to the cistern M, is made to supply the boiler in the manner already described.

To prevent the water in the cistern, where the condenser and air-pump are placed, becoming too hot, and impairing the condensation, there is a pump H, called the cold-water pump, also wrought by the engine. This raises a continual supply of cold water, which flows through a pipe in a constant stream into the cistern. There are thus four pistons attached to the great beam, and worked by the piston of the steam cylinder.

One of Watt's most beautiful contrivances connected with the steam-engine, was that of parallel motion. The apparatus Q is represented on the arm of the beam, which works the piston and air-pump in the frontispiece. It is impossible to explain it mathematically in this place. It consists of a system of rods, provided with joints, &c., which connect the rods of the piston and air-pump. The long arm proceeding from the square frame is, at the one end, firmly attached to a fixed beam, and, at the other, is connected with the square frame Q; as the rods rise and fall, the joints move, and keep them in a nearly rectilinear motion. Another striking appendage to the steam-engine, for the purpose of keeping it going at an equable rate, is the *regulator* or *governor*. This apparatus had been formerly in use for the purpose of rendering uniform the action of the stones in corn-mills, but Mr Watt was the first to make the beautiful application of it, which we now see in the steam-engine. In the woodcut, W represents the regulator. At the top of the perpendicular shaft are two arms, with balls at the extremity. This shaft is turned by a belt which communicates with a wheel, turned round by the engine. From the top of the regulator there shoots off a rod, terminating in a valve, called the throttle-valve, which regulates the supply of steam from the boiler—thus: If the engine be going very rapidly, the balls are rapidly whirled round, and by their natural tendency* to fly from the centre, they spread outwards, and, in so doing, they draw downwards the rod with which they are connected, whilst this alteration in the position of the rod closes the valve, and prevents the admission of steam, thus checking the velocity of the machine. As the motion slackens, the balls fall, and the valve is again opened. It would be difficult to point out in mechanics any apparatus more beautiful, or which answers the purpose better, than this. The large metal wheel R is termed the fly-wheel, and the small-teethed wheels S and T are called the sun and planet wheels. It is evident that the motion most generally useful is that of *continued rotation*. In the first instance, Watt proposed effecting this by means of a *crank*, but he was anticipated by another individual, who took out a patent before him, until the expiry of which he was compelled to employ the sun and planet wheel, as represented in the cut. The wheel T is affixed to the end of the rod attached to the working beam, and called a *connector*. The teeth of this wheel work in those of another wheel S, namely, that to which rotation is to be impacted. This is effected by the wheel T revolving round it, like a planet round the sun, accordingly as the end of the beam rises and sinks. It goes up on *one* side of the sun-wheel, and descends on the other, thus impelling it round. This contrivance has certain advantages, but it is inferior to the common crank, which is now used. The effect of the *fly-wheel* R is to equalise the

* Centrifugal force. See Information, article *Astronomy*.

THE LOCOMOTIVE ENGINE AND ITS APPENDAGES.



A, the engine, with boiler, &c.

B, the tender, which follows immediately in rear of the engine. It is an open light vehicle, containing a supply of fuel and water, with the engineer and his attendant.

C, A train of carriages attached behind the tender: they are from twenty to twenty-five in number on the Manchester and Liverpool Railway, varying according to the number of passengers and goods to be conveyed.

motion communicated by the action of the beam on the sun and planet wheels, or rather the crank, as that is the contrivance now in general use. That action is just sufficient to sustain in the fly-wheel an uniform velocity, and the tendency of this wheel to retain the velocity which it receives, according to the law of mechanics, renders its rotation sufficiently uniform for all practical purposes. It is evident, however, that without the regulator already described, it would be impossible to preserve uniform motion by means of the fly-wheel.

For regulating the circulation of steam, Watt suggested a method, which is called the D valve, from the resemblance which the horizontal section of the valve bears to the letter D. This method is very generally used, although it is frequently modified according to the size of the engine. Without entering into a minute description of this apparatus, it is sufficient to observe that it consists of a series of valves and plugs, which, by their opening and shutting, introduce at the proper moment the steam above or below the piston.

There have been innumerable improvements on the steam-engine since the time of Watt, almost all of which have his for their basis. In short, there are hardly two engines constructed, even by the same individual, but what are varied in some of their parts, so as to render them more effective. Many of these have turned out well, while others have failed to perform the operations expected of them.

In the steam-engines hitherto considered, the creation of a vacuum by means of condensation has been found the prominent feature. There is a class of engines called *high-pressure* engines, where this does not take place. The condensing apparatus—namely, the cold-water cistern, condenser, air-pump, cold-water pump, &c.—are dispensed with, and nothing is retained except the boiler, cylinder, piston, and valves; consequently, such an engine is small, light, and cheap, and thus well adapted for locomotive purposes. Non-condensing engines are generally termed *high-pressure engines*. These are moved by steam, generated under a considerable degree of pressure, and it is the excess of this pressure above that of atmospheric pressure from which they derive their motion. From thirty to forty pounds on a circular inch is the excess above atmospheric pressure which is generally employed in Britain.

The working parts of the high-pressure engine consist of a cylinder, having passages provided with cocks or valves for steam to enter into it, either at the top or at the bottom, and also the means of letting out the steam to the atmosphere, either at the top or at the bottom. The cylinder has an air-tight piston, to be moved from one end to the other by the pressure of the steam, with a rod fixed to it, called the piston-rod, which slides through an air-tight box at the top of the cylinder, to give motion to a crank, or some other piece of machinery.

Now, with steam in the boiler having a force of thirty pounds to the circular inch, if the piston be at the bottom of the cylinder, and the passage from the boiler to the bottom and that to the atmosphere at the top be both open, and the rest shut, the steam will exert a pressure of nearly thirty pounds on each inch of the area of the piston, and cause it to ascend. A little before it arrives at the top, the cocks must be shut; and the moment it has reached the top, the other two cocks are opened. The steam from the boiler will then press the piston downwards, and the steam which has before been allowed to enter will flow out into the open air. The passages are again closed a little before the completion of the stroke; and in this manner the movement is continued. The close of the cocks before the termination of the stroke, prevents either concussion against the end of the cylinder, or strain on the crank shaft; and the elasticity of the steam destroys the momentum of the piston, and recoils it back without loss of force. Non-condensing or high-pressure engines are of two kinds, namely, first, those which act by the generative force of steam, and, second, those whose motion depends on the generative and expansive force of steam.

RAILROADS AND LOCOMOTIVE ENGINES.

Of all the varied uses to which steam-power has been applied, that of locomotion is unquestionably the most important; promoting the greatest facility of intercourse between the most distant parts of the country, and, therefore, cannot fail to conduce, in an eminent degree, to its improvement and prosperity; binding, as it were, "its different parts more firmly together," increasing its strength, and adding consistency and unity of action, and extending its beneficial influence to the great moral interests of the nation.

The first species of locomotion to which steam-power was applied, was that of the moving of vessels on water. Setting aside the invention of Jonathan Hulls, in 1736, which led to no practical use, the individual who had the distinguished honour of first applying steam-power to propel vessels on the water was Mr James Taylor, tutor in the family of Miller of Dalswinton, Dumfriesshire, an account of whose life is to be found in the 58th number of Chambers's Journal. Mr Taylor's successful experiments about the year 1788, led others to take up his plans, which, in a few years, as every one knows, were acted upon with great advantage both in Britain and America. Within the last twenty years, steam-vessels have increased so numerously, that now there is hardly a navigable river in Europe or America which have not their regular packets; and we see the power successfully employed on the ocean itself, and triumphing over the resistance of the winds and waves, which hitherto had baffled the most successful efforts of human genius to overcome.

In situations where the country was intersected by inlets of the sea, great rivers, or lakes, these often formed most vexatious barriers to the regularity of trade; and, as far as regarded rivers, to force vessels against their streams, was found impracticable; so that navigation in them could only be extended as far as the rise of the tide. Now, since the application of this power, all these disadvantages have become unrivalled chains of communication to commerce; and what was before looked upon as a great evil, has now been rendered a blessing.

Such are the advantages which have been realised, within a very few years, by the use of steam to the purposes of navigation. And now a new application of that power has been recently successfully applied in impelling carriages on land. This has long been a favourite project with mechanists, and the many difficulties which were to be overcome in this process have to a certain extent yielded to the perseverance and skill of ingenious men. Mr Watt, to whom we are indebted for some of the most important improvements, as we have seen, in the steam-engine, entertained notions of the future practicability of this application of steam-power so early as the year 1769; for in his original patent he expressly mentions the practicability of applying it to domestic improvement. This idea appeared to have been suggested to him by Professor Robinson, but Watt never seems to have constructed a carriage to be impelled by steam. It has been said that he privately experimented on this subject, but being unable to overcome certain difficulties, he did not make public his attempts.

From the beginning of the present century, there have been various unsuccessful attempts made to move carriages on roads by the application of steam-power. The great obstacles which have hitherto presented themselves in the construction of carriages to be propelled by steam, appear to be the necessary weight of the engines, and the resistance presented by the inequalities of even the best roads; and in moving up an inclined plane, there is an addition to the other sources of resistance to drag the entire weight of the carriage and its load upwards. This oftentimes requires addition of double, nay, even quadruple power. Indeed, the most level road which can possibly be made, will always present the disadvantage of yielding to the great weight necessarily dependent on carriages and their propelling engines. To overcome, therefore, these difficulties, it becomes necessary to construct very large engines, the very weight of which increased the difficulties, in a certain measure, which they are intended to obviate, as every additional load to the carriage creates an additional resistance, arising from inertia and friction, and such other obstacles, exactly in proportion to the increase of the weight added. Hence, there are two opposite evils to contend with: First, if we endeavour to bring our apparatus within the dimensions of ordinary carriages suited to the quality of the roads, the impelling power of the machine is so diminished that it is incapable of overcoming the resistance; secondly, if we give the machine such powers as will suit it to overcome these obstacles, then it becomes too unwieldy for any practical purpose. The only rational hope we can entertain of overcoming these difficulties is by the invention of some much improved method whereby our roads can be rendered still more perfect, as also by the generation and application of steam, which will admit of a diminution in the bulk and weight of the carriage. Notwithstanding various tolerably successful attempts, by Gurney and others, to run steam-carriages on common roads, no instance has yet occurred within our knowledge of the permanent establishment of such conveyances. The case has been very different with respect to railway carriages. The leading object of a railroad is to remove all inequalities which occur on roads constructed of the ordinary materials. This purpose is effected either by means of rails of wood or iron laid horizontally along the ground. The former material is now, however, almost totally laid aside, from its want of durability. These tracks are now laid in lengths of iron from four to sixteen feet, united firmly together by joints at their extremities, and resting at every yard on a heavy block of stone firmly bedded into the ground. Each of these lengths is termed a rail; and the rails upon the most improved construction are those made of wrought iron, by the Bedlington Iron Company, for which they took a patent some years ago. The two tracks together form what is termed a single line of railway. But where there is much traffic, single railways are attended with insurmountable obstacles; and in such cases it becomes necessary to lay down another line parallel with the first, and at a distance of three or four feet from it. This is called a double line of railway, the obvious object of which is, that carriages moving in different directions may pass each other without coming in contact. There are communications at intervals, by which any carriage overtaking another, and which is moving at a greater velocity, may be allowed to pass, by means of an adjacent line or track constructed for this purpose.

Although railways appear exceedingly simple in principle, they are, nevertheless, extremely difficult in execution; and they are attended with much expense in their construction, which cannot be effectually done unless by those who have acquired a highly improved knowledge of the sciences and arts.

It must strike every one as being remarkable, that it was not until the middle of the sixteenth century that this simple invention was thought of, and was then adopted in a very rude manner among the coal-works in the vicinity of Newcastle-upon-Tyne. These first efforts were found of such utility, that, since then, they have been gradually improved and adopted in numerous situations throughout Great Britain, which has tended in an eminent degree to increase the means of conveyance, and greatly added to the powers of traction.

Upon an ordinary turnpike-road, the average weight which a horse can draw for any length of time is fifteen hundredweight; but on an improved railroad, an ordinary horse will drag with ease a load of ten tons, in addition to the weight of all the carriages which contain that quantity of goods, being upwards of *thirteen* times the quantity a horse can draw on a common road, and, in consequence, saving to the owner the keep of twelve horses. This mighty change in things in a country where the population is so dense that we cannot grow corn sufficient for our consumption, must be regarded as an incalculable blessing in a national point of view. On this head an able writer observes, "At a crisis like the present, when the country is labouring under the pressure of a redundant and starving population, the substitution of an inanimate for an animate power, by which an increase of food equivalent to the consumption of sixteen million of mouths, which is equal to the addition of a territory double in extent to that of Ireland, possessing all its natural resources and fertility, without the drawback of an unmanageable population, is a project which bears on its surface not the interests of a handful of individuals, a class of society, or branch of trade, but of the whole nation."

The number of horses employed in the kingdom is estimated at two millions, and each horse consumes as much food as will support eight men. If, therefore, a saving of one-fourth of the above is sufficient for the maintenance of four millions of people, it would effectually provide for the whole paupers in Britain.

Mr Gordon says—"Now, the suppression of the stage-horses upon our principal thoroughfares, and of the dray-horses in the great commercial towns, may be calculated to economise a saving of food equivalent to the supply of the above number of human beings.

It is, perhaps, not superfluous to remark, that the amount of food, equal to the supply of the said four millions, is not the produce of an extended agriculture and proportionate outlay, but is just *that part* of the annual produce of the country, subtracted from the whole, which is at present required for the mere purpose *of transportation*—*i. e.* to feed the animals used for draught—and is consequently a dead loss as unproductive capital.

In addition to the evil arising from such a consumption of unproductive food, is also to be considered the very great loss consequent upon the heavy capital sunk in *horse* purchase. Were this viewed, as properly it ought, as money withheld from other purposes of trade, and which might be more advantageously invested, our capitalists and men of science would not oppose the substitution of inanimate for animate power in the way they have done. Neither, did the landed interest maturely weigh the varied benefits it will produce in agriculture, would they view it in the light of an invasion upon their respective interests. They do not give a *quid* without receiving a *quo* every way as valuable. The reduction of farm consumption—the bugbear of the project—will be met and compensated by a steady and proportionate demand from other quarters; whilst in the United Kingdom, the 8,100,000 acres of land now required to feed the horses, together with the capital sunk in their purchase, will, when both applied to other and general purposes, amply compensate for the exchange.

In order more readily to show one effect, let the horses be considered only 1000; a smaller number may not make the argument so difficult. Let us reduce *this* number,* and the farmer may then turn his oat-ground into wheat-ground; and instead of so much land being employed to furnish food for a thousand horses, the same land, when turned into tillage fit to sow wheat upon, will produce sufficient bread-corn to feed two thousand poor families.

Again, if instead of 20,000 horses we kept 30,000 fat oxen, butchers' meat will be always cheap to the operative classes, whilst the quantity of tallow will of course make candles cheap; and so many hides lower the price of leather, and of shoes and all other articles made of leather; or the same quantity of land may then keep thirty thousand cows, the milk of which will make both butter and cheese cheaper to the poor, as well as the labouring manufacturer; all which articles are very considerable, and of material moment in the prices of our manufacturers, as they in a great measure work their trade to rise and fall in price according to the cheapness of their materials and the necessaries of life. The same may be said in favour of more sheep and woollen cloths.

We have said a horse consumes, on an average, as much as eight human beings. The country is burdened with poor (in want of food); so much so, that an evil is resorted to, to ease the burden; and the strongest and ablest of our peasantry are encouraged to emigrate. Our political strength is thus wasted, while the prospect that eventually these very men may meet us in battle array, is avoided in our search for present ease. Whilst, therefore, we have a remedy really good and practicable before us unresorted to, we may in truth say that we depopulate our country for a 'bestial herd.'

But it would be taking but a limited view of this part of our subject did we confine ourselves to the above observations, important though they are: there are great *financial* results to be considered likewise. The experience of the last thirty years has shown that we have hitherto legislated in vain for Ireland. A starving population cannot be cured either by education on the one hand, or by coercion on the other. Laws, however judicious in themselves, or beneficently administered, must fail to accomplish their purpose amongst a redundant impoverished people. It is bread they want; and this deficit has been the *fructifying* source hitherto of the disordered structure both of her political and moral condition. But let us, by the introduction of inanimate power, supply this want, and we do not, like Mr Canning, create a Transatlantic kingdom, but we resuscitate one at home, leagued to us by blood, by union, and neighbourhood. Let us *make them food*, and they will make themselves educated, and industrious, and happy, and prosperous. The yoke removed which has hitherto bowed the neck of the finest race in the world, Ireland will rise up, though late in time, in the energies of a renewed people, to add a vast fund of financial support, instead of the heavy burden she has hitherto been, to England. And if the last of the Union to attain her meridian of greatness and prosperity, she will likewise be the last to hand down the greatness and prosperity of the British empire to future times.

* It is worthy of remark, that when private carriages became common in this country, an act was passed to prevent the too great adoption of these vehicles, *lest the horses should consume the food of the poor.*

Nor will Scotland find less advantage from a change which will enable her to command a distant market for her home commodities, and which, at the same time, will bring all her imports cheaper to her doors. The produce of her mines will become more valuable, and property acquire a worth which hitherto it has not attained—the increase of finance returns will of course be proportionate.

In various departments of the revenue, the saving of expenditure by the substitution of inanimate for animate power will also be immense. In the post-office alone, for instance, it will amount to upwards of half a million; whilst, from the cheapness of food which the substitution will produce, the navy and army estimates will be most essentially reduced."*

We cannot better elucidate the benefits to be derived from a general use of locomotive engines, however, than by the evidence of Colonel Torrens before a Committee of the House of Commons.

"Have you considered the effect which will be produced upon British agriculture, by substituting, on common roads, steam-carriages for carriages drawn by horses?—I have.

What do you conceive that effect would be?—I think it would produce very beneficial effects upon agriculture.

State your reasons for believing that agriculture will be benefited by substituting inanimate for animal power, consuming the produce of the soil?—I conceive that agriculture is prosperous in proportion as the quantity of produce brought to market exceeds the quantity expended in bringing it there. If steam-carriages be employed instead of carriages drawn by horses, it will be because that mode of conveyance is found the cheapest. Cheapening the carriage of the produce of the soil must necessarily diminish the quantity of produce expended in bringing a given quantity to market, and will therefore increase the net surplus, which net surplus constitutes the encouragement to agriculture. For example, if it requires the expenditure of two hundred quarters of corn to raise four hundred, and the expenditure of one hundred more on carriage, to bring the four hundred to market, then the net surplus will be one hundred. If, by the substitution of steam-carriages, you can bring the same quantity to market, with an expenditure of fifty quarters, then your net surplus is increased from one hundred to one hundred and fifty quarters; and, consequently, either the farmer's profit or the landlord's rent increased in a corresponding proportion. There are many tracts of land which cannot now be cultivated, because the quantity of produce expended in cultivation and in carriage exceeds the quantity which that expenditure would bring to market. But if you diminish the quantity expended in bringing a given quantity to market, then you may obtain a net surplus produce from such inferior soils, and, consequently, allow cultivation to be extended over tracts which could not otherwise be tilled.

On the same principle, lowering the expense of carriage would enable you to apply additional quantities of labour and capital to all the soils already under cultivation. But it is not necessary to go into any illustrative examples to explain this, it being a well-known principle, that every improvement which allows us to cultivate land of a quality which could not previously be cultivated, also enables us to cultivate, in a higher manner, lands already under tillage.

If horses were displaced from common roads, would not the demand for oats, beans, and for pasture, be diminished, and land thereby be thrown out of cultivation, and labour out of employment?—If steam-carriages were very suddenly brought into use, and horses thereby displaced, I think the effect stated in the question would be produced for a time; but, practically, steam-carriages can be introduced only very gradually, and the beneficial effect upon the profits of trade, by bringing agricultural produce more cheaply to market, will tend to increase profits, to encourage industry, and to enlarge the demand for labour; so that, by this gradual process, there will probably be no period during which any land can actually be thrown out of cultivation, the increasing population requiring all the food which horses would cease to consume. With respect to the demand for labour, that demand consists of the quantity of food and raw materials which can be cheaply obtained; and as, by the supposition, the displacing of horses will leave at liberty more food, and more material, the demand for labour will ultimately be greatly increased, instead of being diminished. It has been supposed, I know not how accurately, that there are employed on the common roads in Great Britain one million of horses, and a horse, it is calculated, consumes the food of eight men. If steam-carriages could ultimately be brought to such perfection as entirely to supersede draught-horses on the common roads, there would be food and demand for eight millions of persons. But when we take further into consideration, that lowering the expense of carriage would enable us to extend cultivation over soils which cannot now be profitably tilled, and would have the further effect of enabling us to apply, with a profit, additional portions of labour and capital to the soils already under tillage, I think it not unfair to conclude, that were elementary power on the common roads completely to supersede draught horses, the population, wealth, and power of Great Britain, would at least be doubled.

* Gordon on Elementary Locomotion.

There are soils which are stated to be so poor, that oats alone can be raised upon them; would not the substitution of steam for horse-power have the effect of throwing out of employment the labour required for the cultivation of such lands?—If there are soils of such a peculiar quality that oats is the only marketable product which they will yield, the persons employed in cultivating those lands would certainly be thrown out of that particular occupation; but the extension of tillage over other lands not of this peculiar quality would create a demand for labour which would much more than absorb the persons thrown out from the culture of oats upon that land which would grow nothing else. But I doubt of there being any land which it is profitable to cultivate which would not raise some other agricultural produce than oats, either for man or cattle, for which the increasing population would create a demand.

The general impression on the minds of the committee is, that steam-carriages will, at least for the present, rather be substituted for horses used in conveying travellers than for the conveyance of bulky articles. Do you think that the substitution of steam in this manner will be injurious to agriculture and to the demand for labour, without any adequate compensating advantages?—Upon the case supposed, namely, that steam-carriages should be employed in conveying passengers only, and the whole change to be effected in a sudden manner, I think that there would in the first instance be a diminished demand for agricultural produce, but the following process would take place: As the demand for agricultural produce was diminished, the price of such produce would fall, food would become cheaper, and the cheapening of food would benefit partly the labouring class and partly the capitalists, the one obtaining higher real wages, and the other higher profits; this increase in real wages and in profits would effect a great encouragement to manufacturing industry, and would necessarily lead to an increase in the manufacturing population, and to the amount of capital employed in manufactures. The consequence would be, that after some degree of pressure upon agriculture, the increased number of human beings would create the same demand for agricultural produce, which the employment of horses [illegible]rly created. So that, even upon the extreme [illegible] at improbable supposition that steam-carri[illegible]'d never be employed in conveying agricultu[illegible] to market at a cheaper rate, still the be[illegible] country would be very great, inasmuch as we should have a vastly increased industrious population, and England would become much more extensively than she is at present the great workshop of the world. In point of fact, superseding horses by mechanical power would have precisely the same effect in increasing the population and wealth of England, as would be produced were we to increase the extent of the country by adding thereto a new and fertile territory, equal in extent to all the land which now breeds and feeds all the horses employed upon common roads. Such addition to the extent of fertile territory in England, suddenly effected, would in the first instance lower the value of agricultural produce, and be injurious to the proprietors of the old portion of the territory; but no person would therefore contend, that if we could enlarge the island of Great Britain, by additional tracts of fertile land, the public interests would be injured by such enlargement: this would be monstrously absurd. It is not less absurd to object to the increase of food available for human beings, by substituting mechanical power for horses.

In addition to the advantages you have already anticipated from the introduction of steam-conveyance, would not the increased speed and cheapness of intercourse occasion vast public benefits, in which agricultural capitalists and labourers must greatly partake?—Certainly.

As it is impossible to conceive that steam should be generally substituted for horses, and be confined only to the conveyance of travellers; and as it would necessarily be employed as vans and coaches are at present, for the speedy conveyance of light goods as well as travellers (by the hypothesis, steam-carriages being cheaper than horse-draft, or it would not be used), would not such cheapening of the conveyance of such goods have a considerable effect upon the demand for them, and thereby for labour and food?—On the principles that have been already stated with respect to agriculture, the cost of bringing all things to market is composed of the cost of production and the cost of carriage. Reducing the cost of carriage is precisely the same thing in its effects as reducing the immediate cost of production; consequently, the conveyance of light goods by steam-power must cheapen all such goods to the consumers. This will necessarily enable them to consume a greater quantity of such goods; and the consumption of the greater quantity will enlarge the demand for labour, call a larger manufacturing population into existence, and thereby react on agriculture by increasing the demand for food. This cheaper mode of internal carriage will not only lower the price of light and refined manufactures to the home consumer, but will lower their price also to the foreign consumer. This will increase the advantages which we at present possess in the foreign market, and tend to increase our foreign commerce. So that here again there will be an increased demand for manufactures and for a manufacturing population, and here again will be another beneficial reaction upon the soil. So that the more we contemplate the various effects produced upon the industry of the country by a cheaper mode of conveyance, the more we must be convinced that wealth and population will be increased, and that agriculture, instead of being injured, must necessarily partake in the increased prosperity of the country. In addition to what I have already stated, the saving of expense and of time in conveying passengers and goods, and the rapidity of communication, will produce effects, the amount of which it would be almost impossible to calculate."

But it is not in the saving of horse-power alone which railroads must be looked upon as a blessing, for by means of them we acquire a great alacrity of communication. This advantage was not thought of until the opening of the Darlington and Stockton railway, in September 1825, which gave a fresh impetus to the construction of carriages adapted for more speedy conveyance on railways, and no doubt led to the great communication between Liverpool and Manchester, as it afforded a striking demonstration of the possibility of still farther improvement in point of speed.

Ever since the opening of the Darlington and Stockton railway, coaches have been regularly plying on it between these two towns, each of which is drawn by a single horse, and contains six inside and from fifteen to twenty outside passengers, with their luggage, as well as many parcels. The speed at which they go is ten miles an hour, which must be admitted as extraordinary, when we consider that such an enormous load is drawn by one horse; and so small an exertion appears necessary, that the horse goes with as much apparent ease as if he were dragging only an ordinary-sized gig. These coaches have no springs of any kind, and yet their motion is so gentle, that it is hardly perceptible, and a passenger may read a book or newspaper with as much ease as if he were sitting in a room. Now, it is well known that few persons, without practice, can read in an ordinary carriage or mail-coach. A railway has recently been constructed from Edinburgh to Dalkeith and Musselburgh, with coaches similar to those at Darlington, by which passengers are conveyed to these places, which are six miles distant from Edinburgh, for the very small fare of sixpence: nay, no more than sixpence is required for a seat from Edinburgh to Dalhousie Maine, a distance of eight miles. So easily do these coaches go when once set in motion, that it is not easy to stop them, and it requires a particular apparatus for the purpose, which is termed a brake.

The Edinburgh railway is only a single one; and it sometimes happens that two coaches meet at places where there are no passings, when neither of them can get out of the way of the other. The coachman of that carriage next the nearest passing lane, dismounts, unyokes his horse, and re-attaches it to the other side of the coach (as they are alike on both sides), and drags it back, allows the other coach to pass, and, replacing his horse, again proceeds on his journey. It must be obvious of what immense advantage these conveyances are to the public of a crowded metropolis; affording them healthful exercise at the cheapest possible rate. From January 1, 1833, to December 31 of the same year, so many as 189,294 have been conveyed in these coaches, and many thousands, who never were six miles from Edinburgh during their lives, have had their ideas, to a limited degree, enlarged, and their health improved, by these excursions. It has been found that the number of passengers has been rapidly increasing ever since the opening of the railway, every month exhibiting increased numbers. It is anticipated that more than double will be conveyed during the current year, as, even in the month of January, the number which has gone by this railway is something more than double the number which was conveyed the same month of last year.

Such, then, are the advantages of an ordinary railway over ordinary roads, and such is the saving of horse-power, and, at the same time, a very great increase of speed. Carriages, like all other heavy bodies while in motion, begin to develope in a remarkable manner, demonstrating that grand principle in mechanics, that a state of locomotion is in reality as natural to bodies as a state of rest, and only require an impetus; which, when in action, is maintained in them with as little exertion of force as if they were in reality standing still. Hence it will be seen how fallacious that doctrine maintained by the ancients, that rest was more congenial to the natural state of bodies than motion. There can be little doubt, if all obstacles could be removed which impede the progress of machines, that, if a carriage were once set in motion, it would continue to roll on for ever, if adhesion and gravitation could be overcome.*

"It is well understood that when two smooth surfaces subjected to pressure are in contact, a certain force is requisite to cause them to slide upon each other; and this resistance to motion in surfaces is called *adhesion*. This property was not unknown at the period alluded to; but no data existed by which its extent could be defined; and, in the absence of this, every failure of purpose, which, in reality, arose from some defect in the engine itself, was attributed to a want of adhesion. The knowledge possessed even at the present day on the subject is exceedingly indefinite, having been all derived from practical results formed upon very variable premises. Experience from actual observation has taught us that a certain power of adhesion does exist, and that *generally* it is sufficient to produce the progressive motion; but this experience at the same time proves that different substances, and indeed like substances under different circumstances, possess the property in different degrees. If, for example, we take wrought iron wheels upon wrought iron rails, we find the surface of the rails presenting a greater or less adhesion to the wheels in proportion as the rails are more or less affected by the weather: when the surfaces are the most free from extraneous matter, the adhesion is the greatest; when moistened by wet, or covered with dust or mud, the adhesion is then the least. Taking, however, like substances under like circumstances, it appears that the greater the pressure upon the surfaces, the greater is the force required to give them opposite motion. Now, as the adhesion is the resistance to that opposite motion or sliding force, it necessarily follows that the two properties must be coequal; and hence it becomes evident, that the adhesive property bears some proportion to the weight or pressure applied."*

We now come to a description of railway improvements of a much higher kind than those carriages which are moved by horse-power, namely, those which are propelled by means of locomotive steam-engines.

In the year 1802, a patent was registered and taken out by Messrs Trevithic and Vivian, for a locomotive engine adapted to a railway. It was not, however, till 1804, that an engine was perfected by them, so as to act in this manner. It was first tried upon the Merthyr Tydvil railroad, and was capable of drawing as many carriages as could convey ten tons of bar iron, at the rate of five miles an hour. But what perplexed mechanists was, that the want of adhesion of the carriage-wheels to the rails was imagined to present an insuperable obstacle to the use of the engine in drawing heavy loads. This error led to the invention of many complex devices, to obviate this imaginary inconvenience.

"Mr Blenkinsop, of Middleton colliery, invented a rack reaching the whole distance of the rail, along which toothed wheels, worked by the engine, travelled, and thus produced a progressive motion of the machine. Messrs W. and E. Chapman adopted a chain stretched along the centre of the railway, which chain was grasped by a grooved wheel and roller at each stroke of the engine, and necessarily forced it onwards. Mr Brunton invented two moveable iron legs, each jointed, and terminating in a claw; these were placed behind the engine, and being acted upon by the piston, fixed themselves alternately in the ground, and drove the engine forward at every stroke. Notwithstanding the ingenuity of these and several other expedients, each had some equivalent disadvantage, either of increased friction, or diminution of power, that prevented its general adoption.

In the meantime, the superiority of steam-power was so obvious, that fixed engines were erected upon several railways, and the use of these has continued in a greater or less degree up to the present day. The means by which they effect the moving action, is either by a rope attached to the ascending train, and returned again to the bottom of the plane by each descending train, or by means of what is termed in mechanics an endless chain.

At length, about the year 1815, Mr Blackett, of Wylam, near Newcastle-on-Tyne, effectually proved, by repeated experiments, that the adhesive power of the wheels was at all times sufficient to produce a progressive motion in an engine, with a train of loaded carriages, upon a railway either level or with a very slight inclination upward.

Some time previous to the above date, and about the same period as the introduction of fixed engines, another considerable improvement was effected in the manufacture of the rails. They had hitherto been constructed of cast iron; and the exceeding brittleness of that material rendered them liable to frequent damage, both from the weights placed upon them, and the sharp frosts of the winter season. This had repeatedly occasioned the total stoppage of a whole line of road, and it was desirable that such a loss of time and money should be remedied. Wrought iron was known to possess an advantage over cast iron in this respect; but it was conceived that the softness in its texture, which constituted this advantage, would produce a commensurate, if not greater, evil in the rapid wear and occasional bending of the rails. Experience, however, proved not only that wrought iron was capable of a sufficient firmness—particularly when the rolling body was of the same material—to prevent an injurious decay from friction; but that it also presented a much greater resistance to the oxydising or rusting influence of the atmosphere than cast iron. This led to a very general substitution of the former; although at the present time the latter has many advocates among scientific men.

This, then, was the state of railways a dozen years ago; but let it be remembered that all these were isolated and private undertakings, confined to the mining districts; and that, therefore, very few persons had an opportunity of witnessing their operations. To the many, this subject was as yet a dark shadow in the womb of futurity. But from out the midst of this darkness a new era was ushered to the wondering world.

To the year 1825 was reserved the privileged distinction of applying the principle of railways to the practical purposes of general conveyance; and, on the 27th of September in that year, the first public railway, sanctioned by an act of Parliament, was opened between Stockton and Darlington. This may be considered as having been the infant essay of the more matured and stupendous undertaking, the Manchester and Liverpool railway.

The vast and continually growing increase in the population and trade of both Manchester and Liverpool, had long rendered desirable a readier communication than already existed between the two places. The propriety of supplying this defect, by establishing a railway, was first discussed in 1822; and, two years subsequently, a company was formed for carrying the project into effect. A bill, to obtain the requisite sanction of the legislature, was brought into Parliament in the session of 1825; but, after encountering a strenuous opposition on the part of individuals who had 'vested rights to protect,' it was thrown out in committee by a majority of one. At the commencement of the following session, another attempt was made, and proved successful; the second bill being eventually carried in the Commons, on the 6th of April 1826, by a majority of 47 out of 129; and in the Lords, on the 1st of May, without a division.

The projectors having gained this essential preliminary step, lost no time in commencing actual operations. Directors were chosen at a general meeting of proprietors held on the 29th May; and the draining of Chat Moss, in June, formed a beginning to this great undertaking. This was followed by the first shaft of a tunnel, to carry the railway under the streets of Liverpool to the water-side, being opened in the following September, just twelve months after the completion of the Stockton and Darlington road. In January 1827, the excavations and embankments along the whole line were in progress; and in the spring of that year, a loan of L.100,000 was obtained from the Exchequer Loan Commissioners, for carrying on the work with greater vigour. Early in the year 1828, the directors obtained the sanction of Parliament to some improved alterations in the line of road; and during that year, the Newton-bridge was completed; the piles to support the foundation of the Sankey viaduct were driven; and the last joining of the tunnel was effected. In the spring of 1829, another act was applied for to empower the company to raise additional capital by an additional number of small shares, and to carry the railway directly into Manchester over the river Irwell. As soon as this was gained, extraordinary exertions were made, and double sets of workmen employed to carry on the work during both day and night. In the course of this year, the Rainhill and several other bridges were completed; the bridge over the Irwell was commenced; and the company's premium of L.500, in addition to the purchase-money, for the most improved locomotive engine, was awarded to the Rocket, which was constructed by Mr Stephenson, a celebrated engineer, after a competed trial. On the first day of 1830, the much-dreaded and justly-doubted obstacles presented by Chat Moss were practically surmounted by the completion of one line of railway, and the crossing of a carriage and company drawn by the successful engine.

At length, on the 15th of September 1830—four years and a quarter from its commencement—this magnificent triumph of art was publicly opened. The interesting ceremony was honoured with the presence of a splendid assemblage of spectators: several of his Majesty's Ministers, some of the most distinguished characters of the age, the principal public men in the county, and a very considerable proportion of the residents both of Manchester and Liverpool, paid the deserved compliment of hailing the 'illustrious stranger.' A dark cloud was, however, destined to overshadow this brilliant scene; and while the 15th of September is commemorated as the anniversary of a new epoch in the world's affairs, the saddening reflection will recur, that on that day, too, England lost one of the brightest gems from her coronal of talent. The reader will not need to be reminded of the melancholy fate of Mr Huskisson.

On the following day, the Northumbrian engine performed the first journey for hire; and on the 17th, six carriages commenced running regularly upon the road.

We shall now attempt to give a description of this admirable engine, in the course of which the reader will be referred to the wood-cut entitled "The Locomotive Engine and its Appendages." The engine is supported on four wheels, the main part of the weight being thrown on one pair, which are turned by the engine. The boiler consists of a cylinder six

* See Information, article *Mechanics*.

* See an interesting pamphlet, entitled the Railway Companion, by a Tourist, page 111, which contains a minute and distinct account of the Manchester and Liverpool railway, well worthy of perusal.

feet long, with flattened ends; from one end, as will be observed, rises the chimney, and to the other there is attached a square box, the bottom of which is furnished with the grate where the fuel is placed. This box is three feet in length and depth, and two feet in width. It consists of two casings of iron, one within the other, having a space of three inches in breadth between them. The casing surrounding the box communicates with the boiler by means of two pipes, one from the top, and another from the bottom. When water is admitted into the boiler, it flows through the lower pipe into the casing which surrounds the fire-box or furnace, and of course fills the casing to the same level as that which it has in the boiler. When the engine is working, the boiler is kept about half full of water, and the casing surrounding the furnace is completely filled. The steam generated escapes by the upper pipe into the boiler, from whence there is another leading to the piston, and operating in the same way as in the high-pressure engine already described. Through the lower part of the boiler pass a series of small copper tubes, which at one extremity communicate with the fire-box, and at the other with the chimney, forming a passage through which the heated air escapes to the chimney. The chief part of the water in the casing being lower in its position than the water in the boiler, from its tendency to ascend when heated, passes back into the boiler; so that the water in both vessels is thus kept nearly at the same temperature. The air passing through the burning fuel, and which fills the fire-box, is carried by the draft through the tubes placed in the lower part of the boiler; thus communicating heat to the water which is there contained. It finally passes into the chimney, and rises by the draft, the power of which is increased by the waste steam, after it has worked the piston, being conducted into it by means of a pipe; and thus producing, on account of its levity, a strong current in the chimney. There are two cylinders, each of which works a wheel in the simplest manner possible. A lever connects the piston-rod with one of the spokes of the wheel, which, as the piston ascends and descends, is driven round in the same way as a common crank. The spokes which these cylinders work are placed at right angles on the wheels; the wheels being fixed on a common axle, with which they turn. For the facts contained in the above description, we are indebted to Dr Lardner's work on the steam-engine. We may mention, that the great object to be effected in the boilers of these engines is, to keep a small quantity of water at an excessive temperature, by means of a small quantity of fuel kept in the most active state of combustion.

In a railway intended for general conveyance, where the traffic each way may be considered equalised, it is highly essential to gain, as nearly as possible, a level line; as every inequality—even such as would not be discernible in a common road—forms a material obstruction to locomotive force. It is equally important that the line should be straight, or at least free from sudden curves; for, as the carriages are supported upon the rails by a flange, it necessarily follows that, where the curves are abrupt, the increased friction of the wheel against the side of the rail must very powerfully retard its progress. Both these points have been happily attained in the Liverpool and Manchester railway; the greatest ascent along the whole line—if we except the tunnels, and one ascending and one descending plane near Rainhill—being only in the proportion of one in about nine hundred, and the roundest curve not exceeding a deviation of more than one in two hundred from a straight line.

During the progress of the road, the species of impulsive power to be employed upon it became a matter of weighty and tedious consideration. Upon a level railway, the power is necessarily confined to horses, locomotive engines, and fixed engines. In discussing which of these should be adopted in the present instance, the horse was at once discarded as ineligible. The opinion of scientific men appeared so equally divided upon the remaining two, that it was considered requisite to institute a strict inquiry into the relative merits of each. This terminated in the adoption of the locomotive engine: to this undertaking, therefore, may be attributed the merit of having established the superior claims of this kind of railway power to general patronage. In the course of investigation, it was computed that the *original cost* would be rather greater, and the *annual charge* rather less, in fixed than in locomotive engines: it must at the same time be remembered, that a system of the former kind must be at once completed, while the latter can always be proportioned to the quantity of traffic.

After this question had been decided, it next became a matter of discussion as to what kind of impulsive power should be used on the two excepted points of the road. The inclined plane in the great tunnel commences at the opening towards Manchester, and descends under Liverpool in a straight line of 1980 yards, at the ratio of one in forty-eight. The whole descent, therefore, is 123 feet. The smaller tunnel ascends toward Liverpool in the same ratio. Here a fixed engine with an endless chain is used; but it was evident that the same mode could not be resorted to in the centre of the line without great disadvantage. The two inclined planes at Rainhill are each a mile and a half in length, and the ratio of their inclination is one in ninety-six—a rise that certainly requires additional power. In rejecting a fixed engine at this point, the question then to be decided was, whether the adhesion was sufficient to enable the locomotive engine to perform the task; and if so, whether it should be accomplished by increasing the power or decreasing the speed. This led to a series of experiments, the result of which was, that the difference between the adhesion on the level and such an inclination was too trifling to bring into calculation, provided the same speed were continued; but that to increase the power of the same engine for that purpose would require it to be worked to a great disadvantage on the level. It was finally agreed that an extra locomotive engine should be kept on the spot, to be attached, whenever occasion required, to the ascending train."*

In a great commercial country like Britain, where every branch of natural and artificial produce is carried to its utmost limits through all parts of the country, it must be obvious that an immense capital is annually sunk in the mere transport of marketable produce from one part of the country to another, which bears heavily upon the seller, and may in fact be reckoned an outlay for which there is no return. This kind of expense is also daily felt by the consumer. Hence it must be obvious that any method which can be adopted to accelerate the transport of these, and materially lessen the expense of carriage, must be a great public benefit.

Expeditious conveyance is no less material to mankind, and may be considered as an equivalent to capital; so that no expense is spared in the mercantile world to attain this object. Society are ready to purchase increased speed at almost any expense; and we have lately seen, that, to gain a speed of nine miles an hour, for what was formerly eight, an expense of a third of the original outlay has been paid; and that, for a mile more, or ten in the hour, even double the cost has not been grudged.

"To the merchant, time gained is equal to money; for time occupied in travelling is just so much profitable employment lost. Time occupied in the transport of goods is equivalent to so much interest of capital spent: for a thousand pounds invested in merchandise is unproductive so many days as the transport is tedious. That part of the capital of an individual which is employed in the carrying of his goods to and from market, is as much abstracted from his means of producing more of the article in which he exerts his ingenuity and labour, whether it be in agriculture or manufacture.

Easy communication lessens the time occupied in the transport, and a saving of time lessens the distance, or our notion of distance. This effects a saving of money; and a saving of money permits of a greater employment of capital. Whatever reduces the price of transportation reduces the price of the commodity transported. Whatever reduces the traveller's time reduces his claim for compensation, and (competition being always at work) he is content with a smaller profit upon his merchandise. If a scarcity of any article occurs at one point of the kingdom, the monopolist there cannot continue his increased price for any duration of time. Commerce may, in this respect, be resembled to water, for, if not obstructed, it will always circulate till it finds its level. An opening or channel being furnished, an equalised supply will make its way wherever required.

Thus we see that the strength, wealth, and happiness of a nation, depend very much upon facility of communication. The ill-defended spot in the empire is alive to the reality, that subsidies having bad roads or a tedious navigation to pass may arrive too late to present an effectual resistance to a plundering enemy. The hard-working emigrant of a remote settlement, distant from a market, feels the difficulty and loss he sustains in bringing produce to the spot where merchants and dealers meet for the purposes of exchange. A spot uncommunicated with may be visited by the horrors of famine, and no channel exist for conveying thither the food required. A grievous pestilence may sweep off an isolated people before the aid of the physician can arrive to arrest its progress."†

The practical good resulting from this increased speed of travelling, and the consequent saving of time and reduction of fares, will be seen from the constant increased number of passengers conveyed by the railway between Manchester and Liverpool:—

The number for the half-year ending on the 30th June 1831 was	188,726
And the half-year ending in Dec. same year	256,321
Being an increase of . . .	67,595

Which is more than 35 per cent. increase of travelling for the first six months of the year, and upwards of 135 per cent. increase on the travellers between Manchester and Liverpool during the corresponding months of the year previously to the finishing of the railway.

The original cost of this railway was, for Parliamentary and legal expenses, together with the survey of the country through which it passes, L.48,294; the purchase of land, L.95,305; excavations and embankments along the line of road, L.199,763; the formation, walling, and fencing of the road, L.47,520; and the rails, blocks of stone, and sleepers, L.88,432; the erection of buildings, including police stations, warehouses, and offices, L.66,697; building bridges, L.108,565; carrying the way through Chat Moss, L.27,719; the great tunnel, L.44,768; and the small coach tunnel, L.2485; engines, waggons, and carriages, L.52,637; making a total amount for this stupendous undertaking of L.820,000, of which the late Duke of Sutherland was a subscriber to the amount of one hundred thousand pounds.

We shall now proceed to give a short account of the construction of this great work. The railway is formed with a double way of lines lying parallel to each other, and four feet eight inches apart. One of these ways is used for going and the other for returning, to prevent any dangerous consequences which might occur from the concussion of two rapidly-moving bodies.

'The line has occasional sidings, to allow a free passage in case of any obstruction arising from the stoppage of a preceding train. Branch-railways communicate with some of the intermediate towns lying north and south of the road; each of them having two oblique curvilinear openings inflecting respectively toward the two extremes of the journey, to render the transition of the carriages from or to the main line less sudden.

The structure is a raised edge-rail of rolled iron, two inches broad, and one inch thick, in lengths of twenty-five feet each. These are firmly fitted together, and placed upon cast iron chairs or pedestals, and the whole supported at intervals of three feet by stone blocks, twenty inches square and twelve inches deep. Into each of the blocks two holes are drilled, and filled up with oak plugs; and to these the pedestals bearing the rail are spiked down. On the embankments, and other places where the foundation may be expected to subside, additional firmness is secured by the introduction of oak sleepers. The whole length of the road is thirty-two miles, and posts are placed every quarter of a mile to mark the distances.

The company keep a police establishment, who have station-houses at intervals of about a mile along the road. These stations form also depôts for passengers and goods from or to any of the intervening places. The duties assigned to these men are to guard the road—to prevent or give notice of any obstruction—and to render assistance in the event of any accident occurring; and to do this effectually, they keep up a continual line of communication. They are guided by a code of regulations issued by the board of management. Their directions to the engineer are given by signal. When a train approaches within a certain distance of a station, the policeman presents himself, and signifies a clear road by assuming an erect posture with his arm outstretched; should he take the position of 'stand at ease,' the engineer is aware that some obstruction exists. When a passenger is waiting at the station, a red flag is hoisted by day, and a swinging light exhibited at night. In travelling in the dark, the last carriage of every train carries 'astern'—to use a nautical expression—a revolving lamp, one side of which is red and the other blue. As long as the train is in motion, the red light presents itself to whatever follows, but at the instant of stopping, the blue light is turned outward; the engineer of the next train instantly sees this change, and is enabled, by checking the velocity of his engine, to avoid a collision that would be tremendous. The fire of the engine is sufficient to give warning to the policeman or to any object upon the road of the approach of a train.

Each engine is immediately followed by a tender or light open vehicle containing a supply of fuel and water, with the engineer and his attendant; and to this is attached a train of from five to twenty carriages, according to the number of passengers or goods to be conveyed.

The passage-carriages are divided into three classes, and are made to resemble four coach bodies joined together upon one frame. Those of the first class contain seats for eighteen passengers, three abreast, each seat being separated by arms, and numbered. Those of the second class carry twenty-four passengers, four abreast, and have the seats likewise separated and numbered. The third class are open carriages, containing seats for twenty-four passengers. Each train of carriages is attended by one or more guards, who have seats on the outside. To enable private carriages to travel along the railway, flat frames are provided, upon which the carriage is raised, and its wheels firmly secured upon the platform by moveable grooves.

The cattle-carriages are covered and fenced round with a light grating. Some of them, for the conveyance of pigs, are quite open; and it is no small difficulty for the poor Irishman, who may be thus travelling, to keep his live stock from rebellion.

The luggage-waggons for the conveyance of goods are square open carts, each of which is furnished with a tarpauling to protect the bales of merchandise from the weather. The waggons for conveying coals are likewise open carts, made wider at the top than the bottom.'*

* Railway Companion.

† Gordon on Elementary Locomotion.

* Railway Companion.

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THE DUTIES OF LIFE.

The temporal duties enjoined on rational beings may be thus classed:—1. Duties which one owes to himself.—2. Duties which arise from domestic relations.—3. Duties which arise in the communities of which each one is peculiarly a member.—4. Duties which arise from the political relations of society.—5. Duties which arise between individuals who are of different nations.—We propose, in the meantime, to treat of those duties which a rational being may be said to owe to himself.

LIFE AS A WHOLE.

Life is a succession of parts; infancy, youth, manhood, maturity, decline, old age, and death. What man becomes, depends in part on his genealogy; as his infancy is, so will be his youth; as his youth is, so will be his manhood; as his manhood is, so will be his maturity; as maturity is, so will be decline; as decline is, so will be old age. If youth be passed in idleness, ignorance, folly, and crime, how can one hold his way in the world, side by side with the intelligent, the worthy, and the virtuous? If manhood has been passed in low pursuits, in rooting in the heart evil propensities, in wasting natural vigour, what awaits one in old age but poverty, pity, and contempt? If infancy be devoted to the reasonable expansion of the physical and intellectual powers—if knowledge of human duty be acquired, and be rightly used, will not manhood be worthy, maturity respectable, decline honoured, and old age venerable? Life, then, must be taken as one event, made up of many successive ones. On these unquestionable truths we found all that is worthy of any notice in the following pages.

PURPOSES OF LIFE.

We believe that human life, rightly understood and rightly used, is a beneficent gift; and that it can be so understood and used. It is irreconcilable to reason that man was sent into this world only to suffer and to mourn; it is from his own ignorance, folly, or error, that he does so. He is capable of informing himself; the means of doing this are within his power. If he were truly informed, he would not have to weep over his follies and errors. It is not pretended that every one can escape at once from a benighted condition, and break into the region of reason and good sense. But it is most clear, from what is well known to have happened in the world, that each generation may improve upon its preceding one; and that each individual, in every successive period of time, may better know the true path, from perceiving how others have gone before him. There can be no miracle in this. It will, at best, be a slow progress: and the wisdom arrived at in one age, must command the respect of succeeding ones, and receive from them the melioration which they can contribute. We understand nothing of what is called the perfectibility of human nature; but we understand this, that if human nature can be made to know wherein its greatest good consists, it may be presumed that this good will be sought and obtained. Man was created on this principle, he acts on this principle, although he is seen so frequently to make the most deplorable and distressing mistakes. If it be not admitted that mankind will always strive to obtain whatsoever seems to them good, and strive to avoid whatsoever seems to them evil, their moral teaching is in vain. If this principle be admitted, the sole inquiry is, what is good, and what is evil.

INFANCY.

Every human being comes into the world with physical and intellectual qualities, propensities, and aptitudes, which distinguish him as much from all other beings, as he differs from them in figure and appearance. As society is a consequence of the Creator's will, as the proper divisions of labour are a necessary consequence of society, it is not irrational to suppose that individuals are born with adaptation to labour in some departments, and not in others. In the early stages of life, these qualities are sometimes developed, whether they happen to be understood or not. But almost immediately after gaining some hold on life, all human beings become subject to the incidents which tend to strengthen original qualities, or to obscure or stop their progress, and even to suppress them, and engraft on the original stock those which are entirely different. It would be unjust to make infancy responsible for the evils and errors which arise in this manner; but certainly those who have the guidance of infancy are responsible, and will be held to be so. Children have a right to complain, and society has a right to complain, if duties to children be neglected; and, it is needless to remark, there is another, and inevitable accountability of a far more serious character. We shall have occasion to remark on the very sober duties of those, who, according to the order of natural and necessary law, are entrusted with forming and giving effect to natural qualities. This matter properly belongs to another place.

YOUTH.

We come now to a period when accountability begins, in all the relations which were placed in the divisions of duties. If it be asked at what age this is to be fixed, we answer, that the good sense of judicial law recognises that a child may be a witness in solemn judicial proceedings when inquiries addressed to him are so answered as to make it certain that he understands the nature and the obligation of an oath. This may be at the age of ten or twelve years. But the perception of right and wrong, and the sense of duty, begin at an earlier age. There certainly are children of the age of eight years who have a very clear sense of moral propriety; and very many who between that age and twelve can discern and reason on right and wrong, and arrive at a very sound judgment. We shall presume that all into whose hands this sheet may fall, will be fully capable of comprehending its purpose, and of judging of its fitness to be useful to them. We must assume, then, that we are speaking to those who are willing to be instructed in serious things, and that they will not reject instruction from any source, however unpretending it may be, if it come to them in a manner which they can reconcile with their own reason, and with their own duty to themselves. Young persons think that they can see for themselves, and that they need not to be told what others have seen. But let us reduce this to common sense. Suppose a person to be under the necessity of going from the place in which he has lived, and which is familiar to him, to a far distant place. Let it be supposed that the road he must travel is crossed by many roads, and that he is frequently to find himself at points where several roads are seen, either one of which, so far as he can discern, may be the right one. Will it be of use to him to have been told, before he departs, which of these many roads to take? Will it help him onward to his destination, when he is bewildered and unable to decide for himself, to find some one who can assure him of the right course? Life is a journey. Every step we take in it brings us to something new, something unexpected, and perhaps entirely different from that which was looked for. Those who have gone through it before us, have left us their instructions in what manner it is to be undertaken and accomplished. They tell us of their own troubles and difficulties; they warn us how to avoid the like in our own journey. Which is wisest, to listen to them, and weigh the worth of their warning, or to push on heedlessly, and take the consequences?

HEALTH.

We suppose that every child of the ages last spoken of, can form some opinion of the value of health. Most of them have suffered, more or less, by that time. They are now old enough to consider the purposes for which life has been given to them. They then feel that the purpose is to be pleased, and gratified; to want, and to have; and that restraint is disagreeable. But let them remember that life is a whole; that though all of them will not, yet some of them will, attain to its longest duration, and that it is wholly uncertain to whom that lot will fall. Long life may depend, and often does depend, on what children do, or omit, at an early age. Among the first gratifications which are looked for at this period, is the indulgence of the appetite for food. Here comes in a rigid law of the Creator. It cannot be broken without consequent suffering, nor repeatedly broken without impairing, and perhaps destroying, the material frame which has been described as so fearfully and wonderfully made. To require of that delicate machinery, on which the action of life depends, that which it is not qualified to do, and which it cannot do; to force it to do that which is offensive to it; and to make this requisition habitually, is a sin against natural law. Its punishments are well known. The restless sleep, the heavy head, the many sensations of uneasiness, the positive pain, the disgusting remedies, are the punishments which follow. They are not all. Nature loses its charms, companions their interest, duties become irksome, the mind hates its labour, penalties are incurred, parents or teachers are regarded with displeasure. These are the fruits of momentary gratification of the appetites. On the other hand, there is a law of nature that food shall be grateful. It is required to supply the daily waste, to continue life. If there were not a craving want, we should take food as a mere necessary duty. It is kindly made to be a pleasure, and, like every other pleasure, it is to be used, and not abused. Thus, by ignorant or wilful pursuit of pleasure, we violate a law which brings with its just punishment not only the loss of the like pleasure for a time to come, but also pain and suffering from indispensable remedies. When children are sick, they are subjects of tenderness and pity; but in most instances they rather deserve to be punished, for they have broken a law wilfully, since they have disregarded their own experience. As to kinds of food, nature is not unreasonably nice about this: that which it complains of is quantity.

CLEANLINESS.

This is not a mere matter of decency. It is one of the positive commands arising from the constituted order of things. Be it remembered, that every thing that lives, vegetable or animal, is wasting while life continues; and that all which is sent forth through the millions of openings by the skin, has run its round, and is lifeless; and that more than half of all the food taken comes forth in this manner. If perspiration, sensible and insensible, be permitted to rest on the skin, and stop the way of that which is coming, nature is offended, and will show that she is so. Such neglect is one of the causes of disease. This fact was probably well known to eastern nations, since it was part of their religious duty to cleanse the skin. These nations were ignorant of the modern comfort of wearing a garment next the skin which can be frequently changed. The absence of this comfort was one of the causes of those dreadful diseases of which we read, and which are now unknown among Christian nations. There are classes of labourers and mechanics, whose health would be preserved, and their lives prolonged, if they knew how much depended on periodical cleansing. It may be said that there is a connection between cleanliness and moral feeling. Perhaps it may be going too far to say, that those who habitually disregard cleanliness, and prefer to be dirty, have no moral perception; but it may be truly said, that those who are morally sensitive are the more so from respecting this virtue. There is a close affinity between moral depravity and physical degradation. The vicious poor are always shockingly filthy: the depraved rich are visited by worse penalties: they may have clean garments; but what can wash away the impurities which vice has made part of themselves? It is not for one's-self only that the virtue of cleanliness commends itself. Every one comes within the observation of others. However uncleanly one may be himself, he is not the less offended at the like neglect in those whom he observes. Now, it is every one's duty to himself to recommend himself to others, so far as he innocently and reasonably can, and to obtain their respect. Clean and costly garments may fall very short of doing this, if it be seen that they are a covering for the neglect of this important law. If there be a lovely object to the human eye, it is a clean, clear-faced, healthy, innocent, neatly clad, happy child. There are few children who may not, if they will, be neatly dressed, for this does not depend on that of which the dress is made. There are fewer who may not have a clean skin, and healthy look, if they are properly fed, and sleep in pure air. There are none who may not have a clean skin, for we speak to those who are old enough to judge for themselves. And let it be added, for their inducement, that, in obeying the command to be clean, they are performing a moral duty; in neglecting it, they are inflicting an evil on themselves in two ways; first, in diminishing their own comfort; second, in losing the esteem of others.

AIR.

Among the generally unknown causes of loss of health is the respiration of impure air. The congregation of many persons in one apartment, especially when artificial light, in great quantity, is permitted, is a cause of more maladies than is commonly supposed. Three causes, in such case, combine to destroy the fitness of the air for respiration—the animal heat of the assembly, the lights, and the breathing of the same air again and again. There must be such assemblies. The remedy is proper ventilation. The smoke of lamps has frequently occasioned death. No lamp is properly trimmed if it emit any thing more than a pure bright flame. It is a common practice to keep sleeping apartments shut up. If there be several persons in a small room which has been shut up for several hours, it would be shocking to know how often they must breathe again and again the same air, and how unfit it is to be breathed after it has once visited the lungs. Add to this the impurity of the air, which is continually in contact with the furniture prepared and constantly used for sleeping, in an unaired apartment. It is not mere nicety, or fastidious delicacy, which requires that the pure air should be admitted where the human lungs are in action, but it is a law as old as the creation of man, and cannot be disregarded. A skilful observer might select among many, from the appearance of the countenance, those who have just left an apartment in which they have been respiring for hours a spoiled atmosphere. No doubt that this cause, long continued, so affects the whole mass of blood as to bring on many diseases. If pure air be peculiarly necessary to any class of persons, it is so to children. We believe a more useful suggestion could not be made on the subject of health to the whole community, than to invite them to respect this law of nature, that there cannot be perfect health where the air is impure, and that this applies especially to apartments appropriated to sleep. Visiting friends are often put into sleeping apartments which have not been opened for days and weeks; this is far enough from kind treatment, however innocently it be done.

TIME.

Every person connects himself in his usual thoughts of himself, with all the lapse of time in which he can remember, and with all the lapse of time through which he expects to live. This he calls his life. He does not live in time that is past, nor in time that is to come. He actually lives only in the present moment. Yet he feels that he lives in the past, and will live in the time to come, because the past, the present, and the future, are so connected, that he cannot separate them. It is, then, a law prescribed to us, from which no one can free himself, that he shall suffer in the passing moment for the wrongs done in time gone by, and for the evils of which he dreads the approach. As this is certainly so, how little does he regard the operation of inflexible law, who provides for himself a load of self-reproach, for any gratification which he can procure, by error or by crime!

Let us lay out of the case those errors and crimes which have been alluded to, and consider negligences and follies. Man was meant for action, and his actions were intended to enable him to secure good to himself. Good to himself depends on the performance of his duties to himself. Duty to himself requires that he should improve his faculties, and should avail himself of all the opportunities given to him for that purpose. The hours, then, which are permitted to slide by without any improvement, are lost. In so losing them, he breaks the law of the Creator. Apply this to the vocations in which one is to cultivate his mind in any business, mechanical, scientific, or learned. When one sees himself surpassed by others, and left far in the rear; when he is called on to measure himself against another; and when he sees that comparisons are made between him and others, greatly to his disadvantage, he may feel, and most men do feel, that they are thus depreciated because the precious time which was allotted to improvement has been passed in trifling amusements, or in idle pursuits. To some minds the suffering from such causes is extremely acute. They have no one to blame but themselves. The bitter remembrance which they have of the past, as connected with the present and the future, is the punishment for breaking a positive law. They may console themselves, perhaps, with the firm resolution, that they will repair the wrong done in the past time by diligence in the time to come; but they find that time brings with it its own demands. They are fortunate, indeed, if they can do in one space that which belongs to it, and that also which belonged to another, and in another season of life.

One cannot innocently say his time is his own, and that he may dispose of it as he pleases. His time is his life. It is given to him in trust. Like other trustees, he will be held to an account, in which there is no possibility of concealment, and where nothing will depend on proof. It may be supposed that it will be said to him, there was confided to your use a term of time; you knew, or could know, the laws prescribed to you in performing your trust; are you come from that trust to render an account of it, burdened with reproach from your own conscience, and with marks of guilt, which you cannot hide? or, are you come, without any advancement in the knowledge of your duties, and with no other account than that your days rolled by in childish pursuits, or idle amusement, *no wiser* when you were severed from the world than when you left the cradle of infancy? or, are you come with the exalted acquirements which you might have, and with that innocence and purity which you would have, if you had read the laws of the created world, and those which have been revealed, and placed before your eyes? Where have you read in these laws, that no duties to yourself, and to your associates, nor to the *Lawgiver*, were enjoined upon you? Have you not been told, by every breath you draw, by every movement of your frame, by every thought of your immortal mind, by every just pleasure, that you have had, by every pang that you have suffered, and by all that you have been made capable of perceiving and learning, that there were laws prescribed to you in your trust, and that an account of your stewardship would be exacted from a judge who cannot be deceived?

SELF-LOVE.

It is an invariable law of nature, that every human being shall do those acts which he thinks will secure good to him, and that he shall avoid those acts which will occasion evil to him. Why, then, should not every one do any and every act in his power by which his own will may be gratified, and avoid doing any and every act which is disagreeable to him? The only answer that can be given to this question is, that man is a free agent, entrusted with the power, and charged with the duty, of ascertaining for himself what is good and what is evil, and that this power and duty extend to those with whom he dwells in society, and also to his Creator.

Children always conform to the natural impulse of self-love, until they learn from the discipline which is applied to them, that they cannot have their own will without subjecting themselves to a suffering, the dread of which controls the natural impulse. They learn, after a time, that the greater good lies in giving up what they will to do, and doing what is required of them, rather than to meet the certain consequences. We think that the whole science of morals will be found in the principles contained in the truth above stated.

Self-love is just as strong throughout life as it is in childhood. It is that quality of our nature to which all excellence may be referred; but it is also that to which all unworthiness may be referred. As the dread of punishment, or an unwillingness to displease those whose kindness a child desires, will restrain him, or put him into action, so, in more advanced life, the dread of suffering a certain or probable evil, and the certainty of losing the good will of others, will restrain, or impel to act. With those whose minds have been properly disciplined, and who have learned to comprehend their relation to the Creator, there is a far higher motive, which is founded in a submission to the Creator's laws. As one goes on in life, he may or may not acquire more and more clear and just perceptions of what will be the greatest good to himself, and how he can obtain it. It is a self-evident proposition, that if a person could certainly know what it would be best for him to do, or not to do, in relation to all things and persons, and under all circumstances, and if he should conform to this knowledge, he would best obey the impulse of self-love, and most exactly conform to the laws prescribed for his good.

It cannot be too often impressed upon the youthful mind, that *life is to be taken as a whole*: for if this extended view be not taken, it must frequently happen that it will seem right in certain circumstances; and when the view is limited to these circumstances, that certain acts may be done, or avoided as the great good. Yet, if the consequences could be foreseen, they would disclose that this seeming good would turn out to be a positive evil. It often seems good to the young to avoid the performance of labours which are assigned to them, and to spend in amusement the time which should be devoted to fit them for duties which will be incident to future condition. This misapprehension of good is to be lamented; but with some, this is not all. Their own self-love prompts them to engage in a course of folly, so that not only do they fail to obtain that which is real good, but they find, under the mask of pleasure, that which proves to them to be the most grievous suffering.

The same truth runs, in an endless variety of forms, into manhood, and through all the stages of life. We are impelled by self-love not only to provide for the craving wants of our nature, but to seek pleasure, riches, power, distinction, and luxuries. These propensities are given for wise and beneficent purposes. It is the misapplication of them, as seen in the world, which constitutes human misery. He is called brave and honourable who defends himself, even at the risk of life, against those who would do to him that injustice and wrong which would make the gift of life of no value. But the brave, who invade the rights of others, and subject them, by violence, to losses and to sufferings, without cause, misapply this principle of action. To get riches by honest industry, or the reasonable exercise of one's talents, is a commendable use of self-love. To get riches by unfair and dishonest means, to hoard them up, and to brood over them in secret, is a pitiful misuse of this commendable impulse. To have power over one's fellow-men, and to use it faithfully, and for their benefit, is a relation which one may honestly and commendably desire, as a reasonable exercise of self-love. To seek such power by deceitful representations, and to obtain it by violence and fraud, and to use it for purposes of supposed self-benefit, and to the injury and oppression of others, is another form of self-love. But there are few, if any cases, in the history of mankind, in which self-love has appeared, in the latter form, without eventually overwhelming the agent with disappointment and sorrow. It is true that for a time such an one may seem to flourish in his schemes, and command the applauses of those who look up to him in his apparently fortunate elevation; but, in the very nature of things, if his heart could be sounded, there is no one whom he looks down upon, who is not more at ease than himself. His day of humiliation may be at hand, in the course of events which he cannot control; and if not, he learns, when it is too late to correct his error, that he has misapplied the impulse of self-love. This misapplication is to be seen in many cases of daily occurrence, and in things of little, as well as in those of comparatively great, importance. The principle is every where the same.

We shall be answered, perhaps, that all this is incident to human nature. There is no help, it is said, for these evils. Every boy who has learned Latin repeats the maxim, *humanum est errare* (it is human to err). A more mischievous maxim was never invented. If men understood, as most certainly they may do, that they need not err, and that it is best for them they should not, they would rather adopt as a maxim that none but the wilfully ignorant, and the wilfully foolish, *err*. Such a state of things is yet afar off. It may seem to be foolish, indeed, to assert that any society should ever come to be so well informed as to make a proper use of self-love. Let us not despair. We may improve very slowly; yet, if every one does even the little that he can, in showing, by precept and example, what things a rational and accountable being should desire, and what he should avoid and reject, certainly the time may come when self-love will never be so misapplied as to be necessarily followed by penitence and sorrow.

Will it be denied that there is a certain best course of action for every human being, in every possible condition in which he may find himself? Or, that no small proportion of human suffering arises from not having discerned that it was best, in past circumstances, to have acted differently, or not to have acted at all? Or, that whether one did or did not act, in the supposed case, that his motive was to secure to himself the greatest good of which that case was supposed to allow? If these things cannot be denied, then the great end of life is so to regulate self-love as that it may secure the greatest good. Let us suppose that every person in society knew what it would be best for him to do or not to do, so that his physical, intellectual, and moral condition, should be as good as he could make it. His self-love would never be directed to any end which would impair his bodily powers, or keep his mind in ignorance, or misinformed, or make him a subject of reproach or contempt in his own view, or in that of others. This, it will be said, is an impossible state of things. So it was said that it would be impossible to root out the use of *ardent spirits*. This great change is not wholly accomplished; but does any one doubt that great advance has been made towards its entire abolition? Let us go on, then, in the work of improvement. Let every one try to show the proper uses of self-love. The day may come when every one will admit that all the sufferings which may visit the human family are of their own making, those only excepted which arise from the general laws of the Creator. As to those, they may be greatly mitigated by intelligent moral agency. When these come, they can and will be endured with piety and resignation, if the sufferer can console himself with the certainty that he has done no wrong thing, nor neglected any proper one, to which the cause of his sufferings may be referred.

LABOUR.

It is commonly considered that labour is the *curse* declared to mankind, as a consequence of the transgression of the *first man*. It is foreign to our purpose to enter into any discussion as to the true meaning of this historical or allegorical account; the Christian revelation may not be dependent on a literal understanding of it. However this may be regarded under the influence of further reasonable research, we must take man as he is; and so considering him, labour is not an *evil*, but a *pleasure*. Is it a curse to man, as he now *is*, to be enabled *by labour* to comprehend the existence of the Deity, and the beauty and utility of his works? to adorn the earth and bring its productive power into action? to apply the material substances of the earth to reasonable use, convenience, and ornament? to expand and improve the human mind? to cultivate and strengthen the moral power? Certainly these are the effects of labour; and labour so applied constitutes man's highest happiness.

There are two kinds of labour:—1. Mere bodily labour; 2. Labour of the mind. These two are sometimes necessarily combined. The mind and the body demand some sort of employment. No one whose mind is free from natural defect can prevent its action. It will think of something, good or evil, profitable or foolish. Every one who attends to the operations of his own mind must be convinced that this is so. The body and limbs cannot be kept in any one position for any considerable space of time, unless they have been in action, and demand repose. If it were painful to us to direct the action of the mind to useful labour, and if it were distressing or inconvenient to us to exercise our muscles for purposes which we believe to be proper, then it might be that labour is a curse; but many, nay all, who require of the mind to perform its duties to any useful purpose, and especially those who have disciplined the mind to an accustomed service, find that the absence of employment is an affliction. We cannot see how this should be otherwise, if we rightly comprehend man's relation to the universe, of which he constitutes a necessary part.

As to bodily action, it is seen that children in their sports go through a series of exertions, often exceedingly violent too, from mere pleasure. Men frequently exercise the body much more severely in matters of amusement than they have any occasion to do in necessary labour. This action seems to be a dictate of nature. In many cases of indisposition, bodily motion is the prescribed remedy, and is commonly a successful one. There are sound reasons why this should be so. There is an universal action of the material system to which man belongs, and a continual waste and demand for supply. Excepting only in the involuntary movements in man's structure, which are not confided to his care, he is required to aid nature in her operations. If he would put himself in the best condition to receive, and derive pleasure from his daily food, he must keep himself in action. Those who have the least pleasure in using what was given to be used, as the means of pleasure to the senses, are those who keep the body inactive. This is true of those who labour with the mind only; more strikingly true of those whom affluence excuses from labour of body and mind. They seek happiness in indolence and in luxury. They find it not, because they violate a law of nature. No product of the vineyard, the field, or the sea, however aided by inventive art, will furnish a welcome repast to one who sits in listless idleness, on a downy cushion, from breakfast time till dinner. The day-labourer who sits down to his coarse meal has a pleasure to which the luxurious idler is a stranger. The one receives a rational benefit from the kind and just bounty of nature; the other seeks it where nature has decreed that it shall not be found.

The labour of muscular action is not only in itself a pleasure, but it is the means prescribed to us for the acquirement of subsistence; for the gradual improvement of society; for applying natural and artificial products to our comforts, to our convenience, and to reasonable luxuries. Nor only so: this is the groundwork of all the beautiful and imitative arts; of the discovery and application of the chemical power of matter; of the wonderful contrivances by which man securely moves on the face of the ocean; by which he cultivates his acquaintance with the stars, and raises his thoughts to the Author of all being. Let us not, then, regard labour as a curse, but a blessing, and rank it among the many causes for thankfulness. It is obvious that muscular action would have been given to us in vain, if it were not directed by intelligence. There must, then, be labour of the mind. This is no where said to be a curse. If there be any thing for which we should be specially thankful, certainly it is that we are blessed with the power of mental exertion. This labour is in itself a source of happiness; and in its fruits has made, out of savage men, a rational and improving social being. The most restless and comfortless of all creatures is he who has no occupation for his mind. If one would invent the most miserable condition for a human being, other than mere physical suffering of the most excruciating kind that can be without extinguishing life, it would be to deprive him of all employment of body and of mind.

Can there be a doubt that in man's present condition the ability to labour is his exalted privilege? And is he not accountable for this privilege? Is not reason given to direct him in the use of it? It is well known to those who have compared the condition of mankind in different ages, how much the labour of body and mind has been able to accomplish. Even within the last half century, the most surprising changes for the better have taken place, from the right use of this productive power. On this depends the condition of the human family. From the joint labours of all who wish well to their fellow-men, there will be obtained, eventually, the knowledge of the best manner of using the products of the earth, the best mode of ruling men in their social relations, the just homage due to the Creator, and the true purpose for which human life has been given.

To some descriptions of persons labour is irksome. They are obliged, in their vocations, to use certain muscles, and those only. They repeat the same act throughout the day. Their labour becomes tedious, because it requires little or no action of the mind. To this numerous class we venture to offer a relief which is within the easy reach of many of them. It is well known that the nature of habit is such, that the hands will do what they have been accustomed to do, without any obvious attention, and the mind is left to do what it will. The mind might be employed, while the hands are busy, in pursuing some connected train of thought. Muscular action, so far from being an interruption to the action of the mind, may be made to assist it. Persons who think intently are often seen to have some habitual movement; and we have heard several persons acknowledge that their best ideas had come to them when they were engaged in some simple occasional duty, such as the folding of paper, or the cutting of the leaves of a book. The stir of body seems to produce a corresponding stir of mind. The relief which we suggest is, that sedentary labourers should provide themselves with subjects for reflection, and exact of their minds to attend to these subjects. By such simple means, the memory may be strengthened, the stock of knowledge may be greatly increased, and the mind surprisingly invigorated. One might begin this exercise by attempting to remember, with the utmost precision, every act done during the preceding day, and so go back from day to day. Better still would it be, if the purpose were to see wherein one had not done as well as he might, and as he may wish he had done. This exercise may be applied, also, to the contemplation of subjects suggested by reading; and this contemplation will raise questions which will lead to the examination of books. There may be hundreds of poets, philosophers, and moralists, at the work-benches in this country, who have no thought, of themselves, that they are such. It is in the power of any person who can read and understand the English language, to strengthen his memory, give himself an interesting employment, and furnish himself with a rich fund of the truest philosophy, in this manner. He may commit to memory six lines, each successive day, of Pope's Essay on Man, and on each day repeat all he had learned on preceding days. On the 21fith day he would be able to repeat the whole essay. This might be done without losing one moment of time, and without making the slightest error in one's work. When accomplished, it would be an intellectual treasure for which any man might be thankful, and of which he might be justly proud. The first efforts may be discouraging, but perseverance will insure success. Every one who is accustomed to thinking can attest that most new subjects are at first confused and undefined; but they gradually disclose themselves, and fall into shape and order, just as material substances, used on the work-bench and the anvil, take that form, smoothness, and polish, by successive operations, which the workman requires.

HABIT.

This quality of our nature has engaged the attention of many philosophic minds. It has been considered an *ultimate fact*, as it is called; that is, one of those qualities which, like respiration, digestion, and many others are found to exist; and beyond which fact no investigation can be made. Its laws, rather than its nature, have been the subject of remark. It may be, that habit is to be referred to the law of action, which appears to pervade all material and intellectual being. Life is divided into parts; in one we are awake, and active; in the other, wrapped in sleep, and quiet. Each successive day is a sort of new existence, in which we are to repeat many of the acts of the preceding day. We repeat these acts, because nature demands the repetition of them. Also, almost every one is engaged in some vocation, on which he relies to supply his wants, and gratify his wishes; and most persons have in view certain pleasures, which are innocent, or otherwise. It seems to us that habit arises from this demand for action, and from the manner in which this demand is supplied. Action relates to our selves, to other persons, and to things around us which minister to our wants; supplying its demands, associates us with these persons and things. The want, whatever it may be, arises, and forthwith all things connected with satisfying it, force themselves into notice, and these become a part of our very existence. It is a well-known fact that the appetite for food will associate itself with a particular hour of the day, and with persons, places, and objects of gratification; so that one becomes hungry rather according to the hour than the natural want.

It may perhaps be an ultimate fact, behind which we cannot go, that those acts are most easily and well done which are oftenest done. One who uses a flail, an axe, a scythe, a sword, or a pen, can use either the better the oftener they are used, until he arrives at a point of excellence at which his power of improvement stops. This may perhaps be accounted for by supposing that the first effort which the mind makes to direct muscular action, is the most difficult one. After repeated efforts, the mind seems to understand better and better how to direct, and the muscles how to obey, till at length a very slight effort of the mind seems to be all that is required, and even an effort so inconsiderable and rapid as not to be the subject of notice. On this truth seems to depend the astonishing facility of action to which (among many other instances) jugglers and musicians attain. This is called *habit*, which word is derived from a Latin word which signifies custom or use. There are customs or habits of the mind as well as of the muscles. Persons who accustom themselves to extemporaneous speaking, acquire a surprising ease and readiness in the complicated action of conceiving, uttering, and expressing, by sounds, by looks, and gestures, whatsoever they would impress upon an audience. The mind has its own habits also, in the quiet of contemplation, and in exercising its various powers. It has its own associations, too, with external objects, of which many curious instances are stated in philosophical works.

The moral deduction which we make from these general principles is this, that there is a continual craving to do some act, to obtain some object; or a continually recurring necessity to do some act to prevent an evil, or inconvenience. The frequency of this call upon us to do something, whether it be for eventual good or evil, leads to the practice, custom, or habit of doing; and in some cases, the impulse to act becomes so powerful, that reason, self-respect, the laws of society, and even those of the Law-giver of the universe (if these are heeded), present no sufficient barrier to the impulse. It is to this all-important truth, in the nature of man, that we earnestly invite the attention of the young. The capacity to create habits is the consequence of the power given to us to promote our own welfare, individually, socially, and as accountable beings. This capacity was designed to fasten us down to that course of action which will accomplish these ends of our existence. Like every thing else with which we are entrusted, it may be rightly and profitably used, or may be misused, and perverted to our certain ruin. Habit is the kindest friend or the cruelest foe to human welfare. When it assumes the latter character, it approaches us in the most deceitful and seductive forms. It comes wearing attractive smiles—it delights—it fascinates—it substitutes its own irresistible will for our own—it triumphantly points to the gulf to which it bears us. The fly caught in the spider's web is a faint illustration of the power of habit. He knows, from the first moment, his destiny. The gambler, the drunkard, and the felon, when and how do they learn that they have been caught in the web of habit!

INTEMPERANCE.

This word has attained a meaning more limited than its proper one. It is applied commonly to persons who take habitually ardent spirits; but it is equally applicable to all transgressions of the law of moderation. All acts which may be lawfully done for one's own good, when carried to excess, are acts of intemperance; and all such acts are sooner or later followed by some sort of suffering, according to their nature and degree. Excessive labour of body or mind are as much acts of intemperance as to make one's self dull and stupid by taking food, or irrational and giddy by taking spirits. But there is a wide difference in the degree of immorality in the kinds of excess. An intemperance in study, which brings untimely death in some instances, is not condemned as an immoral transgression (though it certainly is such), for the motive which leads to this intemperance is an honourable one. The loss of health and character, from abusing the privilege of taking nourishment, is universally condemned, because the motive, and the acts done in obedience to its impulse, are irrational and disgraceful.

There are two kinds of intemperance against which the young should be warned. The one is drinking, not for nourishment, but for pleasure; the other is, using tobacco. It has been already demonstrated that nature requires a certain quantity of proper food to maintain a healthy and happy condition of body and mind; also, that excess of any kind will be followed by suffering. This is just as certain as that a full vessel must throw off just as much as is added to its contents. It is very natural that young persons should assemble for the sake of society; being assembled, they must have some employment for the muscles of the body, and the craving of the mind. We have shown that such propensities spring from natural constitution, and that they must be satisfied. There must be a community of purpose in the meeting. That may be found in any muscular action in which all can join, and which has some definite object, as athletic games; or it may be found in some intellectual employment which is common to all present. Unhappily, the most frequent bond in such meetings is *to drink*, for in this all can join. Connected by this common attraction, the mind is called into action; but for what purposes? Those who frequent places of public entertainment can answer this question. Some who are sent to public seminaries can also answer it; and some can answer it who know that they are maintained *there* by pinching economy *at home*. Some others could answer it, who never had a serious thought why such places were established, nor for what uses they were intended.

We refer again to the demonstration heretofore made, that the law of nature, which cannot be broken with impunity, inexorably admits so much, and no more. Let us, then, look in upon a gay company of young persons, around a table, and half concealed by tobacco smoke. What sort of air are they breathing? what sort of substances are they casting into their physical system, already bursting with excess? what sort of thoughts have they in their minds? and what sort of words are flowing from their lips? We *could*, but will not, answer these questions for them. Let us pass by this revel, and go to the next morning. We might then propound some other questions. Are not their heads heavy, hot, and throbbing? Are not their eyes thick and burning? Are not their tongues white and parched? Do not the nerves tremble? Is not the mind muddy and confused? In what condition are they to perform duties to themselves, to those they serve, to instructors, to affectionate parents? *Is not this dear-bought pleasure?* How long can nature bear to be *pleased* in this manner? This matter does not stop here. The same scene is repeated again and again. *Soon habit asserts its awful dominion*; and then the scene *must* be repeated. The craving cannot be resisted. From social drinking, the step is an easy one to solitary drinking. *There is no resting-place for habit; every thing in this system of being must keep on, or end.*

It is believed that the sort of criminal excesses to which we allude are not from the promptings of nature. We venture to assert that they are entirely artificial in the beginning. It seems irrational that any one should like to take more of any thing than nature requires; and more so that one should naturally desire to take burning liquids to the degree of intoxication, or perhaps to take them at all. It is believed there is no such natural propensity; but that such liquids, when first taken, afford less pleasure than pure water. The taste for these articles is created by association, by imitation, by fellowship; and, above all, because there is a kind of tradition that it is *manly* to drink. Songs in praise of the juice of the grape, and of meaner liquors, have some effect in the delusion of drinking. There is a fascination in combined poetry and melody. Such combinations are well known to have the most powerful influence in national associations. They inspire a feeling which bears men on to victory or death. The songs of Bacchus do the same. They conquer the strength of those who sing, and of those who listen to them, and sometimes lay their admirers, not in the bed of honour, but of contempt.

If one could get the ear of such a misguided youth, he would not do much by reasoning with him. He might do something by getting him to reason for himself. It would be necessary to bring to his view some facts from which he could reason. He must be made to know what a wonderful contrivance the digestive power is, and by *whom* it was contrived. That its purpose is to take the inanimate substances, which nature provides for it, and convert them into living, sensitive being, and, possibly, into thinking power, and immortal spirit. He must be reminded how easily every human contrivance may be deranged, and the more so, and irreparably, in proportion to the minuteness and delicacy of construction. But as one might fail to make a thoughtless boy comprehend the nature of the principle of life which resides in his own bosom, because he cannot see it, some illustration must be made. Unhappily there is none which can be effective to this end. The nearest that occurs is this. Let us suppose, then, one knows the use and the value of the human eye in its physical, intellectual, and moral relations; that he knows he must take care of it, and frequently bathe it in cold water, as well to cleanse it as to refresh and brace it, so that it may still be an eye to him, when decline and old age shall come. Let us further suppose, that, instead of so using and so preserving this delicate organ, he should, when he first rises in the morning, let fall into it a drop of burning spirit, and at eleven o'clock another, and so on, at the proper hours, until he sleeps again: How long would the power of vision remain to him, and how soon will this organ of delight become a source of insufferable pain? It must be much the same with the digestive organs as to the abuse of them.

If one could, in some such way, bring home to the perception of an erring youth the grievous wrong which he is inflicting on himself, he might be prepared to reason on his own case, and might be asked some such questions as these: Is it of any consequence to you to be free from suffering and sorrow? As you must inevitably keep company with yourself as long as you live, is it of consequence to you to make of yourself a pleasant and agreeable companion, and not one who will be continually complaining and upbraiding? Is health of any value to you? Can you use your limbs, and the faculties of your mind, as you would like to do, without it? Can you have health if your habit is to throw into that delicate part of your system whereon the action of life depends, substances which excite it to an unnatural exertion, or deprive it of all power of exertion? Does not every part of your system sympathise with the injustice which you do to your digestive organs? Will not your brain, and consequently your mind, suffer by this violence? Do you expect to attain middle age, and old age? Will not the seeds you are now sowing come up in that space of time? Will they come up in the form of enfeebled muscles, chronic aches, self-reproaching thoughts, the loss of the capacity to enjoy the bounties and beauties of creation? Will they grow up to overshadow your moral sense, and shut out the delights of intellectual power? Was life given to you for the few years in which you can sing, drink, and "enjoy yourself," or that you may enjoy life in every stage of it, as a rational being, and by rendering your homage to nature in obeying her laws, and your gratitude to Him who ordained these laws for your happiness? Do you not look forward yourself to be at some time a parent? Have your own parents ever so conducted themselves towards you, that you have a right to punish and afflict them? Are you willing that your parents should see you and know you as you know yourself? If you should be a parent, are you willing that your children should be told with whom, and in what manner, you "enjoy yourself?" Would you tell them how you spent your youthful days and nights, and recommend to them to take yourself as an example?

TRUTH AND FALSEHOOD.

These two subjects relate to two parties: 1. That one who speaks truth or falsehood; 2. That one to whom it is spoken. We propose to consider this matter only in relation to the first party, and as to him in two views. 1. Whether there be any, and what law, which requires that the truth should be spoken; and, 2. What good or evil one may do to himself by lying.

1. One reason why truth should be spoken is, that the knowledge which any one person can have from the use of his own senses, in many things which it most materially concerns him to know, is very limited. He must therefore often depend for his knowledge on what others say to him; and when the thing spoken of is exclusively known to the party speaking, the other must rely entirely on what he says. If, therefore, it be considered how great a part of the most serious concerns in life proceed on declarations made by one person to another, we may readily conceive, that, if these could not be relied on, the affairs of mankind would be greatly embarrassed, and confidence in each other would be destroyed. As this matter of speaking the truth is one which concerns all persons, so all persons agree in holding liars in contempt. Even the very lowest persons consider themselves to be disgraced when charged with the guilt of lying. They can endure charges which would subject them to public punishment, with more composure than they can endure this. A lie is always understood to be resorted to, to secure some advantage or prevent some evil to the person who resorts to it; or to occasion some disadvantage or injury to the person to whom, or of whom, the lie is told; sometimes both these purposes concur. The object in view is always an immoral one, and the means used are always regarded as disgraceful. It is at once obvious that wilful falsehood is forbidden by natural law, which is intended to regulate our social relations, and is expressly forbidden by divine law, which condemns all acts of fraud and deceit, and commands us to do to others as we would have them to do to us.

2. It is a rare occurrence that any one who descends to falsehood succeeds in the object which he may have in view. He is commonly detected, and, if not, is suspected, which may operate quite as much to his disadvantage. If he should escape detection and suspicion, he lives in constant fear of both. He has a very troublesome secret to keep. If he should be able to do this, still he cannot hide it from himself that he is a liar; and such a person, by natural justice, is compelled to pass that sentence upon himself, which he knows that others would pass upon him if they were as well informed as he is. A liar is therefore obliged to feel like a guilty person, and an habitual liar very soon comes to look like one. If there be no higher motive than one's own interest and welfare in speaking the truth and avoiding falsehood, this is a very sufficient one. If a man is known to be a person unworthy of confidence when he speaks, he has not the benefit of being credited even when he speaks the truth; he voluntarily deprives himself of the advantages of social life; his assertions secure to him no credit; his promises are contemned; he makes himself to be alone in the very bosom of society, for every one shuns him. In the administration of justice in courts, a person is not regarded as a witness, whose common reputation is that he is not believed when he speaks. The objection to him is not that he might not tell the truth in the matter which is on trial, but that such a person ought not to be received as a witness, because he cannot be credited in any thing that he says. When such a person has been called and examined as a witness, it is usual to examine other witnesses to prove his character; and if it be proved that he is unworthy of credit, what he has sworn to is disregarded, though he may have declared the truth. This is the common fate of all such unfortunate persons in society, as well as in courts. Independently of the criminality, lying is very poor policy. If the object be to obtain a supposed good, it rarely is obtained by such means; and if it be, the price so paid must always be greater than the good is worth. If the object be to conceal a wrong done, it is rarely successful; and if not, it leaves the offender without excuse for his error, and adds another wrong. If the object be to charge an innocent person with a wrongful act, or to deprive one of his good name, or of some lawful possession, or subject him to some evil which he ought not to endure, the offence is of that cast which the law of the land holds to be *malicious*, and it deals with such offence accordingly. In short, it is very difficult to violate any law of natural justice or divine prohibition without encountering an adequate punishment; and it may be assumed that the punishment which follows lying is as certain and just as in any instance of criminality. If every tenant of every prison, and if every person who is in the custody of a goading conscience, were asked this question, *what was your first step from innocence and purity?* he would probably answer, *telling a lie!*

SINCERITY AND INSINCERITY.

These are other names for truth and falsehood. They are not commonly applied to the most serious concerns of human life, but to what are called the "imperfect obligations." Such obligations, it is well known, are not enforced by the law of the land, but are binding as duties arising as well from natural law (reasonably expounded) as from divine law. Sincerity is a duty to one's-self, because it is demanded by self-respect. As every one has an individual separate physical being, so every one has a *separate circle* within which he exists, and into which no one has a right to intrude. His thoughts, motives, opinions, and policy, are his own. What he will or will not do (so that no wrong be done to others, and no act of duty be withheld from them) is for him to decide upon. Within this circle he makes up his judgments on all persons and things. In his outward deportment he must frequently act in a manner not consistent with these judgments. As an example: one has made up, from repeated observations of a certain individual, a very clear but very unfavourable judgment of his qualities; but there is no occasion to disclose what the judgment is. The observer is obliged, or finds it convenient, to meet this individual, and to deal with him, and perhaps to interchange courtesies with him. It is undoubtedly proper to manifest the respect, in such case, which the decencies of life require, and to show the common proofs of good will. There is no insincerity in this. Though no one can possibly avoid forming judgments of others, nor avoid liking or disliking them, even including very near friends and relatives, yet there may be a positive violation of duty in publishing these judgments, or in disclosing these feelings. The divine law, "judge not that ye be not judged," does not, it is believed, interdict these judgments, because they cannot but be made; but it forbids the wanton, unnecessary, and injurious publication or manifestation of them. Those who are keen observers of their fellow-men, see in their faces, in their manners, in their modes of speaking, in their tones of voice, in the sentiments which they express, &c., causes for respect, esteem, confidence, and approbation; or they may see causes for disrespect, suspicion, strong disapprobation, and disgust. But all these things belong to the *individual circle*. It is not insincere to keep them there. On the contrary, society would be intolerable if they were not kept there; it is very hazardous to the observer to let them out unnecessarily. He may be mistaken both as to the favourable and unfavourable judgments which he forms. Further observation, new circumstances, unexpected changes, may essentially correct his judgment; and, therefore, a prudent man will keep them to himself: they are his own peculiar property, and were obtained for his own use. It sometimes happens that one must associate with, or have something to do with, persons who are exceedingly repulsive and disagreeable to him, though that person may not be so to all, if to any others; and no moral effort will be effectual to remove these impressions. The dutiful course seems to be, not to disclose these impressions even to the party who causes them, if it can be avoided. One may be quite as disagreeable and repulsive himself to other persons, though he may have no suspicion that he is so. He would not like to be told of this, nor would he be able, probably, to change the relation for the better, if he were.

The world gets over these difficulties by establishing a kind of common currency under the name of *politeness*. Those who understand it are never deceived as to its value. They know the coin in all its denominations, and how much of it is to be parted with on all occasions. They know the precise point, in human intercourse, where its value ceases, and where recourse must be had to other means. The rules of civility settle many points in these difficulties. Civility is, however, distinguishable from politeness. The latter is a coin of the world; the former is the manifestation of Christian feeling. They are often confounded, as their practical effect is much the same. They are *insincere* who lavish the currency of politeness, and who lead others to believe that far better opinions are entertained of them than really are. They are contemptibly insincere, who for their own selfish purposes, or from the weakness of desiring to render themselves agreeable, stoop to commend directly, or by insinuation, qualities in others, which they affect to see, but which they well know do not exist in them. This is called *flattery*, which word is derived from a Latin word which signifies wind, breath, puff. This is a kind of aliment, which perverted self-love finds to be exceedingly pleasant. Although it is in truth precisely what its origin indicates, there is hardly a man, woman, or child, who is not disposed to partake of it, if it be artfully disguised. But, on the other hand, all sensible persons, of whatever age or sex, who see what it is, and why offered, feel for the flatterer the contempt which he deserves. This insincerity is, and ought to be, deemed a high offence. It implies art and deceit in the flatterer, and sufficient weakness in the flattered, to be subdued to the purpose in view. The flatterer's purpose may be to secure to himself no more than a better esteem than he can have any pretence to, and it may be, through that, to secure to himself something which may be very costly to his victim.

CIVILITY.

The well-being of society would be greatly promoted if the nature and use of this Christian virtue were more generally known. We take this to be, in personal intercourse, the observance of the command, Do to others as you would that others should do to you. The most rapid glance at any community shows this: That some of its members are brought into contact, in matters of business, necessarily; others meet, incidentally, who have no particular connection; others meet for social purposes in various forms; and that there is a large proportion who know of each other very little beyond the fact that they are of the same country, and perhaps not even that. There must be a *best rule* of deportment for all these classes; and no one will deny, that if this rule were defined, and faithfully applied, there would be much more of every-day comfort and complacency in the world than there is well known to be. If we rightly understand the meaning of civility, it is the manifestation of kind feelings, and of a desire to do all things which are to be done, under the influence of such feelings, in a becoming and agreeable manner.

If every person understood the true foundation of society, the common origin of all its members, their natural and necessary sympathies, their community of interests, their necessary action upon and with each other, it might be supposed that all who are reasonable would be civil. They would be so, because they would promote their own good, because they would be doing what it is proper to do, to promote the good of others; and because they would know, that in so doing they would conform to the design of their creation. We do not include under the term *civility* the great duties of justice, acts of munificence, important personal services. These arise out of some special relation which an individual bears to one or more other individuals. It seems to be limited to the manner in which the common or accidental intercourse of the members of society in general should be carried on. This matter may be better understood by some examples. Thus, if one comes into the presence of another as a beggar, servant, labourer, mechanic, trader, merchant, farmer, lawyer, physician, clergyman, or public officer; or if it be a female, or child of either sex, there may be very various modes of receiving these different persons; yet, certainly, by every one of the laws which we are endeavouring to illustrate, these several persons are entitled to civility. Even the beggar, perhaps one should rather say the beggar in particular, if not deformed by voluntary transgression, should be received with civility—that is, gentleness, kindness, decorum, are to be observed relatively to each one. Why? because no man can afford to be deemed insensible to the calls of reasonable humanity; nor a stranger to the decencies of life; nor ignorant of what is due from him, nor to him, in any of his proper relations. *Politeness* may be quite another thing, in some of the supposed cases. One interchanges politeness with those who happen to know what politeness is—*civility with every body*. A king would be polite to the ladies of his court, to his prime minister, to the members of his council, to foreign ministers, &c., and civil to his coachman, and to the humblest of his subjects.

We may find many illustrations, and fill ever so many pages with them. Let us take one which will concern the greatest number. In this country a stage-coach and a steam-boat bring many persons into a small space, who may be utterly ignorant of each other's existence until they meet. They have a common object, that is, to be transported in the same vehicle from the point of departure to that of destination. Circumstances compel them to be very close to each other, and each one has the power of being very disagreeable to each one of the others, in a variety of well-known modes. Let us suppose that each one consults merely his own interest, including in that his own self-respect, the reasonable good-will which each man desires from all others, and the ever-present principle of doing as he would be done by. He shows that he is sensible of the presence of his fellow-men; that he thinks them of sufficient consequence to wish to have their good opinion; that he is attentive to their comfort or convenience; that he is disposed to learn something from them, or communicate something; or to join with them in disposing of the time in which one has nothing to do, but to be carried. Take the other side of the picture—he puts himself in the best place, takes out his cigar, lights it from a pocket apparatus, and goes to smoking; he sees no one, speaks to no one, and endeavours to hear no one; if spoken to, he answers in a coarse monosyllable, and in a tone which prevents all further attempt at intercourse with him. If he make his presence known to all, beyond his sullen sitting there, it is by some selfish exclamation, or contemptuous ejaculation, on what is passing within his notice. Which of these two persons is *civil*? which of them is making the most of human life? which of them is attracting good will? which of them ought to like himself the best? which of them will have the most to look back upon with pleasure? which of them is a rational, sensible, well-disposed human being? and which of them is a selfish brute?

There is one other consideration which operates on all men who have had much experience in the world. Men and things change, and take new and unexpected relations. Persons who have been long and even intimately connected, suddenly or gradually sever; persons who have known little of each other, and that little uninteresting or unfavourable, are brought in contact by some unexpected turn of affairs. Sometimes one needs favours, or at least good-will, from those he never thought to be of the least importance to him. In such and in a multitude of other circumstances, one may find the advantages of having been acquainted with the virtue of civility, which implies that one has given no unnecessary offence. There are other cases in which one is called on by duty to do things disagreeable to himself, and exceedingly so to others. But there is no good sense in performing such duty morosely, and with inhumanity. As the laws now are, one may be authorised and required to put another to death. It would not be expected that such a duty should be performed *politely*; but there is the strongest reason why it should be done *civilly*.

ANGER.

This word is derived from a Latin word, which means to choke, or strangle. In several other languages its root is found, and in all it has the signification of strangling, choking, constraining, or narrowing. In common understanding of its meaning, which is the true one, it is a violent passion of the mind, arising from some real or supposed injury; and its natural tendency is to do two things: first, to take satisfaction for the injury; second, to make the offender suffer. This passion does not appear to be wrong in itself. Like many other excitements which are common to our nature, it was given to us for useful purposes, and is only wrong when its dominion is injuriously submitted to, and unjustifiably obeyed. There is a principle of general operation among all animated beings, which reconciles the existence of anger with the wisdom and benevolence of the Deity. All animals are entrusted by nature with the preservation of their own rights, and the promotion of their own welfare. But all animals are liable to have their rights infringed, and their welfare disturbed by others. If there were no sensibility to wrongs, the cunning and the strong would make all others obedient to their will. Anger is justifiable in self-defence, and in exacting justice, and in making an offender suffer, within the limits of reason. It is only in the misdirection and irrational use of anger that men make this principle of their nature a cause of affliction to themselves. Certainly the indulgence of an irritable angry temperament is one of the sorest troubles experienced in human life.

Anger has its seat in the mind. It is a passion which literally means an excitement of the human system, by the action of some external cause perceived by the mind. It is that passion which has the most immediate and the closest connection with the material system. Every one who has experienced a violent fit of anger knows that the natural action of the heart is quickened, and that his blood courses through his veins with a feverish rapidity; he feels that his face reddens with this action of his blood, that his eyes are full and distended, that he has a sense of choking in the throat: these emotions will gradually subside as the fit goes off, and the blood will resume its accustomed flow. So far this may be only a temporary physical evil. This, however, is not all the evil. Such an excitement can never occur without affecting other parts of the system. The interior organs of the system, which minister to the digestive process, partake in the evil effects of this violent action of the blood. These also are choked and constrained in their natural and necessary action. Physicians and naturalists tell us that the frequent action of anger generates stones in the gall bladder, makes the liver schirrous (become hard), and, deranging the indispensable flow of the bile, brings on jaundice and other diseases. (Such afflictions arise from various other causes also.) It is well known that there are instances of sudden death from violent anger. This is accounted for by the sudden rushing of the blood through delicate vessels which are not strong enough to hold it. They give way, the human machine is ruined, and death follows. It is said the theories as to long life are contradictory. By some it is referred to temperance. But some persons have lived long who were not remarkable for this virtue. It is rational to suppose that a naturally good constitution will endure long, if the rules of temperance are respected, and if the system is never subjected to violent passions. It is probable that those persons live longest who are not only temperate in quantity and quality, but who are also good-natured and cheerful.

Supposing the foregoing suggestions, as to the nature of anger, to be well founded, they are to be applied by persons who are entrusted with their own rights and welfare, and whose great purpose is to obtain the greatest good from life *as a whole*. It is admitted that all persons may, and perhaps must be, sometimes angry, until all persons attain to a much higher state of moral perfection than has hitherto been known. But it seems to be of great importance to one's-self to learn in what way he can govern the propensity to anger, so as to make it what it was meant to be; that is, means to his safety and welfare, and not, as too often it is, a cause of suffering and humiliation.

The causes of anger are supposed to be these:—First, by the law of nature and of society every one has rights in what he regards as his own property; second, one has a right to hold unimpaired whatsoever he can justly acquire in reputation and character; third, he has a right to have his feelings respected by others, if he do no wrong to their feelings; fourth, he has a right to have the like rights respected in those with whom he is necessarily connected by family and social ties; fifth, he has a right to be treated with justice, and, according to established laws, by those who are entrusted with power; sixth, he has a right to have those who are bound with him, in a common subjection to such laws, treated with justice. Whenever any one is offended by the violation of any of these rights, he may be justifiably angry. But in what manner and to what end he shall express his anger, so as to do himself the greatest justifiable good, is the thing to be known.

Every one who has had a violent fit of anger upon him, knows that it was to himself (independently of the cause and object of his anger) a painful and even a very distressing sensation. No one ever looked back upon such a state of things, as to himself, with satisfaction, but generally with regret, and sometimes with remorse. He feels humbled and grieved in his own estimation of himself. He may too well remember that he used expressions and did acts which he is grieved to have resting in the memory of others, or in his own. It is probable, also, that no one ever saw another in a violent passion, without feeling that this angry person was degrading himself, and acting more like a brute than a rational being. Whatever be the cause of such anger in another, cool spectators always regard the angry person as under a temporary loss of reason, and in danger of doing some serious mischief, and are prompted to restrain him. Every one feels, in such a case, that the least that can happen to one so acted upon, and so acting, is, that he is preparing for himself hours of self-reproach and of bitterness. If no one likes to remember that he was violently angry himself, and if he is offended in seeing others so, it must be admitted that violent anger is contrary to natural law, as it most certainly is to divine law. It is an abuse of the trust confided to us to promote our own welfare.

As to the cause and object of anger, there are certain cases in which sudden and violent anger is justifiable. The law of society permits the expression of it by violence, even to the destruction of human life. Thus he, who in violation of all law, human and divine, is attempting to take the life of a fellow-being, may be justifiably slain by him who is in such peril. The same law justifies the like act in attempts to commit some grievous crime in relation to persons or property. This justification occurs only when the offence is in the course of being perpetrated. In most cases in life, where anger is felt, the causes are of far inferior grade to those which the law of the land notices. It is to those of common occurrence to which our attention is now directed.

The cause of anger is some real or supposed wrong done, which prompts us to obtain reparation, and to punish the offender. It is consistent with reason for any one, who is under the influence of anger, to be prepared to ask and answer the question, whether the wrong is real or only supposed, and whether he is himself free from the first imputation of having occasioned, by his own error, that which he regards as a wrong. If the offence is real, other questions arise of this nature: What real good shall I secure to myself by attempting to get a reparation? and in what respect shall I advance my own welfare by attempting to punish the offender? May I not, in either of these attempts, involve myself, by words or acts, in some wrong, and give my adversary the advantage of finding me an offender, in trying to vindicate myself? If I could succeed in my attempt, what will it come to? Shall I not make the wrong done to me more notorious, and subject myself to the pity and compassion of others? Is it not better to be silent and quiet, and leave the offender to time and his own conscience, than to engage myself in a controversy which is sure to be vexatious, and in which I shall run the risk of doing wrong, and in which I shall not be likely to get any good? If I succeed in humbling my adversary, I shall surely make him my enemy for ever; for, in the nature of man, he is slow to forgive the wounds inflicted on his own self-love. When this matter is over, and time has dissipated the mists which now prevent a clear view of it, and when other feelings and sentiments have arisen, shall I like myself the better for having been silent and quiet, than if I shall have attempted to command justice, and to inflict punishment? It is probable that young and ardent minds, and those who are looking back by the light of experience, will answer such questions very differently. But the experienced can tell the young, with sorrowful truth, that among the most painful sufferings of life are to be numbered those which have arisen from sudden impulses of anger, expressed in words or acts. The experienced can also tell, with like truth, that, in the common occurrences of life, angry words and acts have seldom, if ever, accomplished the purpose for which they were intended; they have neither obtained justice, nor punished the offender; but, on the contrary, they have often converted the injured party into an offender himself, and involved him in bitter recriminations, keeping up an irreconcilable aversion, and even enmity, through life. We have, so far, supposed there to be a real and justifiable cause of anger. But the case is very much stronger against the indulgence of angry feelings when the cause is only imaginary. It is in many cases imaginary, especially among young persons. They take up sudden impressions concerning the supposed conduct and words of their associates and acquaintances, when no such conduct or words have occurred; or, if any did, none with intention to wound or offend. If there be one case in which one feels himself peculiarly humbled, it is when he has manifested anger towards one who has committed no offence, or who is entirely unconscious of having done so.

It sometimes happens that an offended person can restrain himself from expressions and words when he has been seriously offended. But he cherishes a malicious sort of feeling against the offender, broods over the wrong done, and permits his imagination to inflame the sense of wrong, until he makes himself too unhappy, under this excitement, not to express it in some mode which will occasion pain or affliction to the offender. If there be any one who has fallen into such a condition, he may be asked, whether he knows of any thing in the nature of regret or remorse for his own follies and sins, which is so exceedingly burthensome as to carry about with him the feeling of aversion, ill-will, and malice, towards one who has offended? What, then, is to be done? angry words and acts are forbidden by the law of nature, by self-respect, and by convenience; the memory of an unavenged wrong is intolerable. Is there no remedy? We think there is one in every person's power. If the individual with whom one is at variance can, by calm expostulation or by mutual friends, be brought to a just perception of the case, that is the remedy. If that fails, there is another; it is of high authority: if thine eye offend thee, pluck it out. Blot such a person from the memory; never permit him to come into your thoughts. Will you pass your life in humiliating bondage to such an one? We say, *blot such an one out of your memory*. You do him no wrong by that. You do yourself a just and great good; you cut a moral cancer out of your heart.

Among the sources of affliction in human life, is the uncalled-for interference of third persons in the angry collisions of others. It may sometimes be an unavoidable duty to take a part in an angry quarrel. When this duty is to be performed, it concerns every one who is mindful of the trust confided to him of taking care of himself, not to engage in the controversy in such a manner as to become a principal party in it. As a general rule, it is the safe course to let angry persons settle their own concerns as they can. Certainly, no one who claims to be regarded as having a discreet sense of his own welfare, plunges himself into a quarrel. Yet this is a very common thing. It is often seen in schools. Parties and divisions grow up, extend, and become more and more bitter, from the most trifling causes, and are often carried out into manhood, and show their evil consequences through life. This is so, because impressions made in that season are very vivid and durable. It is a duty sometimes to take a part in controversies. It must be remembered, when one engages in such quarrel, that one is dealing with persons who are under a sort of derangement, and who are most exceedingly sensitive, and perhaps mutually vindictive. Those who interpose are bound, by the law of self-regard, to interfere with calmness and sound discretion, and so to conduct themselves, in word and deed, as to do no evil to themselves while they attempt to do all the good possible to the angry parties. On the whole, mismanaged anger is a prolific source of suffering. Yet when calmly looked back upon, in a great majority of cases, the cause was some insignificant trifle, magnified into serious importance by angry words and pitiful acts. Such is the propensity of persons to busy themselves in the quarrels of others, that there is little reason to hope that a preventative can be successfully offered to any but to those who have studied out and who reverence the will of the Deity, as disclosed in the nature of things, and in his own positive law.

SELF-RESPECT.

Every one has some sort of opinion, more or less distinct, of all persons with whom he is acquainted. This opinion may embrace intellect, disposition, virtues, vices, personal appearance, deportment, condition in life. So also every one has some opinion of himself on the same, and on many other subjects best known to himself. When one examines his own opinion of himself, he seems to do it as though he were another person. He uses the eyes of others. He turns aside, as it were, by the way, to see himself pass by. The judgment which one forms of himself is often much more unsound than that which he forms of others. The eye cannot see itself; so neither can any one see himself. He must use a mirror. There are many of these. History, books, daily example, his own experience, every person he comes in contact with, are mirrors. If he sees himself in these, and thereby corrects his own errors and follies, and gives himself reasonable and just credit for his attainments, he may come at length to be entitled to entertain a respect for himself. There is a certain best thing to be done, and a certain best manner of doing it, in all possible circumstances in which one may find himself. Nothing is entitled to be considered *best* which does not conform to natural law, the law of God, the positive law of the land, the conventional laws of society (so far as they are founded in reason and good sense), and to the decencies of life. To that best thing, and to that best manner, no one, perhaps, ever perfectly attains; but it cannot be doubted that there is some such standard. He who comes the nearest to it is he who is best entitled to entertain a respect for himself.

PRIDE.

There is a kind of pride which is often mistaken for *self-respect*. We hear of honourable and of laudable pride. We take pride to be that self-esteem in which a man holds himself. It may be founded in his estimation of the qualities of his mind, in his attainments, in his possessions, in his strength, his beauty, his parentage, and descent. It may also be founded in a consciousness of virtue, and of having faithfully done one's duty in all the relations of life. It seems to arise necessarily from comparing one's-self with other persons. If this be the right meaning of pride, it is very clear that it is not always a sentiment which entitles one to respect himself. A man would be thought to be very unwise who should openly declare that he valued himself, in comparison with other men, on account of his wealth, his beauty, or his family connexion; equally unwise, if he should declare his opinion of himself to be, that he was superior to other men in the gift of natural intellect, in the cultivation of it, or in the practice of the various virtues. The common sense of mankind, founded in natural reason, does not approve of that self-gratulation which rests on the accident of birth, of inheritance, nor even on the acquisition of fortune by one's own industry; nor does it approve of that feeling, when founded on qualities which belong to the mind, nor even in the practice of the virtues, unless when manifested in a certain manner. There must be, in the very nature of things, some persons in every community, large or small, who are superior to others in these sources of self-esteem. In every city, town, and village, in this nation, there are some persons who are in possession of some of these causes of self-esteem in some comparative degree, and other persons who have the fewest or the least of them. Those who so use their advantages as to entitle themselves to the esteem of others, and who are acknowledged to be respectable for that use, may well be entitled to respect themselves from such causes. Those who use them in such a manner as to announce the feeling of superiority over others, and habitually to offend the watchful feeling of self-love, are properly called *the proud*. It is believed that these views conform to natural law, and to the necessary constitution of human society.

VANITY.

A still greater mistake is made in substituting vanity for self-respect. The word vanity is made out of two Latin words which signify *exceeding emptiness*. It is commonly understood to mean a strong desire to be noticed, considered, and esteemed by others, but on account of things rarely worthy of a rational mind. Vain persons covet praise. They thrust themselves, and all on which they value themselves, upon the notice of others. They delight in recounting their achievements, and sometimes make the sad blunder of speaking to those who know they are mistaken. They touch adroitly on their own excellences, and provoke others to descant upon them. They have such delightful visions of self-complacency, that it seems cruel to disturb them. Such persons are very ready to become tools in the hands of more knowing persons. In general, the display of this poor passion is made by persons of very light and frivolous minds. It is seen at all ages, but strikingly in youth. To see a young person strutting or mincing along in a new garment, or in some personal ornament, and watching to see if he is noticed, and by whom, excites a feeling of pity and contempt. The same feeling arises when young persons are seen, who say in their movements, as intelligibly as though they spoke in plain English, "Do they not think me very handsome—elegantly dressed—a charming figure—most exceedingly graceful?" In some instances lookers-on do think so, and smile contemptuously at the same time. But, in general, lookers-on see no such thing as the vain imagine; they do see that which it would be shocking to those votaries of vanity to know *is* seen. They do see talents wasted, time misspent, foolish hopes, and vain desires. They do see that the purposes of life are misunderstood or perverted. Is there any remedy for these follies? None, probably, unless one would bring home to the minds of the vain, that they violate the strongest precept laid down in the code of natural law for the government of persons individually and socially. That precept commands them so to conduct themselves in all things, as to entitle themselves to self-respect, and, consequently, to the respect of others. If the vain could conceive how small a portion they make of created being, how insignificant a part they make of civilised society; how many there are in that society, whose pretensions, if asserted, would be transcendantly superior to their own, they might, perhaps, dismiss their little vanities, and devote themselves to gratifications worthy of their intended nature.

GRATITUDE AND INGRATITUDE.

If a destitute young person should attract the notice of a wealthy man, and should be by him supported, educated, and established in the world, so as to be able to live, to become independent and respectable, every one would say that this is a case for the feeling and the expression of fervent gratitude. Let us suppose that the patron of this young man frequently reminds him of his former condition, and by what means he finds himself where he is. Suppose the patron exacts a frequent acknowledgment of his bounty, and takes to himself unqualified praise for his goodness. Let us suppose that the obliged party finds his condition very irksome, and almost wishes that he had never been the subject of such burthensome favour, and is at length provoked to say so; *Is he ungrateful?* It would seem, then, that gratitude had two sides to it, as well as two parties. He who has conferred a favour has not done all which it concerns him to do; and he who receives a favour may have a difficult task to perform. A bargain is an exchange of one thing for another, and the parties are even. The conferring of favours, whether these be asked for or not, seems to stand on very different grounds. Many elements make up that compound from which gratitude is said to arise. The parties may understand the nature of the favour very differently at the time when it is conferred, and more differently afterwards. He who confers has a retentive memory; he who receives, a fading one: time engraves the favour deeper and deeper in the former, and wears it out more and more in the latter. In the former it often preserves the freshness of a new occurrence; in the latter the sense of favour often goes, and the weight of obligation alone remains. It may be that the complaints made against ungrateful persons are not always well founded, and that the expectations of those who confer favours are as little so. Some poet has written,

> He that's ungrateful has an only fault,
> All other crimes may pass for virtues in him.

The meaning of this couplet must be, that the members of society are under no obligations to confer favours, and that, if they do confer them, the party obliged is a monster if he do not—*what?* We know not what is intended, nor that there is any rule by which gratitude is to be manifested. We think that every member of society is to do what of good he can, and to whomsoever stands in need of it. He is not to stop to measure and calculate how he is to be paid for it. He may not be paid by the party benefited directly, but by some other, and in some other and unexpected way. Whosoever confers favours opens an account with the changes and chances and accidents of life. His credit side will look well in the close. If he confer a favour, he does it because he thinks he can, and ought to do it. He has the *pleasure* of doing it. If he wishes to avoid the affliction of ingratitude, he has only to avoid letting the party obliged know, unnecessarily, whence the benefit comes. When a favour is done, the party conferring it takes on himself the duty of respecting that feeling of the human heart which is founded in reasonable self-love, and which is entitled to respect—that is, *not to ask one who has had the misfortune to be bound in chains, to clank them for the gratification of him who put them on.* There are cases of extreme ingratitude. They may have been occasioned by the irritating or indiscreet conduct of the party who was entitled to a different return. They are not of common occurrence. When they do occur, uncaused, the disappointed party may hope to find a better subject in his next essay.

SLANDER.

This is a two-fold crime: 1. It is a breach of natural law, of divine law, and of the implied law of society, in relation to the party spoken of; 2. It is a breach of the same law, in relation to the party speaking. It has been commonly treated of in the first relation. It is now to be noticed in the second; and if it be shown why it is a breach in this, the other will take care of itself. We beg leave to ask a slanderer a few questions: Do you desire to be esteemed in society for your intelligence, your sense of justice, your knowledge of the decencies of life, and for the observance of them? If you happen to be ill-tempered, petulant, and disagreeable to your family connexions and associates; if you make hasty and troublesome judgments which you have to rescind or reform; if you happen to be ridiculous in your deportment, and remarkable for silly vanities; are you willing to have these things set forth in any, and every company, by any one who knows of them? Suppose there to be only some slight foundation for some one or more of these things, which, if you could have an opportunity to explain, would be entirely cleared up, are you willing to have that slight foundation made the basis of a structure of reproach, which, if true and real, ought to expel you from decent society? Suppose there to be no foundation at all for any such accusation of yourself, and yet somehow, and unaccountably, it is afloat and circulating, should you not think great injustice to be done to you? This is just what you do to others. You take away their good name, if they deserve to have one; you magnify their little faults and errors, and make them ridiculous or odious; you try them on indictments for serious offences, on which they have no opportunity to defend themselves, and of which they are ignorant. Where did you get your information? What credit were they entitled to from whom you had it? Did you understand them as they meant to be understood? Where and how did your informants learn what they communicated? Were they thoughtless or malicious slanderers like yourself? How much have you added to their slanders by way of recommending and making yourself agreeable? Have you broken any law by this conduct? We take the liberty to answer for you.

You have broken every law which an honest and honourable man, and a rational individual, should respect. 1. You have made every person whom you have spoken to, fear you and shun you. You have shown that you know not what the value of a good name is, and have forfeited your own, if you ever had any. You have shown that you are a stranger to self-respect; that you have probably every one of the faults, follies, and errors, which you impute to others; and desire to bring them down to your own level. Thus you have broken that law which commands you to do no evil to yourself. 2. You have violated that principle of natural law which commands you to do no injustice to your fellow-men. You know not what opinions you may entertain of the party you have slandered, if circumstances (as they may) should bring you into connection with him. You may find him to be, on a better knowledge of him, an amiable and worthy person. You may find all that you have said, and helped to circulate, utterly groundless. If he be one whom you occasionally meet, and even ask to partake of your hospitality, how can you meet him, and manifest towards him every sentiment of respect and esteem, when you have so spoken of him? One of two things must be true: either you *act a lie*, when you meet him in such a manner; or you *spoke a lie*, when you represented him as you did to others. 3. You have broken the law of God. To this law, perhaps, you are a stranger, and know not what wrong you have done. If so, the kindest thing that any one can do you is, to urge you to find out what it is, and to learn there the sentence of the slanderer.

It may be asked, whether one is to be entirely silent at all times, and on all occasions, as to the character and conduct of others? Certainly not. There are many occasions for speaking of others, and for speaking the *truth* of them, whatever that may be. All the members of any community are interested in knowing the true character of each other. The knowledge that this character may be known, is one of the most salutary correctives of erroneous conduct, and one of the strongest inducements to pursue that which is commendable. It is probably the case, that the members of every community are pretty well understood by all who have an interest in knowing them. We know not of any law which holds it to be immoral *to speak the truth of any one, from good motives, and for justifiable ends*. It is all-important that this principle should prevail in our country, where so much depends on public opinion. Surely one's arms are not to be folded, and his lips closed, when he sees one bent on mischief, public or private. It may be one of the highest moral duties to declare what men are, and what they are aiming at, in many supposable cases. There can be no surer guide than the *motive* and the *end*. Inquiries are sometimes made, in matters of greater or less interest, concerning others, confidentially, and where the inquirer needs to be truly informed. The party inquired of has a right to be silent, if he thinks he has good reason to be so; but if he answer, he is bound to state the truth. If he choose to speak, and wilfully conceal the truth, so that the inquirer is deceived, he subjects himself to the imputation of an intentional deceiver.

There may be also, and there frequently are, confidential discussions of character, especially concerning public men, and where perhaps there is no particular end in view. This does not seem to be wrong; such intercourse is not founded in malicious nor unworthy motives. It is even sometimes instructive and philosophical. This, perhaps, is the extreme limit. In all other imaginable cases, it is probably most consistent with one's own self-respect, and all truly respectable motives, to let other persons alone, and leave to them the care of their own characters.

PROFANITY.

Excepting the high crimes, which are punishable by the public laws, there is no one so shocking as *profanity*, nor any one which there is so little inducement to commit. Profane swearing is of two kinds: 1. That in which the Deity is called on to do the pleasure of a sinning mortal; 2. That in which the Deity is called on to witness the truth of such a being's thoughtless or wicked declarations. This common practice can be accounted for chiefly on two grounds: 1. Pitiable ignorance; 2. Abominable wickedness. On the first ground, surely the profane swearer must be ignorant of the import of the terms which he uses. If he did understand his own words, he would be struck with horror. Surely, if there be any escape for the profane from that condemnation which they imprecate on others, it must be, that mercy will be extended to them in compassion for their ignorance. On the other hand, if they are not ignorant, but do knowingly and wilfully so misuse the gift of an immortal mind, and that unquestionable proof of divine power and goodness, *the ability to speak*, they cannot be subjects of moral instruction. They should be left, like the consumers of alcohol and tobacco, to shock and to warn others.

Swearing, which formerly pervaded every rank of society, is now to be chiefly found in a very low and uninstructed class: it is, in fact, a vulgar and proscribed mode of speech. Nevertheless, it is still used occasionally by persons of no humble rank, especially by the young, though chiefly for the purpose of giving an emphasis to speech, or perhaps simply to give token of a redundancy of spirits and a high state of excitement. To those who are guilty of it for these reasons, it is only necessary to point out, that no well-informed person can be at the least loss, with the genuine words of the English language, to express all legitimate ideas and feelings, and that to use either profane or slang words, is, at the very least, the indication of a low taste and an inferior understanding. A direct, pure, manly use of our native language, is an object which all may cultivate in a greater or less degree; and we have invariably observed, through life, that the most virtuous persons are the most exempt from the use of mean and ridiculous phraseology, and monkey tricks of all kinds.

Does not one who is habitually profane, necessarily entertain a low opinion of himself? Would any respectable merchant, or mechanic, or farmer, receive into his service a youth whom he knew to be a profane swearer? Could any one who is known to be such, find admission into any school, academy, seminary, or college? Would any respectable parent admit such an one to be a companion of his children, or a visitant in his family? Would not every reasoning person say, that a youth who is so ignorant as not to know that swearing is a violation of natural and divine law, must be ignorant enough not to know that there are many other laws for the proper government of society, and consequently that he is an unsafe person to be trusted? If the profanity be the consequence of voluntary wickedness, then surely all reflecting persons would say, that he who is wicked in this respect, is indeed wicked; but then he will be wicked in others also. For, as there is one chain which runs through all the virtues, and binds them in a sympathetic union, so also is there a chain which unites all the vices. He who swears may be justly suspected of drinking; he who swears and drinks, may be justly suspected of gaming; he who swears, and drinks, and games, must keep very bad company by day and by night. He who keeps such company from such motives, must squander his own property, or steal that of somebody else to expend. He who robs another will commit forgery, and he who is so desperate as to commit these two latter crimes, will not hesitate long to put a human being out of the way of his pressing wants, if he is tempted to do it. It is probable that habitual lying and swearing are the first steps in that mournful series of crimes, and the first beginnings in the course of deplorable wretchedness, which deform and disgrace human society. Will any one maintain that these are necessary evils, and that God has so made man that they cannot be prevented? Surely these are evils wholly of human origin; and where they begin, there lies the power to extirpate them.

ENVY.

It is to be kept in view that the main object is to show that this is a good sort of existence, if man knew how to use it, and that he is the author of his own afflictions. This is remarkably illustrated in the matter of *envy*. It is probable that a large proportion of mankind, in all classes, suffer from the dominion of this passion. It can be shown that it is peculiarly the passion which man has made for himself out of emulation, which latter is the Creator's work. In this instance, man has been exceedingly ingenious and successful in making himself miserable. He has done worse: he has provided for himself, in creating envy, a fountain which sends forth not one water, but many, and each one foul and poisonous. He who has submitted himself to envy has bound himself to think, to feel, and to act, as envy prompts. It would be most shocking to know what agency this monster has had in human affairs. If any one should read history, and watch the movements of his fellow-men, merely to learn the operation of this principle of action, he would see, probably, the most operative cause of the misery which men inflict upon themselves and on each other. If one has not time to read history, and watch his fellow-men, he may perhaps learn much of what he would find in these authorities, by *reading his own heart*.

The word envy comes from two Latin words, *in* and *vidio*, and signifies looking *against*. It arises from perceiving in other persons, qualities which one's own self-love leads him to wish to have—as beauty, strength, grace, learning, eloquence, power, &c. It extends to riches, to office, to distinction, to the respect and esteem in which one is held by his fellow-men, and even to birth and ancestry. It makes one *sorry* that he has not these good things, and makes him *angry* that others have them. One easily persuades himself that great injustice is done to him, in that *he* has them not. The next step is to *hate* him who has them. Then comes the desire to deprive the supposed fortunate possessor of the benefit of them. But to admit that one has these malignant promptings, is contrary to another principle of self-love; and therefore no man tells another of his own envy, and he tries to wrap it up from his own view. As he cannot and dare not openly manifest that he is envious, he must obey the suggestions of malice in the dark. He therefore intrigues, insinuates, and becomes adroit in putting one thing for another; he secretly and by covert means undermines the object of his hatred. He whispers his doubts, suspicions, opinions, and belief. If the tenure of the hated object is too strong to be shaken, then the bad use which he makes of his advantages are sought out. The base accompaniments of his fine qualities are brought forth, and placed in the strongest light. "She is beautiful; *but* she is vain, haughty, and silly. He is rich, *but* he got his wealth by frauds, and hoards it like a miser. He is able, eloquent, and popular; *but* he is selfish and insincere, and would put a yoke on every neck in the country, if he could. He is making a great flourish in the world, *but* it is all false and hollow; he came from nothing, and will go back to nothing." It may be easily inferred that one who has surrendered himself to the dominion of envy, not only deprives himself of the profitable use of what he has or might have, but makes himself wretched in contemplating what he must know he cannot have; he is so wrought upon, that whatsoever seeds of crime he may have in his heart, are sure to start into luxuriant growth.

Can any rational being doubt that this sort of suffering and crime are entirely of man's making? Can it be doubted that he can prevent them? These are violations of natural law and divine law; and no law comes from this source which cannot be understood and obeyed. Let us take an example, and seek out the unreasonableness and immorality of envy; and to do this effectually, we must take a strong case, and in some degree a fanciful one. Let us suppose that in a seminary of females there is one who is very beautiful; her parents are very rich, and are highly respectable; and that this young lady is distinguished by her genius, and her diligence and good conduct, and is obviously in the receipt of the preceptor's unqualified approbation. Let us further suppose that there are some of her schoolfellows who envy her. Their countenances show what they feel. Every mark of favour manifested to this fortunate person is a blow on every envious heart. Discontent, distress, and malignity, take up their abodes in these hearts, and enter into thriving partnership. But the beauty, the genius, the diligence, the wealth, the parentage, the applause, are not among the dividends which these partners make; these remain where they were; and what dividends do they make? Let us suppose that the envious would do what they would; that is, annihilate the envied qualities, and make the possessor too low and contemptible to be more thought of; and let us suppose, too, that the successful adventurers succeed to what is now the first eminence; is there no one below to pull them down? They are soon down, and by like means; and thus the demolition would descend, until the seminary became too low a place for even envy to find something to live on.

Is not this a fair example of what we continually see in all grades and classes of social life? and is not this passion of envy, earthborn, mischievous, and odious? What is the remedy? Common sense and plain reason point out the remedy. Generally speaking, every member in society is just as much in his own place as he is in his own skin. No one can be in another's place. Every one has his place originally assigned to him, and his natural condition in it, by means over which he had no control, and in making which he had no agency. What he will make out of himself, and of the circumstances in which he finds himself, must depend (after the irresponsible state of infancy is passed) on his own thoughts, motives, and acts. He will find his greatest good, not in repining at the good of others (which he can never make to be his own, and which he cannot destroy without expecting retributive justice as to himself), but in making his own condition as good as he can, consistently with self-respect and peace of mind. That which is given to others, and all that they can lawfully acquire, is righteously their own. All that is given to one's-self, and all that he so acquires, is in like manner his own. If he would have no injustice done to him by those who are below him, he must do no injustice to those who are above him. We entertain no doubt that the day will come when youth will be so instructed, and men so self-disciplined, as to know that the laws of nature and the laws of society, when conformable to these, permit to every person a proper place, enjoin duties in that place, and ensure happiness from the performance of those duties. When that day comes, envy will die.

EMULATION.

This has been sometimes classed with envy, but they have nothing in common. One would feel like a culprit in being known to be envious, but would rightly take praise to himself in being emulous. This motive to action was given to man for the best possible purposes; and upon the application of it, with justifiable views, and to commendable ends, the advancement of human welfare mainly depends. We understand it to mean, the desire to obtain excellence in laudable pursuits. An envious man may be supposed to say, "Your eminence distresses me; I cannot bear to see you sitting up there; and though I have not the shadow of hope that I can ascend to your place if you were out of it, nevertheless I must pull you down if I can, and then we shall stand on the same level." An emulous man may be supposed to say, "I admit that you are where you should be. You have raised yourself by fair and just means. I have no desire to disturb you, nor to impede your further progress. You have done me no injustice; on the contrary, you have rendered me the important service of showing me how one may honourably rise.

I shall follow your example, and endeavour to place myself by your side. If I can get there, we shall have a fair, good-tempered rivalry, and we may animate and quicken each other's efforts. If you are able to keep always in advance of me, you will make me diligent, and enable me to excel others, if I cannot equal you." There seems to be nothing immoral in this. In this view, emulation is presented in its true and amiable character. Like every thing else entrusted to man's use, it may be, and often is, perverted. It frequently excites very unworthy feelings. Hence it has been confounded with envy. It is upon the principle of emulation that diligence in schools is commonly founded; and it is in schools that the perversion alluded to is frequently noticed. When several children are required to get and recite the same lesson, there must be a best and worst among them. That they are such, respectively, may depend on natural talent, and upon industry, or on both. It deserves great consideration, whether rewards and punishments are generally understood in their true philosophy. There must be emulation in schools; because there is, and ought to be, that stimulant every where in all the vocations of life. If men had not the advantage of comparing themselves with each other, and the promptings to exertion which arise from that comparison, this life would be very still and stupid. But what use is to be made of this principle in schools? is a question of exceeding interest. We express no opinion on this point, because we might not express a sound one, and might thereby do some injury, and very possibly no good in any case. Add to this, that such an inquiry does not come within our general object.

PEACE OF MIND.

It is believed that most persons pass a large portion of their lives in a state of inquietude and uneasiness. Persons who have no bodily disease are anxious and disturbed. They have some urgent want which cannot be gratified, or which cannot be so, without incurring some evil, which would be worse than the unsatisfied want. They have the dread of some probable or possible evil to come, and which is the more terrible because of the uncertainty of the manner and of the time in which it may come. Others are uneasy from remembering the past, in which some benefit was not secured, some blunder made, some wrong done to themselves, some vain gratification not obtained. There are many persons who are habitually discontented. They find every thing goes wrong. The weather is bad; their food is not as they would have it; no one does any thing in the right time, or right manner; or that is done which should not be, or that is omitted which should be done. Such persons are always groaning, sighing, or grumbling. They dislike every body, and every body dislikes them; and particularly, their abundant *advice* is disliked, and their manner of giving it. There are other persons who are of unquiet mind for more serious causes. They have recollections which distress or torment them. They are transgressors; perhaps criminally so. They have been able to conceal this, but they live in the fear of disclosure; at any rate, the fact cannot be hidden from themselves.

These are frightful instances of the agency of this companion which every man has in his own bosom. There are hours in every one's life, when he must compare the condition in which he is with that in which he thinks he might have been. To some persons, these are hours of dread and terror. It is believed that this cause of suffering is purely of human origin, and that prevention must be found where the error began. It is the law of the Deity that there shall be such suffering when the guilty mortal makes it necessary to apply that law. There are great differences in the temperament and natural dispositions of persons. It is incredible that the worst-tempered person would not make a better whole of life, by suppressing their natural propensities, and acquiring a control over themselves, and teaching themselves to look out for what may be pleasant and agreeable (passing by that which seems ill to them), instead of doing exactly the reverse.

There are cases in life in which it is said there must be anxiety and inquietude, from the very condition in which men are placed. Persons who sustain public offices, persons who are placed in important trusts, persons whose vocations are perilous, those who are pricked by the thorn of political ambition. It is probable that such persons do experience many painful and distressing emotions, and that they sometimes pay dearly for their distinction; but it is demonstrable that even such persons might have tranquillity, if they had a right frame of mind. There are persons who substitute an aching solicitude for the reasonable discretion and care, which is all that is required in the performance of duty. There are others who greatly overvalue the distinctions to which they attain or aspire; and very few of them reflect, that, when they do succeed, they must take success, especially in popular governments, with the accompaniments of having their worthy acts misunderstood and reproached, and their mistaken ones magnified and distorted, to suit the occasions of adversaries.

The remedy for this sort of suffering is within every one's power. Those who are poor, and in humble life, if not in extreme poverty, may possess peace of mind; and it is of easier acquisition by these than by those who are involved in the duties of office, and the responsibility of trust, and the embarrassment of wealth. Certainly, without this treasure, no earthly grandeur, no promise of posthumous glory, is worth having or seeking for. If the laws of nature, and the teaching of revelation were properly known, respected, and obeyed, the common causes of inquietude would hardly be known. For example, what is more common than complaints of the weather? It is too hot or cold, wet or dry. It is not nature that mistakes about the weather, but ourselves. The movements of the winds and the waters, and the temperament of both, proceed on some great and universal laws, far beyond human perception. That which is exacted of us to believe is, that it is so, and to adapt ourselves to it, by our experience and ingenuity. What sort of effect would it produce in the earth, if such things were regulated by human perception of what is best? When one has occasion to put to use a board or stick of timber, which has been in contact with the ground for a certain length of time, he disturbs and puts to flight families, communities, and whole nations of living beings. Man may be much in the same relation as to general laws (not meant for him to comprehend), in which these insects are on the removal of their covering.

As to all causes of inquietude arising from the operation of nature's laws, in which human agency has no concern, they must be right, although they occasion inconvenience to individuals. As to the acts and omissions of others which affect us, some questions are to be asked and answered before one can rightly judge of these; viz., what is the real cause of our complaint? Did not the first fault arise from some act or omission of our own? Do we judge reasonably of the supposed wrong? Do we make charitable allowance for the misapprehension which may affect the party complained of? When the inquietude arises from our own wayward and peevish disposition, from our own misconduct, negligence, or breach of laws, which we could know if we would, the remedy lies in becoming wiser and better, and more reasonable in learning how we may make of life that which it was intended to be, when we use it as we should. Let any reasonable being look back on his own life, and calmly consider the causes of his own contentions, ill-will, and sufferings, in body and mind; how many of these can he fairly lay to the blame of the Creator's laws, of nature's laws, or those of society, whether positive or implied? If to these he can charge but very few, who but himself is there to take the residue?

We have been trying to show what peace of mind is not. We have to show what it is, or rather in what it is founded. It comes from sober conviction that the Creator has made his own laws for his own universe; that he requires conformity to these laws; that he permits and enjoins the use of what is good and right; that he punishes all that is wrong and disobedient. He has trusted every mortal with his own welfare, but has associated him with others who live in the same trust, each one for his own, but yet for mutual welfare. All are to contribute their common efforts to the common good. Those who have the means are to aid others in acquiring a knowledge of the laws which are common to all. If these laws were understood and applied, how abundantly would peace of mind increase in the world! The schoolboy would get his lessons and obey his preceptor; the labouring classes would labour diligently, live temperately, and find a greater pleasure in their frugal food than the luxurious in their festivals; for the former live as nature orders, the latter as fashion dictates. The opulent and luxurious would learn that the accidents of their fortune do not exempt them from the laws of nature; that, if they have affluence beyond their reasonable and commendable wants, they are blessed with the means of purchasing a precious name; they would learn that no wealth will exempt any man from earning an appetite for his pleasures by physical motion; that, if he is tired of being rich and happy, *he must work* to accomplish some reasonable purpose. His distinction is, that he may choose the means in which he will expend *to be busy*, while others can only work in some prescribed mode *to live*.

The middle classes, and all who are not dependently poor, have as many and as valuable sources of enjoyment as those have whom they think to be better off than themselves. They can love and be loved; they can be respected and esteemed; they can have the consciousness of behaving well, where their lot has been cast; they have a far keener zest for natural and reasonable pleasure than those who misuse the bounties of accidental condition; they can have peace of mind when it is denied to those whom they deem more fortunate. If these natural laws, which seem to be so plain and obvious, were understood and respected, the labourers *in mind*, in all their varied employments, would do diligently, and in the best manner in their power, that which they have undertaken. Men of public trust would do honestly, and with a single view to their trust, that which they have undertaken. Suppose it were all so, and yet troubles and disappointments come. This may be, and yet there would be peace of mind. If every one were assured that no act, no omission of his own, makes him suffer, that he has acted faithfully and honestly, and to the best of his ability in the circumstances in which he was placed, he would be entitled to have, and by the law of immutable justice, he would have, *peace of mind*.

HAPPINESS.

There is no word in our language more commonly used, nor any one less defined or less understood. It is sometimes taken to mean pleasurable sensations derived through the senses; sometimes it means a peculiar state of mind. It may be said that a pirate who has been brought to the most perfect penitence, and who is sensible that he has forfeited his life to the demands of justice, and that he is about to be transferred from the perplexities and sufferings of this state of being to endless felicity, is *happy* that he is going to be *hanged*. Perhaps it is easier to tell what happiness is not, than what it is. The most perfect *health* is not happiness, unless one has something to do. Health and *riches* do not make one happy. These accidents of being, rather excite cravings for enjoyment. They are means, not ends. A rich man can ride but one horse, or sit but in one coach, or eat but one dinner, or wear but one suit of garments, or live but in one house, at a time. Persons in moderate circumstances can do the same.

Health, riches, *power*, and *distinction*, do not make happiness. Distinction is troublesome: it has more pains than pleasures; it is jealous, envious, and distrustful. Power does not make one happy; it demands the most busy watchfulness to keep it. If lost, its absence is often followed by painful suffering, and the possession of it is always accompanied with the fear of losing it. Riches are sometimes regarded as means of enabling one to live in elegant luxury, and even in voluptuous enjoyment. This is no way to be happy; the appetite soon become satiated; the stomach wears out; the senses are palled; diseases come; the body may be racked on a velvet couch as well as on a straw bed. Is there, then, any such thing as happiness? There must be such a thing, or the laws of nature, which provide for physical, intellectual, and moral being, are false and deceitful, and the gift of revelation is a fable. If there be such a thing as happiness, it will be found in that knowledge of and obedience to the laws of nature which make health. It will be found in obeying the propensity to action, to some continuous, useful end; that is, in pursuing reasonably some one of the many vocations in society which tend to secure one's own self-respect and peace of mind, and which tend also to the common good. But there may be disappointments, ill luck, and causes of mortification and sorrow. These, we apprehend, do not seriously disturb any well-regulated mind, when there is a consciousness that no reasonable foresight or prudence would have discerned and prevented the cause. Finally, one may feel assured, that if he so live as to be healthy, so use his time as to be reasonably busy, to some good purpose, and so couduct himself as to be justly entitled to his own approbation, and if he live in the habitual assurance that there is an omnipresent, omniscient, and merciful judge of moral, accountable, and immortal man, he will certainly be happy.

FROM THE EDITORS.

The matter of this sheet has been extracted, with a few slight alterations, from the Moral Class-Book of Mr William Sullivan, published two years ago at Boston, in the United States, and of which we have already given a few specimens in *Chambers's Edinburgh Journal*. Of the excellence of purpose, firmness and expressiveness of language, profound observation, and amiable sentiment, displayed in this book, we need hardly speak, after presenting the reader with such ample materials for forming a judgment of his own. It is impossible, however, to omit the opportunity of congratulating our brethren on both sides of the Atlantic—for we never can consider them but as one nation—on the rise, in America, of a body of moral writers, of whom Mr Sullivan is but a specimen, who seem resolved, as they are unquestionably able, to seek the improvement of their fellow-creatures in all that tends to elevate them in the scale of being. If it did not appear invidious, we would even be inclined to say that moral literature in America is at present under happier auspices in some respects than it is in our own country: a higher order of talent seems there applied to the humbler and more useful class of subjects, than amongst us. While this is to be candidly acknowledged, it affords us the greatest pleasure to find ourselves able, by the command of so many channels of publication, to diffuse the better writings of our American contemporaries in Britain, by which our more immediate countrymen are put in possession of what they could neither obtain from the writers of their own country, nor, to any great extent, in its original shape. We originally intended to reprint the Moral Class-Book piecemeal in the Journal, and had made some progress, it will be recollected, in parcelling out the introductory part, which consists chiefly of a view of the evidences for divine revelation. We found, however, that not only was this apt to induce a sense of tediousness, but it prevented the force of the author's reasoning from fully taking effect; and we subsequently formed the resolution of presenting the bulk of the volume in two numbers of the Information for the People. The present sheet contains M. Sullivan's view of the Duties which one owes to Himself: another, to be published a little later in the series, will comprehend the Duties which one owes to Others, as classified in the opening paragraph.

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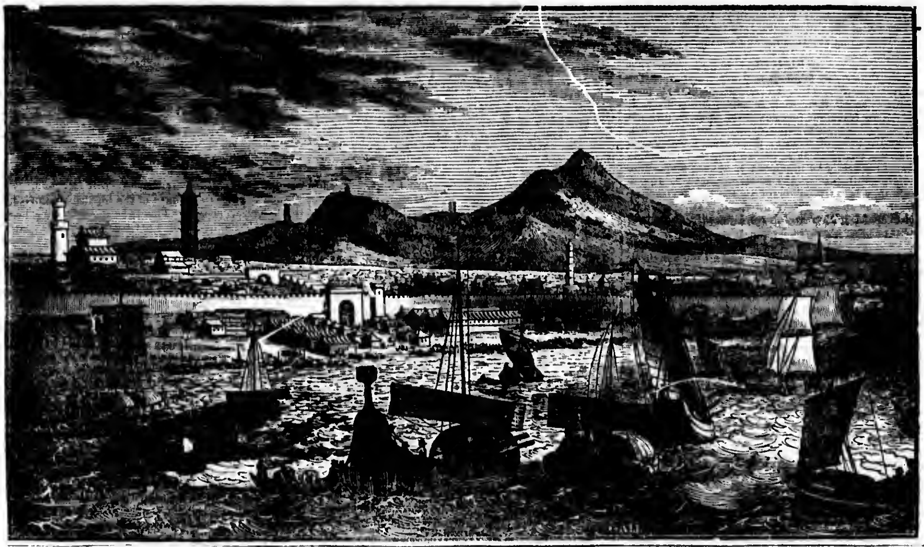
CHINA AND THE TEA TRADE.

VIEW OF CANTON.



GEOGRAPHICAL POSITION—BOUNDARIES AND DIVISIONS.

CHINA—called by the inhabitants Tchong-Koue, or the Middle Kingdom, from an idea that it is the centre or heart of the universe, around which all the other nations of the world lie scattered like minor provinces—is an immense country of Asia, extending 18° from north to south, and about the same from east to west, and lying between 20° and 47° of north latitude. It is conterminous with Asiatic Russia on the north-west; bounded on the south and east by the Pacific Ocean (that part of it being commonly called the Chinese Sea); on the west by huge mountains and sterile deserts, separating it from the great body of Asia; and on the north by the regions of Tartary, from which it is separated by the stupendous erection known by the name of the Chinese Wall, which extends 1500 miles in length. The Tartars call China Catay and Nicancarou; the Japanese, Thau; and the natives of Siam and Cochin-China, Cin (pronounced Chin or Tsin). From the latter countries lying nearest (nautically) to the Hindostan dominions, it is conjectured, with much probability, that the last-named appellation first gave rise to the European name of China. Some theorists, however, set down its derivation from the patronymic of the first imperial family Tsin, or Tai-tsin.

It is divided into fifteen provinces. Pe-tchelee, Shansee, and Shensee, are situated towards Asiatic Russia on the north and north-west; Setchuen and Yunan on the west; Quansee and Quanton on the south; Fo-Kien, Tchekian, Kiannan, and Shantong, on the east; and Honan, Houquang, Koetchou, and Kiangsee, in the central region. Of these provinces, a survey was made by some Jesuit missionaries, employed by the Chinese government, nearly a century ago, the execution of which occupied about ten years. A manuscript map, by a Chinese, constructed according to this survey, is now preserved among the archives of the Royal Library of Britain. Pe-tchelee is now the principal province in the empire, from its capital Pekin being the residence of the emperor and seat of government. Its name signifies the northern court, in contradistinction to Nankin, or the southern court, where the emperor formerly resided.

The whole area of China is estimated at one million and a half of square miles, or upwards of eight hundred and forty-three millions of acres, of which six hundred and forty millions are reckoned arable.

INTERNAL APPEARANCE AND CLIMATE.

From its immense extent, it may easily be imagined that China presents almost every variety of scenery. "In the long line of internal navigation," says Mr Barrow, "between the capital (Pekin) and Canton, of 1200 miles, with but one short interruption, the traveller will observe every variety of surface, but disposed in a very remarkable manner in great masses. For many days he will see nothing but one uniform extended plain, without the smallest variety; again, for as many days he will be hemmed in between precipitous mountains of the same naked character, and as unvaried in their appearance as the plains; and, lastly, ten or twelve days' sail among lakes, swamps, and morasses, will complete the catalogue of monotonous uniformity. There is a constant succession of large villages, towns, and cities, with high walls, lofty gates, and more lofty pagodas; large navigable rivers, communicating by artificial canals, both crowded with barges for passengers and barks for burden, as different from each other, in every river and every canal, as they are all different from any thing of the kind in the rest of the world." One general feature, however, pervades the empire—the utter nakedness of the country, as respects trees and hedges.

The climate of China embraces almost every degree of the thermometer. In Canton, it ranges from 80° to 90° during the summer, but the winter months are so cool that many of the inhabitants use fires. There can be no more certain criterion of the climate of any country than its vegetable productions, and we may therefore mention here generally, that within the bounds of China are all the varieties of tree, shrub, flower, and herb, to be found growing in every other country of the world. The temperature, however, may be generally described as rather warm than cold; but it is much affected by the direction of the winds, which may be literally said to "box the compass," with uniform regularity, during the various seasons of the year. They blow from the north and north-east in October, November, December, January, February, and March, during which months the weather is rather cold; in April and May, from east and south-east, when it is milder, but still cool; in June and July, from the south and south-west, when it is hot; and in August and September, from the west, when the temperature is oppressively sultry and hot. Speaking summarily, the coldest months are November, December, and January; the warmest, July, August, and September. Canton, although situated in the same parallel of latitude as Calcutta, is so much cooler during the winter months, that fires are generally used; nay, ice has frequently been found at Canton of the thickness of a dollar, but snow is never or rarely seen. The air is generally dry during the north, moist during the south, and clear during the west winds. The north winds are the most violent, and the south the most feeble. In the months of July, August, and September, the hurricanes, called by the inhabitants *Tay-fun*, usually occur, which, although extremely violent, and coming in sudden gusts, seldom occasion much disaster, owing to the inhabitants being prepared for them. The climate of China is on the whole highly salubrious; and many of the complaints common to the whole of Europe are there unknown. The Chinese profess to be free from stone, gout, and gravel complaints; and they are at all events seldom affected with cutaneous diseases. Much doubtless is owing to their uncommonly temperate mode of living, of which we will have occasion to say more hereafter. Epidemic fevers, however, are very frequent and fatal, arising from the crowded state of the towns and numerous swamps. The small-pox, too, was formerly very destructive, from the characteristic prejudice of the Chinese against all foreign innovations, however beneficial in the mode of treatment. Their physicians pretended to distinguish *forty* different kinds of small-pox; and when a favourable sort appeared, they endeavoured to propagate it, not by inoculation in the usual mode of incision, but by inserting into the nostril a little cotton wool dipped in the virus, or putting on the clothes of the infected! Of late years, however, the European mode of vaccination has generally been adopted, and at the present moment has perhaps entirely superseded the ancient practice. Sore eyes, and even total blindness, is very common, and is undoubtedly to be ascribed to their low crowded and smoky habitations, conjoined with their practice of bathing their face in warm water even in the hottest of the summer months.

Several parts of China have suffered much from earthquakes; but there is no appearance of volcanic eruptions throughout the country, though various substances of that description are found in some of the islands along the western and southern coasts.

HISTORY.

From the grossly fabulous and exaggerated nature of the Chinese records, an air of doubt has been thrown over all their early annals. Pretending, as they do, to trace the foundation of their empire not only as far back as the time of the deluge (of which, it is well worthy of remark, their traditions bear attestation), but even to a period long antecedent to it, it can scarcely be wondered at that a disposition should prevail to reject the whole as purely fictitious. There may be as much error in too great disbelief, however, as in too ready acceptance. The early annals of every nation are mingled up with much that is absurd, and obscured by the suggestions of ignorance and superstition. Nor are those Chinese historians, who trace the origin of their kingdom back through ninety millions of years before the Christian era, a whit more deserving of ridicule than the Romans themselves, who, with all their enlightenment, believed that the gods of their barbarous mythology took an immediate and active share in sublunary matters. The only substantial ground for wonder, in regard to China, is, that many modern writers, some even of our own country, should have given in their adhesion to the fabulous records of the native historians, and pretended to have established beyond doubt that the Chinese empire was founded more than 2000 years before the Christian era! The following may be given as an abstract of the result of their veracious theories:—They suppose that Moses, by Mount Ararat, does not mean to particularise any individual mountain, but merely the first land which showed itself upon the subsiding of the deluge, which they conjecture to be the elevated parts of Asia: That he followed the track of the large rivers of China which flow southward, as leading to a fertile and open country, and became the founder of the Chinese monarchy—identifying him with the Fo-hee or Foo-shee of their history: That, becoming offended with the impiety of his rebel offspring, he separated himself from them shortly before their presumptuous erection of the Tower of Babel; and steering his course eastward, after 200 years' peregrination, settled himself in one of the northern provinces of China (2114 years before Christ). Here, having settled his colony, and established the religion, laws, and government, which he had received from his antediluvian ancestors, he died in the 115th year of his reign, and 950th of his life (1999 years before Christ). He was succeeded by Shin-nong or Zing-nung, who reigned 140 years, and at his death (1859 years before Christ) left the crown to Whang-tee or Hoang-tee, the inventor of Chinese arithmetic and other arts, who reigned 100 years; and at his death left the crown to Shau-hau (1759 years before Christ).

But it were a mere waste of room to complete the enumeration of this genealogical succession of princes. Suffice it to say, that these theoretical historians trace it, with painful accuracy, down to the reign of Yau (1452 years before Christ), in the 67th year of whose monarchy happened the remarkable solstice mentioned in the book of Joshua, and which is actually noticed in the old Chinese annals, although without the specification of any year. From this time downward, the national records have undoubtedly some appearance of veracity, being principally contained in the *Shoo-King* (or history) written by Confucius, who lived about 500 years before the birth of Christ. Mr Barrow, to whose researches the present age is chiefly indebted for the information most deserving of belief respecting this singular nation, suggests a much more moderate and rational statement, of which the following is the substance:—He observes, that although the Chinese may be admitted to have been among the first nations of the world, after the flood, yet they do not appear to have made such progress in arts and learning as the Chaldeans or Assyrians; that is, only from the time of Confucius that they seem to have advanced in civilisation; that previous to his time, the country was divided into a number of petty kingdoms, under separate chiefs, with a recital of whose reciprocal wars and struggles for superiority the Chinese annals are chiefly filled; that their historical records are sufficiently abundant and complete during the last 2000 years, and the transactions of each reign fully detailed without interruption, down to the present time; and that, during this time, the empire of China has been less disturbed by foreign wars or intestine commotions, than any other portion of the world of which we possess any accounts.

Even from this view of the subject, very great deductions must be made. We are, however, compelled to walk according to our lights, and to offer the following summary of the Chinese dynasties from the period when their chronicles begin to assume an air of probability:—

From the reign of Yau (mentioned above) until the final succession of the present royal family of Tching, or Ta-tsin, in 1644 (A.D.), the Chinese annals enumerate twenty-two imperial dynasties. Three royal families are mentioned as having possessed the throne from 1767 till 258 before Christ—Kia, Shang, and Chew. About the latter year appeared a Chinese hero, Chi-hoang-ti, who overran the empire, extirpating all the petty chiefs and rulers, and uniting the whole of China. He also built the great Tartar or Mongolian wall, and reigned until the year 207 before Christ. This prince was the first of the present family of Ta-tsin, who of course are justly proud of their great claims to antiquity.

The empire was, however, again dismembered, after his death, under his son Ul-shi, but was reunited, ten years later, by Lieu-pang. He adopted the new name of *Hong*, and founded the dynasty of Hang. The princes of this dynasty extended their conquests considerably to the west, and took part in the affairs of Central Asia. The religion of Tao-tse prevailed during their ascendancy; and in the same period Judaism was introduced into China. In the course of time, the princes degenerated, and, under Hien-ti, China was divided into three kingdoms (220), which were again united by Wu-ti (280). Whilst the whole aspect of Europe was changed by the general migration of nations, two empires were formed in China, with the extinction of the dynasty of Tsin—one in the north (386), and the other in the south (420). After this, China was torn by internal commotions, and almost every province had a separate ruler, when, in 900, the people elected the able Shao-Quang-Yu emperor. He was the founder of the dynasty Sing, or Song, which reigned till 1279. His immediate successors resembled him, yet the country suffered considerably by the devastations of the Tartars. Under Yin-tsong (1012), the Chinese were forced to pay tribute to the Tartar Leao-tsang. Whey-tsong overthrew the empire of Leao-tsang (1101); but the Tartars possessed themselves of the whole of the north of China (Pe-cheli), 1125. Kao-tsong II. was their tributary, and reigned over the southern provinces only. Under the emperor Ning-tsong, the Chinese formed an alliance with Genghis-Khan, and the Niu-cheng submitted to this great conqueror (1181). But the Mongols themselves turned their arms against China, and Kublai-Khan subjected them, after the death of the last emperor, Ti-ping (1260). Under the Tang dynasty, arts and sciences flourished in China; several of the emperors themselves were learned men. The Chinese authors call the Mongolian dynasty of emperors *Yuen* (from 1279 till 1368), and Kublai-Khan is by them called *Shi-tsu*. This was the first time that the whole of China was subjected by foreign princes. But the conquerors conformed themselves entirely to the Chinese customs, and left the laws, manners, and religion of the country unchanged. Most of the emperors of this line were able princes. But after the death of Timur-Khan, or Tsing-Tsang (Tamerlane), 1307, and still more after that of Yeson-Timur-Khan, or Tai-ting (1318), divisions in the imperial family frequently occasioned internal wars, which weakened the strength of the Mongols. The Chinese Chu took up arms against the voluptuous Toka-mur-Khan, or Shunti, and the Mongolian grandees became divided among themselves. Toka-mur-Khan fled into Mongolia (1368), where he died (1379). His son Bisurdar fixed his residence in the ancient Mongolian capital Karakorum, and was the founder of the empire of the Kalkas, or northern Yuen. This state did not remain long united; but, after the death of Tokoz-Timur (1400), each horde, under its own khan, became independent; in consequence of which, they were, with few exceptions, constantly kept in subjection to China after this period. Chu, afterwards called Tai-tsoo IV., a private individual, but worthy of the throne, delivered his country from the foreign yoke, and founded the dynasty of Ming (1368 till 1644), which gave the empire sixteen sovereigns, most of whom were men of merit. On the frontiers of the empire, the remains of the Niudshee Tartars, now called Mantchoos, still existed. The emperor Shin-tsong II. gave them lands in the province of Leao-tong; and when an attempt was made, soon after, to expel them, they resisted successfully, under their prince Tai-tsu, and obtained possession of Leao-tong; upon which their chief assumed the title of emperor. He continued the war during the reigns of the Chinese emperors Huan-tsong and Hi-tsong, until his death. His son Ta-tsong succeeded him, and Hoai-tsong, a good but weak prince, was the successor of Hi-tsong on the throne of China. On the death of Ta-tsong, the Tartars did not appoint any one to succeed him, and discontinued the war. But in China, Li-tching excited an insurrection, during which Hong-Puan put an end to his life (1644). Li-tching's opponents called in the Mantchoos to their assistance. They got possession of Pekin, and of the whole empire, over which they still reign. Under Shum-chi, a child of six years old, the conquest of China was completed (1646–47), and the present dynasty of Tsing was finally established. He was succeeded, in 1662, by his son Kang-hi, who subdued the khan of the Mongols, took Formosa, and made several other additions to his empire. During the reign of this prince, the Christian religion was tolerated, but his son Yong-ching prohibited it in 1724. The son of the latter, Kien-Lung, continued the persecution against the Christians (1746–73). He conquered Cashgar, Yarkand, the greatest part of Songaria, the north-eastern part of Thibet and Lassa, the empires of Miao-tse and Siao-Kin-tshuen, and extended his territories to Hindostan and Bucharia. He peopled the Calmuck country, which the expulsion of the Songarians had rendered almost a desert, with the fugitive Torgots and Songarians from Russia. In 1768, he was totally defeated by the Burmese of Ava; nevertheless, the Chinese took possession of a town in Ava in 1770, and returned to their country with the loss of half their army. They were more successful against the Miao-tse (mountaineers). Towards the end of his reign, his minister, favourite, and son-in-law, Ho-Tchingtou, abused his influence over him. Kien-Lung was succeeded, in 1799, by his 15th son, Kia-King. His reign was frequently disturbed by internal commotions. The Catholics, whom he favoured, have lost most of their privileges by their inconsiderate zeal; and at Pekin, the preaching of the Christian religion has been strictly prohibited. Kia-King was succeeded, in 1820, by his second son, Tara-Kwang, whom the Russians call *Daoguan*.

Such is a brief summary of the historical annals of this singular people. Throughout their chronicles occur many periods which are completely blank, and these chasms have been filled up, as usual, with gross fables, which throw an air of doubt over the whole; but it is worthy of remark, that many of the leading facts recorded in their more veritable histories, have been confirmed by contemporary travellers and historians of other nations.

On the whole, however, it appears, that, instead of having existed as a great and united nation from a period of 3000 years before Christ, as the natives pretend, China was not formed into one state until between 200 and 300 years before Christ. Since the establishment of the Mogul dynasty, the empire has not been again divided, but has experienced two great revolutions, at the accession of the Chinese dynasty of Ming, and the re-accession of the Mantchoo Tartar dynasty (Tsing) in 1644; and has scarcely in any reign been free from revolts, wars, and domestic seditions. Instead, therefore, of having a right to be regarded as a privileged country, governed from time immemorial by the same constitution, exempt from foreign conquest and intestine commotions, the only peculiarity it possesses, distinct from the other empires which have been swept from the earth, is—that, owing perhaps to its peninsular situation, at the extremity of the habitable world, and its consequent exemptions from the destructive sweep of those conquering nations who supplanted those whom they overthrew, it has preserved its usages and manners in a great measure unaltered, amid the many internal revolutions it has undergone. Still, the fact of this, the greatest mass of population which was ever united under one government, being kept together in one bond of union for a period of time far exceeding that at which the earliest European nation may be said to commence, presents a moral phenomenon of the greatest interest, and seems altogether inexplicable by any of the usual principles which are supposed to bind society together. That it has neither been owing to the nature of the government, nor the virtue of the princes, nor the morality and peaceable disposition of the people, is certain; and we can only conjecture that the system of strict exclusion from all communication with foreign nations, and the national habit of appealing to ancient usage as the universal rule of conduct in all matters of life, have served to preserve their primitive habits and ideas in a great measure unchanged, and left unstimulated those energies invariably called into action by the free intercourse of mankind.

GOVERNMENT.

The government of China is not so much what is usually understood by an "absolute monarchy," as a specimen of what we learn from history to have been the social arrangement of a patriarchal family. The emperor, like the "head of a house" in those times, is perfectly unlimited in his power over all under him. He can dispose of the lives of his subjects at pleasure; can make or abrogate whatever laws he chooses; all offices and emoluments emanate from him alone; in short, he is equally the source of all power, honour, and mercy in the state. He can even appoint his own successor to the throne, either from his own family, or whatever class of his subjects he pleases. One of the leading principles in the Chinese constitution is to place as great a distance as possible between this universal autocrat and his subjects, and to hold him up as a demigod, a sort of *dragoman* betwixt heaven and mortals, alternately communicating the decrees of one and the petitions of the other. He is altogether exalted above the common gross sphere of humanity. He is styled the "Holy Son of Heaven, sole guardian of the earth, and father and mother of his people." In fact, he is *believed* to be of heavenly origin; and this superstitious notion appeared sufficiently obvious by the obstacles opposed to the succession of the present Mantchoo dynasty, on account of their family not being able to trace its descent through more than eight generations. The new monarch, aware of the danger of this stigma to the stability of his throne, caused his genealogy to be drawn out and published, wherein it was given out that the daughter of heaven, descending on the borders of the lake Poulkouri, at the foot of the White Mountain, and eating some red fruit, conceived and bore a son, partaking of her nature, and endowed with wisdom, strength, and beauty; that the people of that nation chose him for their sovereign, and that from him was descended the present Son of Heaven, who filled the throne of China. This explanation at once satisfied all the scruples of his celestial subjects. Offerings are made to his person and throne, and he is worshipped by prostration, not merely in his presence, but in places where he is *supposed to be present*—as our sailors lift their hats on coming upon the quarter-deck of a man-of-war. When Lord Amherst, in his ill-starred mission to Pekin in 1816, stopped at one of the stages towards that capital, a repast was found prepared by orders of the emperor, and he and his suite were ordered to prostrate themselves nine times before the *table*, as if the descendant of the red fruit of lake Poulkouri had been personally present. It is, of course, only in keeping with such superstitious notions, that the emperor should be reckoned not only the sovereign of China, but of all the world besides, the other royal personages being merely his vassals. "Heaven has not two sons, earth has not two kings, a family has not two masters, sovereign power has not two directors; only one God and one emperor." Such were the precepts of the learned Confucius 500 years before Christ, and such is the doctrine of the Chinese at this hour.

'This irresponsible autocrat bears two distinct characters: first, that of High Priest; and, secondly, that of the Sovereign of the Empire, or "Father and Mother of the People." In the first character, he is sole mediator with heaven for the sins of the nation; the sole officiator at all solemn rites and sacrifices for propitiating the favour of God. He has thus exclusive credit of all the blessings the people enjoy—such as plentiful crops, favourable weather, &c.; and although occasions of public calamity, storms, inundations, and such matters, are also laid to his charge, yet such is the infatuation of the people, that they forgive his faults in consideration of the proof thus afforded of the attention of heaven to his conduct! But care is always taken to present his character in the most amiable light possible to his subjects, who only hear of him as practising all the Utopian virtues of his station—remitting taxes and punishments, protecting virtue, punishing oppression, relieving the poor. So much for the head of the executive. What may be called the administrative government, consists of the emperor's council and the great public tribunals. The council is composed of the ministers of state, taken from the first order of mandarins, and presidents of the supreme tribunals, but is never assembled except upon occasions of extreme public importance; every thing being in general directed by an inner council, where the emperor sits in presence. There are six superior tribunals at Pekin. The first, named Lü-poo, watches over the training of mandarins, or persons to fill official situations, as well as over their conduct after being appointed to office; reports their proceedings and character to the emperor, and, in short, has them entirely under their surveillance. The second tribunal, called Ho-poo, may be designated the court of finance, where all the revenues of the empire, the royal treasures and domains, and every branch of public expenditure, is managed. The third tribunal, Lee-poo, or the court of ceremonies, superintends the observance of ancient customs and religious ceremonies; examines the public schools, and reports the progress of the sciences; receives foreign embassies (a great tax on their time); and regulates all matters of etiquette about the court. The fourth tribunal, Ping-poo, is something akin to our war-office, in having the management of all the military concerns of the empire. Fifth, Hong-poo is the police department, directing every thing relating to the detection and punishment of crimes. The sixth tribunal, Kong-poo, is the tribunal of public works, having charge of the palaces, public buildings, canals, mines, manufactories, &c. All these tribunals have under them a great number of subordinate tribunals scattered throughout the empire, subservient to their various objects of institution. Each of the six supreme tribunals has two presidents, one of whom must be a Tartar by birth, and the other a Chinese. They have, also, twenty-four assessors, who are half Chinese half Tartars.

There is, also, another tribunal, the nature of which sufficiently demonstrates of itself the grand principle upon which the Chinese government is based—namely, of making every thing depend upon the emperor. This is a board of *censors*, who send an inspector to watch over the proceedings of each of the tribunals—both the supreme and subordinate. These functionaries take no part in the proceedings of the tribunals, but merely sit and attend to all the proceedings, which they report to their principals, and these again to the emperor. These agents are, in short, his spies; and by them he indirectly governs his empire. The mandarins are changed from one situation to another every three years, to prevent their acquiring too much influence with the people, at which times they are obliged to appear regularly at court—to resign the seals of office, we suppose, and kiss *the ground*, upon entering on a new one.

The beautifully complicated machinery of government just described, might be supposed, if properly regulated, well adapted for accomplishing its object; but it is only by that very elaborateness of construction rendered the more liable to be abused. The emperor being the prime source of all power, it would be requisite for him to manage the whole machinery with his own hands, or under his own inspection at least—a task which would require him to possess as many hands, heads, and eyes, as Briareus and Argus had between them. The necessity, therefore, of relying upon the fidelity of so many thousand agents for his information and the execution of his will, is in every department of his government taken advantage of; and the whole may be generally described as a uniform system of corruption, plunder, and oppression, from the prince to the beggar. As soon as the censors (or spies) visit the provinces, they are instantly waited upon by the mandarins, who attempt to purchase their favour with rich presents, the value of which has of course been raised by the most grinding exactions from the poor inhabitants. Every mandarin entrusted with any temporary lucrative commission from the court, makes all he can of it by the most unscrupulous means, and, by bribing the higher officers about the court, is allowed to sit down in quiet with his ill-got gains. As all complaints must pass through the hands of these officers, of course no remonstrance ever reaches the throne against such oppressions. It is true, frequent examples happen of a guilty mandarin who is sometimes imprisoned, and his riches confiscated to the state; but it is well known that these examples of punishment do not originate in motives of justice. "The emperor," says M. de Guignes, one of the most intelligent of our modern travellers, "makes use of his grandees, as of a sponge, to suck up the riches of his subjects. When the sponge is full, he squeezes it, and sends it elsewhere to be filled anew." One mandarin, complained of by Lord Macartney, was dismissed by the emperor to the government of Quang-ton and Quang-see, with the following observation:—"I place you in a city where there are many European curiosities, but from which nothing is ever sent to me." The hint was not lost. Upon entering on his government, the inhabitants found it impossible to obtain an audience of him for less than a present of 15,000 or 20,000 piastres (L.4500). "I have lived a long time in China," observes M. de Guignes; "I have traversed that vast empire in all its extent. I have every where seen the strong oppress the weak, and every man who possessed any portion of wealth, employ it to harass, to burden, and to crush the people." In fact, the jealousy and suspicion which prevail between all the members of the government, from the emperor to the lowest of the magistrates, sufficiently evince how little they trust between themselves to their fine moral maxims, by the influence of which they pretend the throne is upheld, and the happiness of the people secured.

The great basis of the Chinese government is the strict inculcation of the sacred nature of filial obedience into the hearts of the young. The parent is understood to possess unlimited power over his offspring as long as they live—a maxim which has been for ages interwoven with their earliest feelings and ideas. The child stands in the same relation to the father as the father does to the sovereign. No wickedness or unnatural treatment by the father can relieve a son from his subjection. The merit of every good action performed by the son is ascribed to the father, but the son bears his own disgrace. In like manner, as already mentioned, the sovereign receives all the merit of the country's prosperity, but incurs no disgrace for its misfortunes. To be consistent, in thus placing the young and vigorous at the mercy of the old and feeble, the emperor sets an example by prostrating himself, at the commencement of every year, before the empress dowager, before receiving the prostrations of his officers and attendants. This same principle pervades all the branches of authority; the governor of a province or city being held as the father of all under his jurisdiction. The effect of this State-morality is, while it must certainly be viewed as the cause of the long stability of the government, to deteriorate the principles and feelings of the people, and destroy all genuine sentiment amongst them. From the beggar upwards to the sovereign, each individual is the slave of him immediately above himself; and, what is worse, all are aware of the hypocrisy of each other, and there are no other bonds to hold society together, save the chains of tyranny.

LAWS.

The laws of this singular nation may be described as those of the bamboo, the cord, and the scimitar. "This great nation," says Mr Barrow, "may be aptly enough compared to a great school, of which the magistrates are the masters, and the people the scholars. The bamboo is the ferula, and care is taken that the child shall not be spoiled for sparing the rod; the bamboo, however, is not used merely as an instrument for flogging the people. In the fundamental laws of the empire, it forms the scale by which all punishments are supposed to be proportioned to the crimes committed, and which are carefully dealt out by weight and measure. Punishment, as an example to deter others from the commission of crimes, would seem, indeed, to be less the object of Chinese legislation, than that of satisfying the claims of rigid justice; to wipe off a certain degree of crime by the infliction of a proportionate degree of suffering."

The laws are embraced in a code called the Leu-lee, which has generally undergone some modifications under each new dynasty, but has continued fundamentally the same from time immemorial. It is one of the duties of the mandarins to instruct the people in the provisions of these laws, and they are likewise promulgated in all the schools and public seminaries. The code of the present family, called the Ta-tsing leu-lee, consists of six great heads, to correspond to the functions of the six supreme tribunals, and embraces an epitome of the whole system of government. Our readers would not, we believe, thank us for an exposition of this institute of Asiatic jurisprudence; but the fifth division, relative to crimes and punishments, contains matter sufficiently curious and interesting. Treason—which, besides the crime of rebellion, comprehends nine other species of offence, amongst which are parricide, impiety, and desertion to a foreign power—is invariably punished with death, in the former case with the most lingering tortures. But it is not merely upon the criminal himself that the penalty for treason falls. All the male relations of such persons are indiscriminately beheaded, the females sold into slavery, and all their connexions relentlessly put to death. And it is well did the vengeance of the law always terminate here; but it too frequently happens that whole villages, nay, sometimes entire districts, are indiscriminately slaughtered for the crime of one individual! To intrude into the line of the imperial retinue while the emperor is travelling, subjects the offender to death. One of the most extraordinary decrees is, that if the emperor's physician is discovered compounding any medicine in a manner not sanctioned by established usage, he is punished with 100 blows. If any dirt is found amongst his majesty's food, the cook receives eighty blows; and if he mixes any unusual ingredient or sauce which his majesty's palate does not agree with, he receives 100 blows, and is compelled to swallow the article himself! All cases of deliberate murder are punishable by death; and death, with the most lingering tortures, is denounced against parricides. The penalty of death is also awarded against a slave who shall strike his master; a son who shall strike his father or mother; a grandson who shall strike his grandfather or grandmother; a wife who shall strike her husband's father, mother, grandfather, or grandmother. But if a father kill a son, grandson, or slave, even designedly, the punishment is no more than sixty blows of the bamboo, and a year's imprisonment. Even this lenient punishment is generally remitted for a fine, as the law presumes the cause of the act to be the disobedience of the child, which is held as a crime of the deepest dye, as affecting the principle of the whole system of government. The jealousy of the Chinese law on this important point is further illustrated by the following decree—"that a child or grandchild, who is guilty of addressing abusive language to his or her father or mother, paternal grandfather or grandmother, a *wife* who is guilty of the same to her husband's father or mother, paternal grandfather or grandmother, shall in every case *suffer death by being strangled!*"

There are five degrees of punishment for offenders:—The first is inflicted by the lesser bamboo,* and is said merely to be in the way of reproof and admonition. The correction extends from four to twenty blows. The second degree extends from twenty to forty of the larger bamboo. The third is temporary banishment to the distance of 150 miles, extending from one to three years. The fourth degree is perpetual banishment, with one hundred blows of the bamboo. The fifth and ultimate punishment is death, either by strangulation or decollation. There are also various kinds of torture to extort confession and evidence. The punishment by the bamboo, however, is, in the case of offences committed by the officers of government, commuted to fine or degradation, and, under peculiar circumstances, the benefit of commutation by fine is extended also to private individuals. In fact, there is a regular scale of charges for those not legally excluded from the degradation of flogging, of which all who are rich enough may avail themselves. The motive of this regulation is evidently to fill the coffers of the royal treasury.

REVENUES.

No correct estimate, for want of the necessary data, has ever been ascertained of the actual amount of the revenues of this immense empire, and the most different statements have been put forth on the subject by various writers and travellers. The Chinese themselves, of course, attempt to impress foreigners with a most exaggerated idea of its magnitude. A Chinese minister represented it to Lord Macartney as amounting to a sum exceeding sixty millions sterling, of which, after defraying all the civil and military expenses, about twelve millions were supposed to remain for the

* This instrument, which makes so conspicuous a figure in the Chinese code, is of two sizes: the larger is five feet eight inches long, two and three-fourth inches broad, and two inches thick, weighing two and two-third pounds; the smaller is the same length, two inches broad, one and one-fifth thick, and weighs one and five-sixths of a pound. The infliction is applied in open court immediately upon sentence being passed.

emperor's private support. Mr Barrow reckons "that fifty millions, in an economical government like this, where the officers and magistrates are so shamefully paid that they could not live without robbing the people, may be considered as an ample revenue for all the necessities of the state." Some late writers have reduced the estimate as low as twelve millions; but such a calculation is evidently absurd. Perhaps the nearest to the truth is that of the intelligent M. de Guignes, who accompanied the Dutch embassy in 1794. He drew up a minute summary of each individual tax, and branch of expenditure, and their amount, and the result was as follows:—

Revenue - - - -	L.31,555,554
Expenditure - - - -	22,222,221
Surplus	L.9,333,333

the surplus, after the emperor takes what he immediately requires, being deposited in the public treasury. If this calculation be correct, it is evident that enormous sums must thus sometimes be accumulated. Mr Barrow, it is true, says, "that the immense treasures said to have been amassed by the reigning dynasty, exist only in the imagination of the Chinese." But he seems to have forgotten what he himself states in another place, where, speaking of the various means adopted to preserve the emperor's popularity, he tells us that the sovereign sometimes remits a whole year's taxes to his people—a proceeding which could not easily be put in practice with an empty exchequer. The emperor has also private domains, the revenue of which was estimated by M. de Guignes at upwards of four millions.

The revenue is raised from a land-tax, amounting to about a tenth of its produce, one-half of which is paid in money, and the other half in kind. There is besides this a tax on salt, coals, and manufactures; and a capitation-tax upon merchants, artisans, &c., who are held lowest in the scale of society. It is a curious fact, that the regulations for collecting the duties on manufactures, and preventing smuggling, resemble exactly the British system of permits, excise-officers, licences, &c. In addition to these revenues, is the large amount raised by the duties on foreign shipping and merchandise, of which we will have further to speak when we come to treat of the trade of China.

ROYAL FAMILY—COURT-DRESS AND CEREMONIALS.

As may be imagined, the emperor is domiciliated in a style adapted to his immense wealth, high rank, and pretensions to unlimited sway. His train of courtiers, officers of state, and other attendants, when he appears in public, which is exceedingly seldom, is inconceivably numerous; and being all apparelled in gorgeous silks and satins of the brightest dyes, garnished with gold and silver, their appearance is inexpressibly magnificent. But it is only while going through this public exhibition that all this show of wealth and magnificence has any reality. When released from duty, they retire to their mean and solitary cells in the outskirts of the palace, where they devour their rice out of wooden bowls with their chop-sticks, and then lie down on their mats on the uncovered floor, to slumber away the hours till their services are again required; for to enter into conversation with his fellow-slaves, would, as being so strange a departure from the national taciturnity, subject the parties to the suspicion of conspiracy.

The emperor has three classes of wives. The first consists of one who has the rank of empress; the second, of two queens and their attendants; and the third, of six queens and their attendants. The emperor's wives and women are doomed to reside for ever within the walls of the palace, and are, after his death, imprisoned for life in a prison called the "palace of chastity."

The princes of the blood who are descended in a direct line from the reigning family, have their name and date of their birth registered in a yellow book, and have the privilege of wearing a yellow girdle; but those who are only of collateral descent, have their names enrolled in a red book, and wear a red girdle. So inimical is the spirit of the government, however, to a multitudinous nobility, that even the princes of the blood beyond the third generation, unless they have talents and learning to recommend them to some honourable employment to which rank is attached, gradually merge into the common mass. The princes have the privilege of being tried only by their peers, and may procure exemption from any corporal punishment by a fine. The persons of those who wear the yellow girdle are held so sacred, that any one insulting them incurs death. Those who hold no office, only receive a salary equal to the pay of a common soldier in the Tartar bands, and receive 100 taels (about 30 guineas sterling) at their marriage. The emperor and his children wear robes of satin of a bright yellow colour, while all the other branches of the royal family, like the mandarins, wear robes of a violet colour. The emperor, his sons, and those of the first rank, are also distinguished by figures of dragons with five claws embroidered on their vestments: princes of the second rank have dragons with four claws; those of the third rank, as well as the mandarins, have, instead of dragons, serpents with four claws. The *button of ceremony* on the head-dress of the emperor consists of three dragons of gold, placed one above the other, encircled and studded with pearls. His upper robe has four circles embroidered with dragons. His necklace, which in his case alone is composed of pearls, consists of 112 pearls, and other ornaments of rubies, sapphires, and amber. His girdle is of a bright yellow, with four circles of gold, studded with rubies, sapphires, and pearls. The oldest son of the emperor, called Hoang-tay-tse, has a similar button with his father, only with fewer pearls. His necklace is of coral, and he has a bright yellow girdle like his father, but adorned. The bonnets of the sovereign and heir-apparent have also a figure of the idol *Fo*. The other sons of the emperor are adorned in much the same fashion as the eldest, but with fewer ornaments. All these distinctions of dress in the royal household—as indeed the apparel of every class in the kingdom—are expressly regulated by law.

The public exhibitions of the royal person amid all the pomp and circumstance of his household, are limited to certain fixed festivals, such as the anniversary of his birth, beginning of the year, &c. Those on the former occasion are the most splendid, all the principal officers of the government, tributary chiefs, and Tartar princes, being in attendance. As the ceremonies observed on such occasions—like every thing else in China—never vary, the following description of one in 1793, given by Lord Macartney, may be taken as an equally faithful account of the exhibitions at the present day:—"The 17th September being the emperor's birth-day, we set out for the court at three o'clock in the morning. We reposed ourselves about two hours in a saloon, at the entrance of the palace inclosure, where fruit, tea, warm milk, and other refreshments, were brought to us. At last notice was given that the festival was about to begin, and we immediately descended into the garden, where we found all the great men and mandarins in their robes of state, drawn up before the imperial pavilion. The emperor did not show himself, but remained concealed behind a screen, from whence, I presume, he could see and enjoy the ceremonies without inconvenience or interruption. All eyes were turned to the place where his majesty was imagined to be enthroned, and seemed to express an impatience to begin the devotions of the day. Slow solemn music, muffled drums, and deep-toned bells, were heard in the distance. On a sudden the sounds ceased, and all was still. Again they were renewed, and then intermitted, with short pauses; during which, several persons passed backwards and forwards in the *proscenium*, or foreground of the tent, as if engaged in preparing some grand *coup de theatre*. At length the great band, vocal and instrumental, struck up with all their powers of harmony; and instantly the whole court fell flat upon their faces before this invisible Nebuchadnezzar. The music might be considered as a sort of birth-day ode, or state-anthem, the burthen of which was, 'Bow down your heads, all ye dwellers on the earth! Bow down your heads before the great Kien-long! the great Kien-long!' And then all the dwellers upon China-earth there present, except ourselves, bowed down their heads, and prostrated themselves upon the ground, at every renewal of the chorus. Indeed, in no religion, either ancient or modern, has the Divinity ever been addressed, I believe, with stronger exterior marks of worship and adoration than were this morning paid to the phantom of his Chinese majesty. Such is the mode of celebrating the emperor's anniversary festival, according to the court ritual. We saw nothing of him the whole day, nor did any of his ministers, I presume, approach him, for they all seemed to retire at the same moment we did."

All who are admitted to the honour of an audience of his "celestial majesty," are compelled to perform the ceremony of prostration, or *koutou*, which consists in prostrating themselves nine times on the ground, and beating it as often with their foreheads. This humiliating ceremony is exacted from foreign embassies as well as natives, as typical of the emperor's dominion over all the earth, and has been hitherto complied with by all the European plenipotentiaries who have visited the Chinese court, with the exception of the British; of which more hereafter. Of the other internal regulations of the royal household, nothing is known.

CLASSES OF POPULATION—OCCUPATIONS.

The population of China, under the emperor himself and his family, may be divided into eight distinct classes. And one of the most striking circumstances in the social system of this great despotism is, the want of that which has almost universally been reckoned indispensable to the stability of a monarchy—*a nobility*. With the exception of the princes of the blood, whose persons are in some degree held sacred, there is no rank but what is derived from the holding of some office in the state. But although those thus favoured are, by courtesy, esteemed noble, and even some families are, by the emperor's favour (such as the descendants of Confucius), allowed to retain a title of honour, they derive no power, privilege, or emolument therefrom. The sons of the highest mandarins derive no dignity or advantage from the rank of their fathers. As the possessions of a parent, too, are all equally divided amongst his sons, the riches of the greatest families diminish in proportion to the number of heirs; and if these are no way distinguished by talent, they soon sink back into the common mass of the people.

The great body of the people may be divided into the following classes:—The MANDARINS, the MILITARY, the LITERATI, the BONZES (or priests), the HUSBANDMEN, who are the most favoured class in the state, the ARTISANS and the MERCHANTS, who are the *least* respected, *especially those who traffic with foreign nations!* It is one of the most curious features of this singular government, that, being so essentially despotic in itself, both in principle and practice, it possesses one feature generally reckoned the main principle of a democracy—namely, that *the highest honours and offices in the state are alike open to all classes of the people*. The meanest origin is no bar, and the proudest rank is no recommendation, to the individual. This system no doubt soothes the public mind, and induces the people to bear with greater patience that insolence of office and stretch of power which they themselves have the prospect of exercising in turn. The result, however, is exactly in the inverse ratio to the plausibility of the system. "Where the offices of state," says Mr Barrow, "are open to the very lowest of the people, when possessed of the requisite qualifications, the candidates for employment become so numerous, that every trifling fault is laid hold of to create a vacancy; and these frequent removals and degradations fall in precisely with the system of government, which is to break down all connection between the officers and the people, and to turn the respect and veneration of the latter exclusively to the sovereign." It is found, that the more mean the original condition of a mandarin has been, the more oppressive and extortionate is his conduct to those under him, not only with the view of making his origin be forgotten in his present elevation, but, knowing the insecurity of his situation, of making the most of it while it is in his power. The people, however, submit patiently to his exactions, assured that his dismissal (of which they are certain) will open the way for one of themselves to enjoy the same opportunities of robbery and oppression.

In accordance with the national system, however, the office of mandarin, to which all ranks eagerly aspire, is almost wholly engrossed by individuals selected from the three humblest classes, the husbandmen, the artisans, and the merchants. Those who have acquired wealth, by whatever means, generally enter into some of these occupations to render them more eligible for the office, in order, that, by attaining it, they may enjoy their possessions in more security. Others purchase the office with their whole fortune, secure of finding the means of recruiting their finances during their three years' administration.

The mandarins consist of two classes, the civil and the military. The former, however, are the chief officers who govern the empire, although they are placed under such restrictions as to prevent their ever becoming dangerous to the emperor. They cannot marry in the province or city they govern, nor hold office in a province within 50 leagues of that where they were born, until they are 60 years old; with many other despotic regulations of the same nature. A mandarin has unlimited power in his district, but his conduct is watched by those above him, as it is the policy of the Chinese government to make every department responsible for the one immediately inferior to it. Notwithstanding this surveillance, however, and although their salary is barely sufficient for simple maintenance, it is regarded as a phenomenon by the Chinese to see a mandarin leave office without amassing great riches. Their means of accomplishing this we have already explained under the head of Government. Notwithstanding their infamous exactions, the people observe towards them the greatest reverence. They are saluted with the title of "Great Lord," and every one bends the knee while addressing them. The two chief classes of mandarins are divided into nine different orders, who are all minutely distinguished by particular parts of their dress. The most marked, however, is the button in the bonnet, which, among those of the first order, consists of a red ruby; others of a meaner order have a rock-crystal; and the most inferior, one of gold. The number of civil and military mandarins is calculated at between 20,000 and 30,000.

The *literati* form the most distinguished part of the Chinese nation, as it is from amongst these that the individuals necessary for discharging all the higher duties in the state are recruited. To ensure the adequate accomplishment of these learned statesmen, there is, as before stated (under head of Government), a board of censors, named *Lii-poo*, to direct their studies, and examine into the progress of their erudition; and government has fixed for every city of the first, second, and third class, the number of literati allowed to qualify themselves annually in each, by taking out a diploma, corresponding to the degree of Bachelor of Arts in Britain. There are, then, in China upwards of 24,700 individuals annually added to the qualified literati; and it is, therefore, conjectured that there are never less than 495,000 of this body. These are all exempt from taxes of every description; and as soon as they have taken out their degrees, their names are enrolled in the lists of the *Lii-poo*, who choose from amongst them the higher orders of mandarins.

It is, however, in productive labour that perhaps two-thirds of the Chinese are employed; the remaining third, amounting, after deducting the civil and military officers, students, literati, &c., to about ten millions, being engaged in trading and manufactures. It is the great maxim of the Chinese government, that agriculture is the true source of national prosperity and wealth; and they have in every age honoured and protected the cultivators of the soil. This class, indeed, may be considered much the happiest and most independent of the nation; for although they pay to the amount of a tenth annually to the emperor, they have neither priesthood nor poor to support—unless the poor of their own families, whom all classes are bound to provide for. The monarch is the universal proprietor of the soil, and the tithe exacted from it is the whole rent paid by the farmer. But though he is thus in a manner a tenant at will, he is never disturbed in his possession so long as he continues to pay his land-tax, and has the power of letting out any part, or the whole, if he pleases, to another. As there are no public funds in which to vest capital, and commercial speculations are reckoned degrading, all classes are eager to lay out their capital in land. It is for this reason that even the princes and nobility vie with each other in countenancing agriculture. Yet, notwithstanding all this encouragement, the amount of land cultivated is trifling in comparison to the extent of the empire. By a report made to Kien-long in 1745, it appeared that there were only about 6,000,000 of acres under cultivation, out of the 640,000,000 calculated to be capable of tillage. From the want of enterprise, but still more from the want of skill and suitable implements, immense tracts of lands are allowed to lie waste; and it is estimated that a fourth of the whole country consists of lakes and swamps, most of which are capable of being drained. It will easily be seen how inadequate the produce of the soil is to insure a regular supply of food to the inhabitants, in seasons of scarcity, occasioned by long droughts, which frequently occur; and when it is considered that there is no foreign supply of grain to make up for deficiencies, little wonder need be expressed at the terrific famines which often afflict the nation. To provide against these scarcities, a year's produce of the land is always kept stored up in public granaries; but this provision is never found sufficient to prevent the frequent recurrance of the most dreadful scenes of starvation.

We are somewhat puzzled what to say regarding the amount of the population of China; for although all accounts agree that it is something enormous, there is a difference of millions between the statements proceeding from what may be termed the most authentic sources known. The mandarins attendant on Lord Macartney, in the year 1793, gave out the population at 333 millions; and by a census taken in 1813, by order of the Chinese government, this enormous mass is swelled up to 367,821,647, which gives about 268 to the square mile. This calculation has been implicitly credited and commented on by various writers; and a late contributor to one of the acutest of our periodicals,* gravely philosophises upon it in anticipation of the benefits expected to accrue to Britain from the opening of the trade between it and China. But Mr Barrow, certainly the most intelligent and trustworthy writer on this subject, considers this estimate as not only improbable, but impossible. And certainly, when we compare the ostensible means of subsistence with the number of *mouths* here thrown open to swallow it, the alleged impossibility would seem sufficiently manifest. The most veracious and probable calculation, in Mr Barrow's opinion, is that taken from some statistical accounts of China, drawn up by order of Kia-king, about the years 1810-12, translated by the celebrated Chinese scholar, Dr Morrison of Calcutta, who accompanied Lord Amherst's mission in the year 1816-17. According to this census, the total population, including all ranks and conditions, great and small, amounts to between 145,000,000 and 146,000,000 *mouths* (by which designation the census is always taken); and this estimate acquires the greater probability, from its tallying pretty exactly with a census taken by Kien-long in 1743. By the latter, the number paying taxes was stated at 20½ millions, which, reckoning five persons to each family, would make in all about 142½ millions.

The more moderate calculation relied on by Mr Barrow is even greater than the following estimate, given in a British parliamentary paper, on the subject of China, drawn up and published in 1830. From this statistical table, it appears that the whole population of China proper, exclusive of Tartary and the dependant provinces, amounts to 141,470,000 souls, which, when compared with the area or surface of the country, gives an average of 103 souls for every square mile. Let this be compared with the known averages of some other countries:—

	Souls
China, per square mile	103
Hindoostan	104
Austria	110
France	164
England	222

Thus we see that this so much vaunted population does not amount to one-half of that of England, compared with the relative extent of territory of each country.

The cause of the apparently excessive population of China arises from the provinces being very unequally peopled, and the over-crowded portion of the country to which foreigners generally, if not solely, have access, and thence draw their exaggerated conclusions. There are, in fact, but four provinces, out of the fifteen into which the empire is divided, that are densely inhabited; these embrace but little more than one-fourth of the entire area, yet contain above two-thirds of the population.

PRODUCTIONS—AGRICULTURE—TEA CROP.

The staple productions of China are rice, tea, silk, cotton, sugar, salt, porcelain, tin, lead, musk, rhubarb, quicksilver, saltpetre, wines, fruits, and various manufactures.

Rice is the great staple article of food; and so much is its importance regarded, that a high festival is held at the commencement of each seed-time. The emperor performs in person, and prepares himself for the solemn occasion by three days' fast and prayer. He then goes forth in great pomp, takes the plough in his own hands, opens a furrow, and throws in the first seed of the season. The same is done in every part of the empire, on the same day, by the viceroys and governors. The grain reaped from this seed is preserved in granaries, and reserved for sacrifices. The cultivation of this grain, of which there are two crops annually, requires little or no labour; water supplies every purpose, and for the most part this element is abundant in every part of the empire. The growers display great ingenuity in their various contrivances for raising the water from the rivers, by means of wheels, levers, swinging buckets, &c. The first crop of rice is sown in March, and the second in July, the grain being ready for the sickle three months after it is sown. Exclusive of rice, there is a great deal of barley grown in some districts, besides wheat, maize, peas, and beans. Oats, which spring up spontaneously, are pulled up as a useless weed. The implements of husbandry are extremely simple. The plough is held by one hand, and consists but of a single piece of crooked timber, the lower extremity of which is armed with a hook, and the superior guided by the hand; while a perpendicular piece of wood rises from the middle of the beam, across the top of which another piece is placed lengthways, one end of which is fixed to the handle, while the other is connected with the traces. This implement does not turn up the earth to the depth of more than six inches, so that new earth is never reached; and being thus exhausted, the ground requires often to be left fallow for want of manure.

The Chinese excel in gardening more than in agriculture, and especially in the art of laying out garden grounds; and this may be considered the only one of the fine arts in which they display genius or taste. Their style indeed strongly resembles that of England. The most magnificent and extensive of the emperor's gardens are those of Yuen-min-yuen, at Pekin, and of Gehol in Tartary; the latter of which is described in glowing terms by Lord Macartney, who says it reminded him of the pleasure-grounds at Lowther Hall in Westmoreland. They are, however, on somewhat larger a scale, being ten English miles in diameter, or 60,000 acres, containing within the precincts thirty separate habitations for the emperor, each resembling a village of considerable size.

The Tcha, Tha, or Tea-tree, grows equally in the mountainous and level districts, but prefers a light and rocky soil. It is sown by putting seven or eight seeds into a hole, two or three of which only spring up, and these are afterwards transplanted into rows. They begin to yield leaves three years after being planted, but require to be renewed every five or six years, as the leaves then begin to grow hard and harsh. The appearance of the tea-shrub resembles that of the broad-leafed myrtle, with a flower like that of the wild white rose. There are different modes of cultivating the tea-crop in different provinces; but there are in fact only two distinct species of it, the green and the black. All the rest are mere combinations of these two in different proportions, or are simple varieties produced by difference of soil, culture, gathering, or curing.

The black tea is grown in the maritime province of Fo-kien, with the exception of about one-third of the bohea, which is produced in the north-east corner of Canton province, in a district called Wo-ping. Green tea is all grown in the maritime provinces of Kiaguan, Kiang-si, and Che-Kiang, but chiefly in the two former. Some of the buds of the plant in Fo-kien are picked in the early part of the spring, before they have burst, and a small portion of these is mixed with the best parcels of congou, to give them a flavour. Pekoe is also brought to Canton unmixed with other leaves.

In the beginning of April, the leaves are stripped off the plant; a new crop is then thrown out, and picked about six weeks afterwards, and a third crop about the end of May: the two first pickings are the best, and nearly equal in quality. The third crop of leaves yields tea of little strength and inferior flavour: hence the best crops are composed wholly of the choice leaves of the two first gatherings, with a small sprinkling of the buds or pekoe. The inferior crops contain a larger share of the third pickings, and none of the pekoe. The black tea in Fo-kien is cultivated largely by cottagers in small plots of ground or gardens. The leaves are picked by the family, and immediately sold to persons whose business it is to collect quantities of them, and manufacture them in parts, that is, expose them to be dried by the wind under the shade, and afterwards to be further dried in a heated warehouse. The tea merchants and the agents of the Hong merchants come to the tea districts, and purchase quantities of the dried leaves of the first, second, and third gatherings, discriminating the leaves of young and old plants of those grown in well-known favourable spots. They then complete the drying or roasting process, and employ women and children to select the hard, the best leaves, with more or less discrimination, according to the object of making very fine, middling, or common tea. The green tea is less highly dried than the black, and Mr Barrow supposes that it is from the former thus retaining much of its natural juices, that its nervous properties (generally ascribed to its being dried in copper vessels) are to be imputed. The green tea is usually pressed into chests while hot, to give it a finer flavour. The tea is made into parcels of from 100 to 600 chests each, with a distinctive name to each parcel, and conformity of quality, where the tea merchant acts honestly; hence those parcels of tea, which, under certain Chinese names, have proved, in a series of years, of excellent quality and similar characters, and which are greatly sought after at the London sales, are not the produce of any particular farm, but owe their character to the skill and good faith with which the tea merchant or the Hong merchant's agent have executed their commissions in selecting only superior parcels of leaves in the markets of Woo-y-shan. Like the black tea, the different classes are formed by selecting the better from the inferior leaves after they have been dried; the light leaves separated by a winnowing machine from the heavier, the latter of which constitute the gunpowder tea; the lighter are of inferior quality, and only used by the common people. The blooming appearance of hyson, gunpowder, &c. is said to arise from the effects of carefully roasting the leaves in iron vases placed over a fire, and by rubbing them against the sides of the vessel; in this process, with the green teas much skill is requisite, and there is a class of persons hired by some of the tea merchants to superintend their respective manufactories. The bohea tea is composed partly of the lower grades of the Vu-y-shan tea, which has been left unsold after the departure of the last ships of the season, and partly of the tea grown in the district of Canton called Wo-ping.

The tea-chests undergo severe scrutiny in Canton, previously to being purchased; and if, when finally examined at the period of their shipment, they are found superior to the quality which has been attached to them, their price is raised; if inferior, they are rejected, or their price lowered. The scientific mode of proving the finer teas is to put a small quantity into a cup; pour on it pure spring water at full boiling heat; place the saucer above the cup, filling it also with boiling water to increase the heat: after a sufficient time has elapsed for the leaves to unfold themselves, to examine the appearance, flavour, but particularly the *colour* of the infusion. The latter quality is of course only known to the initiated.

Tea is the universal beverage of China. It is drunk at all meals, and is almost the only liquor used at feasts, and while visiting each other. But it is a general rule amongst them never to drink tea immediately after a long fast, being apt to affect the nerves, and create giddiness. The tea-shrub is cultivated only in China and Japan, and is supposed to be indigenous to one or both of these countries. All attempts to introduce it into Europe have hitherto failed.

The quantity of tea annually plucked in China, it is impossible to calculate, unless we also knew the quantity consumed by the natives. About 54,000,000 of lbs. are annually exported from Canton to all parts of the globe; and it is a remarkable fact, that of this quantity Great Britain and Ireland alone consume nearly 32,000,000 lbs—being about 10,000,000 lbs more than all the nations of the civilised world put together!

MANUFACTURES.

From the inveterate adherence of the Chinese to all ancient customs and practices of every description, they have been left completely behind by almost every civilised nation in all useful mechanical arts, even those which originated with themselves. Every thing seems to have stood still in China but Time. Nothing can be more illustrative of this fact than in the case of the silk-manufacture, of which they were undoubtedly the inventors, and the knowledge of which, as their annals boast, they possessed 3000 years before Christ. The native reeler and weaver still continue to labour on by the same tardy process, and with the very same materials, as were used by their ancestors; while in England, where the manufacture was totally unknown until the fourteenth century of the Christian era, Sir Thomas Lombe, so far back as 1718, erected at Derby a machine, driven by a water-wheel, by every revolution of which wheel 73,726 yards of organzined silk-thread were thrown off, and amounting per day to 318,504,960 yards! At this day, the silks of China will not bear comparison with those of Lyons, Spitalfields, and Edinburgh; the first for light fabrics, the second for the more substantial, and the last for shawls. Again, in the article of porcelain (from the Portuguese *porcella*, a cup, they being the first who introduced it into Europe), which, until a very late period, continued to be the admiration of the world, we have been enabled, through the researches of Reaumur and other chemists, to compound earths matching that with which nature voluntarily furnishes the Chinese, and not only equal them in the fineness and durability of the ware, but infinitely excel them in elegance of manufacture. For nearly a century, the clumsy fabrics of the Chinese, with their daubs of blue paint, which formerly were the principal ornaments of the mansions of the wealthy, have been driven out of the market by the beautiful wares of Dresden and Sèvres.

The same remarks may be applied to all the other manufactures of China, the principal of which, besides

* Westminster Review, February 1834.

the two above mentioned, are those of cloth, nankeen (or cotton), linen, paper, and ink. In whatever department of art the Chinese continue to maintain a superiority over, or equality with, the rest of the world, the cause is to be found in the bounty of nature, not their own ingenuity. Thus, the beautiful yellow which distinguishes the nankeen cloth is a natural quality of the cotton grown in the province of Kiang-nan (of which Nankeen is the capital), and is to be found in no other district of China. The Chinese still pertinaciously adhere to their ancient practice of fabricating their paper from the bark of the bamboo and Koo-tchoo (by the latter of which names they term it), notwithstanding their being perfectly well aware of the superiority of that made from rags, and the infinitely greater cheapness and simplicity of the manufacture.

The Chinese ink is obtained from the soot produced by the smoke of pines and the oil in lamps, mixed with the isinglass of asses' skin and musk, to correct the odour of the oil. It is principally made in the province of Kiang-nan.

ARTS AND SCIENCES.

What we have said respecting the stationary condition of the manufactures applies equally to the arts and sciences of China. The process of printing continues the same as when originally invented by themselves about 1700 years since. The characters are first written on paper, which is glued upon boards of hard wood, and the engraver carves the characters upon the wood, hollowing out the intermediate parts. When an impression is to be taken off, the printer lays on the ink with a brush, applies the sheet of paper, which he presses down with a softer brush than the other, and with a greater or less degree of pressure, according to the quantity of ink laid on. Such is the primitive mode of printing still persevered in throughout the interior of China, although moveable types are of course necessary in printing the Royal Gazette of Pekin, which is issued daily, and other documents.

One of the most singular features of Chinese genius is developed in their attempts at painting. They display extraordinary powers of minute imitation, and will copy with the utmost exactness the number of petals, thorns, spots, &c., of a flower, and the scales of a fish; but they are utterly unable to mix and soften their tints, and copy every defect as well as excellence in the object of their imitation. They have not the slightest idea of perspective, considering the diminished and faded appearance of distant objects as the consequence of a defect of vision; and they therefore insist upon placing every object in the foreground. When one of their ministers of state beheld a portrait of his Britannic majesty, he remarked that it was a pity it should have been spoiled by the dirt on the face—meaning the shading of the nose. When they draw a picture of the emperor, they consider it would be almost impious to represent him of the ordinary human proportions, and therefore make him twice as large as any of his attendants—the head particularly. But this self-conceited people consider themselves in this, as in every other art, pre-eminent over all other nations, and reject with disdain the remonstrances of European artists.

In sculpture, as in painting, the Chinese have no conception of order, attitude, or proportion; and there can be nothing more monstrously grotesque than the figures which *adorn* their temples, bridges, and tombs. It is affirmed, indeed, by recent travellers, that there is not a statue or column in the whole empire worth notice.

The Chinese music remains in that state of primitive simplicity in which it has been observed to exist in all barbarous nations. Dr Burney says, that "all the melodies of this nation have a strong analogy to the old Scottish tunes;" that "both resemble the songs of ancient Greece;" and that "the music of all three ought to be considered as *natural* music." Their gamut, like that of the Greeks, consists of five natural tones, and two semi-tones; but they use neither lines nor spaces in noting down their music, which they do in a column confusedly, without any attempt at marking time, key, or expression. They always endeavour to play in unison, having no idea of counterpoint or parts in music. Their musical instruments are extremely rude, consisting chiefly of drums, bells, triangles, &c.; and the only kinds resembling those of Europe are a species of lyres, or harps, with strings of silk, and a small organ, or rather Pan's pipe, made of unequal reeds, stuck into a hollow cup of wood, and blown by a pipe for the mouth, which conveys the wind to all the reeds. Dr Burney tried in vain, however, to adapt a scale to this instrument. The great delight of Chinese taste, in short, is in the commingled sounds of all sorts of instruments at once. An anecdote is told of a Chinese of rank, who, being in London, was carried by a friend to one of the theatres. When the orchestra at first commenced, he appeared inexpressibly pleased, but listened with the utmost indifference to the beautiful overture that followed, asking impatiently if the musicians were not going to play again the fine air they did at first? His friend was puzzled to imagine what the air could be; until, upon the performers proceeding to re-tune their various instruments after the first act was over, the Chinese exclaimed, in rapture at the medley of sounds, "There it is—that's it now!" The affected gravity and unsocial life of the Chinese, indeed, are unfavourable to the cultivation of music. They like to see dancing, but not to practise it—like the Turks, considering it a species of labour, not of pleasure. It is told of a Turkish ambassador that when he saw, at a ball given by some nobleman in London, all the nobility and gentry of both sexes capering about on the floor, he expressed unfeigned wonder at their giving themselves so much trouble, and observed contemptuously, "We make our slaves do all these things for us!" And thus it is with the Chinese.

In almost all the mechanical arts, however, the Chinese are wonderfully expert, and in some have attained a degree of perfection unrivalled by any other nation. No people have carried the art of dyeing, or of extracting dyeing materials from animal, mineral, and vegetable substances, so far as the Chinese have done, and this without any scientific chemical knowledge. They show particular dexterity in fashioning ivory fans, baskets, nests of eight or nine moveable balls one within another; "yet it does not appear," says Mr Barrow, "that they practise any other means than that of working in water with small saws. As little can Europeans pretend to rival their large horn lanterns of several feet in diameter, perfectly transparent in every part, without an opaque spot, and without a seam; yet a small portable stove or furnace, an iron boiler, and a pair of common pincers, are all the tools required for the manufacture of those extraordinary machines. Their expertness in cutting tortoise-shell, mother-of-pearl, and all kinds of stones and gems, is extraordinary, and in all the metals they work with extreme neatness.

Respecting the state of science in China, Mr Barrow says, "Nothing has yet appeared in Europe, from an authentic source, to warrant any other conclusion than that of the utter ignorance of the Chinese in the pure, speculative, and abstract science of mathematics. Their knowledge of arithmetic and geometry is bounded by mere practical rules. Their numerical notation is marked down by symbols of the language, as that of the Greeks and Romans was by letters of the alphabet. The common operations of arithmetic are generally performed by a few balls strung on wires (called the *swan-pan*), somewhat resembling the Roman abacus, and sometimes by the joints of the fingers. The measure of quantity is usually determined by reducing all surfaces and sides to the dimensions of squares and cubes; and with those few practical operations they contrive to manage all the common purposes of life." All other recent observers concur with Mr Barrow in attesting the defective knowledge of the Chinese in the science of astronomy, for their proficiency in which they have hitherto enjoyed such high reputation. Their high pretensions in this department turn out to be founded fully as much on superstition as scientific observation. So sensible are the Chinese monarchs of this fact, that for many generations the construction of their vaunted Imperial Almanac has been entrusted to foreigners, the native astronomers only contributing the important department of fixing the lucky and unlucky days, days of festivals, &c. "The Chinese system, if system it can be called," says Mr Barrow, "resembles so closely that which remains of the Hindus, that both must have been derived from the same source. The period, or cycle of sixty years, by which their chronology is regulated—the period of 10,800 years observed by the Tao-tse which is the sum of the first three Hindu ages, with their intermediate periods—the division of the zodiac into twelve signs and also into twenty-eight constellations, or habitations of the moon, corresponding with the twenty-eight Hindu naschatras—are so many signs of a common origin; and both may perhaps have derived the remains of this science from some third nation, more ancient than either; as the little which both nations do possess appears to be the remains rather than the elements of the science." There is, nevertheless, a board of astronomers and mathematicians maintained at Pekin, which is, in fact, one of the official departments of government; and a committee is annually appointed with great ceremony to superintend the compilation of the national calendar. It is curious to see this ostentatious show of a love of learning kept up by a people who are still so ignorant as to reckon that the firmament is a body encircling the earth, the latter of which is a solid fixed square, and round which the sun revolves, as well as the moon; that all the stars are stuck into the sky at an equal distance from the earth;—who gravely decide, by the state of the planetary system, the days proper for taking medicine, marrying a wife, setting out on a journey, laying the foundation of a house, &c. Their geographical is on a par with their astronomical knowledge, as may be imagined from their supposing China to be the middle region of the globe, and terming one mountain, which is reckoned the centre of the empire, the "Navel of the Earth." The more educated are at this day well acquainted with the fallacy of such doctrines, but they are still propagated amongst the mass of the people, as it would be equally impolitic and dangerous to expose the delusions which have obtained credence amongst them from time immemorial, and the gross ignorance of their idolised sages. The fact is, that the pretended knowledge of the literati, and ostentatious patronage of learning by the government, is a mere State-trick, for the purpose of exciting the veneration of the ignorant multitude.

Of natural philosophy, or chemistry, the Chinese know literally nothing, except from a practical acquaintance with the results of certain causes. Of medicine, as a science, their whole stock of knowledge is a combination of quackery and empiricism; and it is a remarkable fact, that the healing art, which, in almost every other quarter of the known world, whether savage or civilised, justly obtains its professors the highest respect, honours, and emolument, is in China so little estimated, that all classes are allowed to practise it *ad libitum*. There are no schools for medical instruction; the theory of the human frame is wholly unknown to them; and they even reject the doctrine of the circulation of the blood. Their remedies are chiefly of a vegetable nature, and consist almost solely of ginseng (a native root), which they pretend to prepare in seventy-seven different ways, rhubarb, China-root, and tea. Their surgical knowledge is equally defective, as may be judged by the fact, that the practice of it is limited almost entirely to the honourable fraternity of barbers. Their operations consist in setting a fracture, reducing a dislocation, letting blood, by scarifying, cupping, or acupunctuation (for they entertain a sentimental horror of the lancet and scalping knife), cutting corns, cleaning the ears, tweaking the nose, beating the back, pulling the joints till they crack; in short, we may sum up our account of Chinese knowledge of the healing art, with the remark of the late Dr Gregory of Edinburgh, that "the emperor of China could not command in all his dominions such medical aid as a smart boy of sixteen, who had been apprentice for one year to a well-employed Edinburgh surgeon, would be able to afford."

LANGUAGE AND LITERATURE.

The language of the Chinese is another branch of their history, respecting which the rest of the world has been impressed with the most preposterous and exaggerated ideas. It has been represented as consisting of millions of characters—as being perfectly unattainable by foreigners, and so forth; and thus has this truly barbarous nation acquired a reputation for philological science as spurious as that which they have enjoyed for other branches of antique erudition. "It is true," as Mr Barrow says, "that their language, more than any thing else, stamps them as an original people. It has no resemblance whatever to any other language, living or dead, ancient or modern. It has neither borrowed nor lent any thing to any other nation or people, excepting to those who are unquestionably of Chinese origin. The written character is just now as distinct from any alphabetical arrangement as it was some thousands of years ago; and the spoken language has not proceeded a single step beyond the original meagre and inflexible monosyllable." All this certainly goes to prove the Chinese to be a primitive people, and so far the circumstance is a moral curiosity; but at the same time it shows their inveterate and immoveable obstinacy in adhering to a system of characters so utterly unreducible to any kind of intelligible vocabulary. The foundation of the language is purely hieroglyphic and symbolical, including all the remarkable objects of nature, such as the sun, moon, earth, fire, water, wood, stone, a horse, a cow, a dragon, &c.; the utensils most commonly in use—a knife, a spoon, a box, &c.; the primary relations of life—a father, mother, brother, son, &c.; some of the most obvious qualities of bodies, as straightness, crookedness, &c. &c. To give a detail of the history of the Chinese language, through its various modifications and arrangements, would occupy the space of volumes, and to no purpose beyond the amusement it might afford to those antiquarians who delight in the investigation of matters as frivolous as they are obsolete. Suffice it to say, that the Chinese language, which has hitherto proved such a mystery to all the rest of the world, has at length been fathomed and rendered clear by the industry of British genius. In fact, the difficulties attending the acquisition of it have proved almost altogether visionary. The industry of Dr Marshman and Dr Morrison has supplied us with grammars and dictionaries of this singular language, and placed within our reach all the supposed treasures it contained. "Europeans," says Mr Barrow, "have been deceived as to the vast number of characters in this language, which was supposed to create its difficulty. In the great Dictionary of Kaung-hee there are not more than 40,000 characters, of which about 30,000 only are in use. The Lexicon of Scapula contains about 44,000 words, Ainsworth's Dictionary 45,000, and Johnson's about the same number. The whole works of Confucius contain only about 3000 different characters. The *Leu-lee* may have, on the whole, about 100,000 characters, but not more than 1800 different ones throughout the whole work. Where, then, can there possibly be any difficulty?" The same writer also adduces numerous instances of Europeans acquiring the Chinese language in a comparatively short time.

From all that has yet been seen, the trouble of learning the Chinese language will be very inadequately compensated by the literary "treasures" of which Mr Barrow speaks. There are no doubt a profusion of poems (so called), novels, histories, and dramas, &c.; but of what character are they? From the translations which we have yet been favoured with, the poems, like some of Ossian's sublime passages, consist of unintelligible imagery; their novels of silly and pointless stories; their histories, as we have already seen, of fables; and their dramas, although for the most part true to nature, yet exhibiting nature in her most revolting forms. M. de Guignes, Mr Barrow, and other visitors of Pekin, assure us that the theatrical exhibitions are beyond every thing abominable and disgusting.

It has been with all writers a theme of wondrous animadversion, how a government so despotic as that of China should make the cultivation of letters a subject of such special anxiety. Even the intelligent Mr Barrow makes a marvel of this fact, notwithstanding that his own writings (had we no other authority) furnish a sufficient explanation of the seeming anomaly. It is true, there is a school to be found in every village of China, and that the instruction of the pupils forms one of the most anxious concerns of the government; but what is the nature or purpose of their education? To instruct them in all the erroneous doctrines of their parents—to confine their knowledge to the native productions of Chinese writers—to make, in short, Chinese politicians of them. The boasted system of education in China is not for the purpose of enlightening the people, but of keeping them in darkness. They are allowed to know nothing of other nations, and cannot therefore comprehend their own degraded and enslaved condition.

RELIGION.

There can scarcely be said to be any religion in China—at least as a system of divine worship or a regulation for the conduct of the people. There is no sabbatical institution, nor congregational worship; no external forms of devotion, petition, or thanksgiving. The emperor takes the sole charge of the spiritual concerns of the people, and is the only individual in the nation who directly addresses the Supreme Being, performing at fixed periods certain ceremonies and oblations. The equinoxes are the times when the grand sacrifices in the temple dedicated to Heaven are offered up, when every kind of business is suspended in the capital. The national, or rather Government-religion, may be described as a sort of Deism. The Tien, or Great Spirit, is invested with the attributes of omnipotence, omniscience, and ubiquity. The names by which this sovereign power is known, are *Whang-tien*, the illustrious heaven; *Chang-tee*, the supreme ruler; *Tien-tee*, heaven and earth; *Che-chung*, the first and the last; *Ken-puen*, root and branch; and other descriptive denominations. In addition to this supreme power, however, the Chinese, like all barbarous nations, invest all the elements with innumerable spirits and genii, fanciful images of which they worship both in their own houses and in temples dedicated to the purpose. These temples are under the care of the Bonzes, who live unmarried, and associate in convents like Romish monks. The idol-worship exhibited in these temples is characterised by every mark of the most debasing and besotted superstition. When a votary has applied to his idol for some time in vain to obtain a certain boon, he abandons the ungenerous spirit in indignation; sometimes demolishing his image, and kicking it through the streets, with every mark of contumely! In every possible circumstance of life, the Chinese implore the protection and aid of some idol. Should a countryman be about to raise a building, or attempt any other work in which he might lie in danger of receiving injury, he places a small stone upright, surrounds it with a few candles, burns two or three gilded papers, and then proceeds to work with perfect confidence. They also consult oracles previous to undertaking a journey, commencing a law-suit, &c.; and thus the Bonzes, who are the interpreters of the responses, are kept in constant employment. So strong, indeed, is the resemblance of the interior of a temple of Fo, the dress of the priests, and the ceremonies of devotion, to those of the church of Rome, that one of the missionaries says, "it seems as if the devil had run a race with the Jesuits to China, and having got the start of them, had contrived these things for their mortification." The foreign religions which subsist in China are the Jews, Mahomedans, and Christians, and these seem to be tolerated merely on account of the public usefulness and learning of the missionaries of these sects. The Christians, for the same reason, are the most generally respected, but have been treated, from time to time, with the most arbitrary capriciousness, being persecuted by one emperor and encouraged by another. In the year 1747, five missionaries were beheaded in Fo-kien, and two Jesuits strangled in the same year in Kiang-nan, all of which was done "according to law," which says, that the chief of any sect who seduces the people from their duties under religious pretences, shall be strangled.

REVIEW OF MANNERS, CHARACTER, AND CONDITION.

From all we have said, it will be evident that civilisation has as yet advanced little beyond the infancy of what may be called agricultural society in China. It may be readily admitted that they were amongst the first of existing nations who arrived at a certain degree of excellence; but it is not less evident that they have long remained stationary, and have even in some points retrograded. "They can only be said," observes Mr Barrow, "to be great in trifles, whilst they are really trifling in every thing that is great." The following assertion of Sir William Jones may almost be literally adopted:—"Their letters, if we may so call them, are merely the symbols of ideas; their philosophy is in so rude a state as hardly to deserve the appellation; they have no ancient monuments from which their origin may be traced, even by plausible conjecture; their sciences are wholly exotic; and their mechanical arts have nothing in them characteristic of a particular family—nothing which any set of men in a country so highly favoured might not have discovered and improved."

In their moral qualities, the Chinese are a strange compound of vanity and meanness, affected gravity and real frivolity—an utter want of all manly judgment and sense, combined with the most insidious art and cunning, the usual accompaniments of vulgar ignorance. The Tartar race are distinguished by a blunt and unstudied frankness of manner and openness of disposition; but the true Chinese betray the most debasing servility of tone and manner—plausible, sly, and artful. They have not the slightest regard to truth, and will assert and deny any thing with the most unblushing effrontery, being also entirely destitute of shame. The pain inflicted by the bamboo is the only consideration they attach to public and disgraceful corporeal punishment. They have neither sense of honour nor self-respect. "A Chinese prince, or powerful mandarin," says a recent traveller, "will commit extortion or oppression whenever he can do it with impunity, and regards it as a matter of right attached to his station. A Chinese trader will cheat and defraud whenever it is in his power, and even piques himself upon his skill in overreaching, as a proof of his talent. A Chinese peasant will pilfer and steal whatever is within his reach, whenever he can hope to escape detection; and the whole nation may be affirmed to have almost nothing in view but their own self-interest and security. Their general character, in short, in point of morals, compared with the minute enforcement of duty by the penal laws, affords an irresistible proof of the utter incompetency of legislation, without the aid of religious principle, to reach beyond the mere external conduct of individuals, or to produce any thing like real social virtue among human beings." In their feelings, the Chinese are cruel, sensual, and vindictive. Mr Barrow, M. de Guignes, and other travellers, all agree in their representations of the inhuman conduct of those in authority. One of the arbitrary laws of China is the compelling of the natives to pull the imperial barges alongst the canals; and Mr Barrow had several opportunities of witnessing the merciless exercise of this authority on the part of the military. The impressed labourers took, of course, every opportunity of deserting; and whenever there was a deficiency of hands, the despotic officials set off to the nearest hamlet, roused the natives out of bed with the whip, made them jump into the water to assist the towing operations, lashing them with long cart-whips all the while with the most ruthless barbarity. Mr Barrow also relates another specimen of Chinese indifference to human life which he witnessed in passing down the great canal betwixt Canton and Pekin. Several persons who had crowded to the brink of the canal, had posted themselves upon the high projecting stern of an old vessel, which broke down with their weight, and precipitated the whole group into the water. Although numbers of boats were plying about at the very spot, not one was observed to go to the assistance of the drowning wretches, whose shrieks and cries were totally disregarded.

Nothing is so significant of the moral condition of a people as their treatment of the female sex, and no where are the women so inhumanely used as in China. They are not permitted to stir out of doors, excepting the wives of the lower orders, who are to be seen toiling at all kinds of laborious tasks, while their indolent husbands are sitting quietly smoking their pipes. In the country they are even to be seen drawing the plough and harrow, while their lazy helpmate drives them on.

Amongst the other moral iniquities of the Chinese, is the crime of infanticide; and from the contempt in which females are generally held, parents expose their female children without the slightest remorse. It is a part of the duty of the Pekin police to go their rounds with carts, at an early hour of the morning, to pick up the bodies of the infants that have been thrown out into the streets in the course of the night, and to carry them, without inquiry, to a common pit without the city walls, where they are thrown in promiscuously. It has been calculated that there are between 20,000 and 30,000 female infants yearly sacrificed in China! What a horrible picture of national depravity does not this one fact present!

In comparison with the lower orders of the Chinese, the slaves in our West India colonies live like princes. They have scarcely an article of furniture, besides two or three jars, a few basins of coarse earthenware, a large iron pot, a frying-pan, and a portable stove. They use neither tables nor chairs, but at meals all the family sit upon their heels round a large pot, with a bowl in each of their hands. After taking the rice from the pot with a spoon, they then take their chop-sticks, which consist of two small pieces of wood, or generally of porcupines' quills, and are held between the two first fingers of the right hand. With this strange utensil they throw their food into their mouths with remarkable expedition. Boiled rice is their staple food, with the addition of millet or barley; but they likewise eat all sorts of animal and vegetable putrescent substances. The dead hogs thrown overboard the ships in the river at Canton are greedily picked up by the natives; and in the public market, dogs, cats, and rats, are exhibited for sale. It is strange, that, amongst this sober people—for sobriety is the only offset they present to their innumerable immoralities—there is almost no use made of milk.

INTERCOURSE WITH FOREIGN NATIONS—BRITISH TEA-TRADE.

The systematic discouragement which the Chinese government displays towards all intercourse with foreign nations, explains the trifling amount of commerce carried on in a country adapted better than any other in the world for its prosecution, whether we consider its geographical situation, its productions, or the genius of the people. The innumerable rivers and canals with which the country is intersected, present facilities for internal communication possessed by no other country; yet there is no regular system of trade amongst them; it consists almost solely of barter, there being no circulating medium, excepting a small copper coin, the value of which is almost too minute for calculation. It is reckoned that on the grand Pekin canal there are upwards of 10,000 boats and barges of various descriptions continually employed in the interchange of national produce. Of the commercial capabilities of China, indeed, we need only look to the immense number and crowded state of their cities. These are divided by the Chinese into three classes, according to the number of leagues which they occupy; and of the first class alone—or *imperial* cities, as they term them—the natives enumerate upwards of 4000. There is much exaggeration here no doubt, but even estimating the number of social communities at a third or even a fourth of what is set down by the Chinese, what an enormous source of consumption for all the necessaries of life is here shown! What an unbounded mart for all kinds of British manufactures would be thrown open by the removal of the government restrictions upon commerce! That the people of China are anxious for this free intercourse with other nations, has been abundantly shown; and in fact their greedy and peculatory disposition sufficiently guarantees the readiness with which they would engage in foreign traffic. But the all-powerful constraints of the government hang like a millstone round their necks. Whatever be the ignorance of the lower classes, there is no want of enlightenment in the executive, which is conscious that a free trade would inevitably lead to the breaking up of the whole despotic system of ruling. Their jealousy, indeed, is not so much to be wondered at, considering the precedent before them in the rise of the British power in the neighbouring kingdom of India—the only wonder is, that amid all the turmoils of war which have disturbed the world during so many ages, this country, so fertile in every thing which can make a country desirable, should have remained totally unmolested. That it is not from internal strength, is well known. At this moment they can hardly be said to possess either army or navy; and an army of 20,000 disciplined British soldiers would effect the conquest of China in a few weeks or months. Their sole protection has been their distance from the moving events of Europe.

It is well known that the foreign trade of China is confined exclusively to one port—that of Canton. The overland trade with Russia and India has now almost entirely ceased. So great is their jealousy of the Russians, indeed, that the latter are the only people interdicted from even visiting Canton. To enter upon a history of the origin and progress of British intercourse with China, would be to interfere with a subject already in progress, and which will probably form another topic for our INFORMATION—India and the East India Company. We need, therefore, merely observe in this place, that hitherto that Company has enjoyed exclusively the right to trade between China and Britain. This monopoly they have possessed since the year 1600, when they obtained their first charter; and although the continuance of it has proved a popular subject of animadversion for a long series of years, it seems questionable whether, without such an association, we would ever have obtained intercourse with that remote region. Their wealth and enterprise, through a long-continued series of difficulties and losses, were alone the means of establishing this branch of British commerce; nevertheless, having outlived the period of their utility, and their right to enjoy a monopoly any longer, they have very properly been denuded of their advantages over private traders.

Tea does not appear to have been known in Britain previous to 1650, and it is evident, from the following note in Mr Pepy's Diary, that many years elapsed previously to its coming into general use:—"September 25, 1661. I sent for a cup of tea (a China drink), of which I had never drunk before." And in 1664, there is mention made of the East India Company commissioning their foreign agent to purchase 2 lbs. 2 oz. of tea as a present to his majesty! From this time forward, however, the increase in the consumption of tea increased with a rapidity scarcely less wonderful than the progress of the British cotton manufacture. Such was the demand for it, that smuggling increased to an amazing extent. So much so indeed, that in 1784, Mr Pitt carried his measure for reducing the duty from 119 to 12½ per cent.; and the consequence was, that the legal imports of tea were almost immediately doubled. In 1795, however the duty was raised to 25 per cent.; and after successive augmentations, in 1797, 1800, 1803, and 1806, it was raised to 96 per cent. *ad valorem*. At this it continued till the year 1819, when it was raised to 100 per cent. upon all teas that bring above 2s. per lb. at the Company's sales, at which rate they have ever since continued. This system, as every one knows, is soon to be broken up by the act of Parliament, which throws open the trade between China and Britain after the 22d April 1834.

Canton, at which the whole of the foreign commerce is carried on by the Chinese, and, consequently, at which all the exports of tea take place, is situated on the eastern bank of the river Pekiang, a beautiful placid stream, as wide as the Thames at London. This great outlet of Chinese trade is about 400 miles in length, and Canton stands at the distance of 80 miles from its mouth. Canton consists of two descriptions of towns—that which is inclosed by walls, and the suburbs; both together, they are said to contain from seven to eight hundred thousand inhabitants. The circuit of the walls, which are of a moderate height, and furnished with a few cannon, is estimated by some at five, and by others at nine, miles. Only about a third part, however, of the space inclosed is covered with buildings; the rest is occupied with pleasure-grounds and fish-ponds. The neighbouring country is very charming, hilly towards the east, and presenting in that quarter a beautiful prospect. The houses are generally low; and towering above them may be seen temples and pagodas. The populous streets are long and narrow. At night the gates are closed, and bars thrown across the entrance to the streets. From this inclosed city, as well as from every other town in China, all foreigners are rigorously excluded; and these, provided they have permission, must take up their abode in the suburbs, which contain a very miscellaneous population, though not therefore inferior in point of accommodation or appearance. But the most curious particular regarding Canton is the existence of a floating town on the river, consisting of perhaps forty or fifty thousand barks, junks, and vessels of various kinds, arranged close to each other in regular rows, with passages between them to allow other vessels to pass. This floating town extends several miles in length. For what reason we know not, the owners of these vessels and their families are not allowed to come ashore, and so they spend the whole of their lives on the water.

Foreigners are not permitted to go ashore and reside at pleasure at Canton. Their only land establishments consist of *Hongs* or Factories, which extend in a line along the banks of the river, from which they are distant about 100 yards. They are built on a broad quay, with a spacious promenade in front. The hongs or factories individually consist of courts or lanes, admitting of no thoroughfare, and solely dedicated to the accommodation of the foreign residents. Large warehouses for the reception of goods are adjacent. The place of the Chinese suburbs which is most frequented by foreigners, is termed China Street, consisting entirely of shops, in which the native dealers are to be seen seated from morning till night. Their tricks in entrapping British seamen into purchasing their commodities, have long been matter of notoriety. Their signs uniformly exhibit an English name as well as a Chinese one; and having picked up an acquaintance with the most familiar of Jack's expressions, their mode of addressing their rough customers evinces at once the crafty and unscrupulous disposition of the natives.

The manner in which foreigners have heretofore conducted business at Canton is as follows:—When a ship arrives, it is necessary immediately to get a native merchant (or, as he is called, a Hong merchant) to become security for the import and export dues, as well as for the good behaviour of the crew. In this there is never found the slightest difficulty, there being, on the contrary, always a competition amongst the natives for the honour of a consignment. The import duties consist of a tax upon the different species of goods, as well as a tonnage upon the vessel. Their mode of determining the latter is curious enough. They measure the ship from the centre of the foremast to the centre of the mizenmast, for the length, and close abaft the mainmast, on the outside, for the breadth; then multiplying the length by the breadth, they divide the product by ten, and hold the quotient to be the proper result. Although destitute of a native currency, with the exception of the small copper coin before mentioned (called a cash), foreign coins are quite current in Canton, especially Spanish dollars. In fact, it is affirmed that there is no port in the world where business is conducted with such facility and dispatch. In addition to the tonnage and cargo charges, there is also levied what is called a *kumshaw*, or present to government, exigible from ships of every burden alike. It has been estimated that all these various port charges, including the expenses of victualling the ships, &c., amount to about 7000 dollars on a ship of 400 tons register.

The British trade with Canton has hitherto consisted of two branches—that of the East India Company, and that carried on by private individuals in the British ports in India; who began to be tolerated (under certain restrictions) at the renewal of the Company's charter in 1814, and whose business has increased so rapidly, as almost entirely to supersede the exports of the Company from China in every article but that of tea. This is shown by the fact, that, in 1813, the Company's exports amounted to nearly L.1,000,000, and in 1829, to only L.583,651. In fact, the expensive mode of the Company's transacting their business at Canton, leaves it doubtful whether they have derived the smallest benefit from their monopoly for many years. The expenses of their establishment, consisting of supercargoes, writers, repairs on houses, &c., have annually amounted to between L.140,000 and L.150,000.

Up to the present time, the importing of tea has been confined exclusively to the port of London, the government-tax or duty being an *ad valorem* one of 100 per cent. upon all teas sold as above 2s. per lb., and 96 per cent. on all sold at 2s. or under; but if rated at the sale price, when that is doubled by the Company, the duty also is doubled; or, in other words, the public are compelled to pay above 300 per cent. more than it would otherwise cost them!

It has been hitherto customary for the East India Company to expose their teas periodically at public sales—previously announcing the quantity to be disposed of; so that they have had the privilege of regulating the price according to their pleasure. The purchasing of the teas has all been managed by professional brokers on behalf of the tea-merchants, who, after examining the lots, mark each box with a conventional sign, expressive of its quality. By this process of sale, the public have, as it appears, been seriously injured. The persons employed in purchasing teas at the periodic sales have pursued a practice of leaguing among themselves to bid up the prices considerably above what they ought to be; and hence, by the duplication of the duty above a certain price, the public, as above stated, have hitherto paid much higher for their tea than what the article can be bought for in America, Hamburgh, and other places abroad, where the same kind of monopoly has not existed. From these complicated causes of the enhancement of the price of tea, it appears that the consumption of that article has been declining in this country from the beginning of the present century. In 1801, with a population of 10,942,646, the amount of tea consumed was 20,237,753 lbs. or 1 lb. 13 oz. to each individual. In 1811, with a population of 12,609,864, the amount of tea used was 20,702,809 lbs. In 1821, with a population of 14,391,631, the amount of tea used was 22,892,913. And in 1831, with a population of 16,537,398, the amount of tea used was 26,043,223, or one pound nine ounces to each individual. The East India Company and its advocates have long endeavoured to persuade the people of this country that no British free-trader could possibly negociate the purchase of a good cargo of tea at Canton—that their good credit, their extensive system of dealing, their knowledge of Chinese customs, &c., give them a preference with the Hong merchants over all other competitors. We take the liberty of saying that this is a pure fallacy. Witness the dealings of the Americans, the Dutch, the French, the Portuguese, and others, with the Hong merchants. "The American intercourse with China," says M'Culloch, "commenced shortly after the termination of the revolutionary war, and has since gone on rapidly increasing, so as to constitute one of the most valuable branches of the trade of the United States." Mr M'Culloch gives a table showing the extent of the exports from Canton to America from 1804 to 1826–7, by which, in the last-mentioned year, it is seen that the Americans had twenty-six ships in the tea-trade, and that the total value of exports from China was 4,363,788 dollars. "The principal articles," continues this most accurate authority, "carried by the Americans to China, are bullion, furs, Turkey opium (an article legally prohibited), English woollens and cottons, and ginseng. The commodities exported by the Americans from China are tea, nankeens, raw and wrought silk, sugar, cassia, and camphor, with minor articles." The Americans are exceedingly enterprising in this, as in every other trade in which they engage. The teas chiefly imported by the Americans are souchong, gunpowder, hyson, young hyson, and hyson skin; it therefore appears they principally use green, or a more delicate tea than the British. The price of tea per pound in the United States is in general about a half what it is in England. The Dutch are less enterprising than the Americans, yet they seem to take the lead among the continental nations at Canton. The Dutch tea-trade, like that of America, is free, and the effects of this free-trade are observable in the following table of the comparative prices of tea at London and Hamburg:—

Species of Tea	Coy's selling price, per lb, in 1828-29.		Prices at Hamburgh, per lb, in 1828-29.		Excess of Coy's prices over those of Hamburgh.		Excess of Hamburgh prices over those of the Company.	
	s.	d.	s.	d.	s.	d.	s.	d.
Bohea	1	6¼	0	8¼	0	10		
Congou	2	4	1	2½	1	1½		
Campoi	2	0	1	2	1	7		
Souchong	2	10¼	1	1¾	1	8½		
Pekoe	3	9¼	4	6¾			0	9½
Twankay	2	5¾	1	2¼	1	3½		
Hyson skin	2	4	0	11¼	1	4¾		
Hyson	4	1¾	2	8	1	5¾		
Gunpowder	6	6¼	3	5¼	3	1		

Mr M'Culloch, from whose excellent work we quote the foregoing table, presents the following forcible view of the injurious effects which have been sustained through the exclusive privileges of the East India Company:*—"Bohea is the cheapest of all sorts of tea brought from China, and is, consequently, most generally consumed by the lowest classes. From 1793 to 1811, its price, at the Company's sales, amounted to about 1s. 6d. per lb. In 1812, it was raised from 1s. 7d. to 2s. 3d., and continued at about that rate till 1825-26, when it was reduced to 2s., and has since fluctuated between 1s. 6d. and 1s. 7d. This fall has had the effect of increasing the consumption of bohea from about 2,000,000 lbs. in 1823-25, to 3,788,012 lbs. in 1828-29—a striking proof of the powerful influence of a reduction of price in augmenting consumption! But were it not for the monopoly, the price of bohea might be farther reduced from 1s. 6d. or 1s. 7d. to 8½d. or 9d.; for such is the difference between the price charged for it by the Company and its price at Hamburgh, New York, &c.! Were it reduced to this extent, it may be fairly presumed that the consumption of bohea would amount to 7,000,000 or 8,000,000 lbs. The vast increase that has taken place in the consumption of coffee since 1807, shows the prodigious influence of low prices in extending the demand for such articles. Coffee, however, is troublesome to make, and is neither so suitable for, nor so well liked by, the poorer classes as tea. Its increased consumption is in fact quite as much owing to the system followed in the tea-trade, as to the reduction of the duty affecting itself.

"Congou is the next cheapest tea disposed of by the Company. It was sold by them at 2s. 11d. per lb. in 1815-18, and they have since permitted it to fall to about 2s. 4d.—an inconsiderable decline, compared with that which has taken place during the same period in the price of pepper, and other eastern articles imported by free-traders. Congou is used by the middle classes, and forms about two-thirds of all the tea consumed in the empire. Notwithstanding the reduction of its price, it is still sold, like bohea, at an advance of about 100 per cent. over its price in Hamburgh. The rate of advance on the finer species of tea is not so great, so that the weight of the monopoly falls principally on the lower and middle classes. It should, however, be observed, that the exorbitant price of tea in this country has driven all but the very wealthiest class to the secondary qualities; and it is to this that it is owing, that, notwithstanding England is the richest country in the world, and the taste for tea is more generally diffused amongst us than amongst any other people, we consume very little of the superior qualities! Indeed, some of the finest are not to be met with in our markets; and while about a dozen kinds of tea are regularly quoted in Hamburgh, Amsterdam, and New York Price Currents, there are never more than seven, and sometimes only six, species to be met with here. Imperial—a very fine green tea, regularly imported into America and all parts of the Continent—is unknown in the English market. Singlo, once imported by the Company, has disappeared for about 40 years. Pekoe and gunpowder, the finest qualities of black and green, are little known in the English market, and, in fact, are only imported in small quantities by the officers of the Company's ships. Thus, like all other monopolies, that of the supply of tea has not only the effect of adding enormously to its price, but of substituting inferior in the room of better qualities. Were their prices the same, can there be a doubt that superior teas would be in as great demand here as in the United States?"

By the operation of the act of Parliament passed in 1833, abolishing the monopoly of the East India Company, the British tea-trade will be placed on a footing resembling that on which it stands in America and other countries; it being decreed to be "expedient that all his Majesty's subjects shall be at liberty to repair to the ports of China; and to trade in tea and all the other products of the same empire," under certain restrictions. In future, therefore, vessels may be freighted from any port in the United Kingdom to trade with China, and hence the dealers in tea will be supplied by importers on a fair principle of competition, and without having the article heightened in price by the interference of the London traders. At, or shortly after, the opening of this great trade, misarrangements may occur to the detriment of the public; but it is clear that a free-trade in tea will ultimately be conducted on the most advantageous terms for the people, not only as regards the reduction of prices, but the introduction into use, as in America, of a superior quality of teas. The new law provides that, in lieu of the duties recently payable on tea, there shall be collected and paid, from and after the 22d day of April 1834, the several duties following; that is to say—For every lb. of bohea, 1s. 6d.; for every lb. of congou, twankay, hyson skin, orange pekoe, 2s. 2d.; for every lb. of souchong, flowering pekoe, hyson, young hyson, gunpowder, imperial, and all other teas not enumerated, 3s. As this scale of duties must prove a source of endless disputation at the various places of import, from the difficulty of ascertaining one quality of tea from another by tasting or by examination, there can be little doubt but a fixed duty will be imposed instead.

* M'Culloch's Commercial Dictionary, a work containing the most ample, and, we believe, the most accurate details on the subject of the tea-trade; and which we recommend to the perusal of all who are interested in the traffic with China.

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CHEMISTRY.

Chemistry is the science which defines the laws or principles which regulate the combinations of elementary particles of matter, and relates to those operations wherein the nature of bodies is changed, or by which they acquire new properties. The term Chemistry is of doubtful derivation; but it seems to have been applied at an early period to various methods of melting or preparing metals, and was identified with the visionary science of alchemy, which professed to be the art of transmuting copper and other base metals into gold and silver. It is only within the last sixty or seventy years that chemistry has risen to the rank of a science; but during that period it has advanced towards perfection with a rapidity unparalleled in the history of philosophy. The applications of chemistry are universal. There is no science so immediately conducive to human comfort. To whatever art or manufacture we turn our attention, we find that it has either been created by chemistry, or indebted to it for some of its greatest improvements. In the present sheet, it is our object to present a simple and intelligible view of the principles of this exceedingly important science, with a description of the various elemental bodies, and their more immediate combinations. We shall commence with the laws of matter: the first of which to be noticed, is

ATTRACTION.

The term attraction, in its general signification, denotes that power or force by which the masses or the particles of matter are made to approach each other, and either to come only into contact or to enter into intimate union. Attraction is every where diffused, and it is impossible to conceive of the universe subsisting without it. It is the tie which connects the most remote parts of it together; and were it dissolved, the spacious fabric of the universe could no more exist as it does at present; the particles of which the countless worlds or globes are composed, would literally exhale into space like dew-drops before the rising sun, and nothing of the beautiful creation would exist but an infinity of invisible atoms which renounced the society of each other. There are various kinds of attraction. That of gravitation, which causes the weight of bodies, and which is exerted at apparent and frequently immense distances, and between masses of matter of the most stupendous magnitude. Of this species of attraction we have already given an account in the number of this work which was devoted to Astronomy. The attractions dependent upon magnetism and electricity also operate at sensible distances, and so far coincide with gravity. There is also capillary attraction, which, however, we need not advert to.

But, besides these, there is a species of attraction which is exerted between particles of matter, and which takes place in general at insensible distances. That all bodies are composed of minute atoms, the aggregate of which constitutes masses of matter, is a fact too obvious to stand in need of illustration. These particles adhere to each other with various degrees of force, and can be separated by methods which it is the province of the chemist in a more particular manner to investigate. The species of attraction by which particles are made to unite, is of two kinds. When it is exerted between particles of a similar nature, it is called the attraction of aggregation or cohesion; and when it is exerted between particles of a dissimilar nature, it is called chemical attraction or affinity, or the attraction of composition. The distinction between these two kinds of attraction may be thus shown:—If a solution of common potashes be mixed with oil, a union immediately takes place between the particles of the two bodies, the result of which is a new substance possessing properties entirely different from either of the constituents in a separate state. This change is effected by means of chemical attraction, which takes place only between particles of matter of a different nature. The new body which has been formed is the useful article soap; and if the watery vapour be driven away from it by the application of heat, it assumes a solid consistency, as in the form in which it is commonly used for domestic purposes. Now, it is familiar to every one that the particles of the soap adhere to each other with a certain degree of tenacity, and the application of force is necessary before one part of the wedge can be separated from another. This results from the attraction of cohesion.

The restoration of cohesion to a body after it has been deprived of it, is exhibited in a great variety of instances. For example, if a large quantity of sugar which has been dissolved in water be allowed to stand and cool, the attraction of cohesion will take effect between the particles, and the sugar will again resume the solid form. Here, however, a remarkable circumstance has occurred. Whatever the state of the sugar may have been originally, it invariably, in resuming its solidity, assumes a particular form, one of great regularity and beauty. It was formerly opaque, it is now transparent; originally a shapeless mass, it is now a prism of six sides, surpassing in lustre and symmetry the products of the lapidary's wheel. This solid spontaneous production is called a crystal; and the process by which it is produced is entitled

Crystallisation.—Bodies, whether solid, fluid, or vaporous, are susceptible of assuming the crystalline form, and the substances which do so are numberless. The shapes which the crystals take, and the facility with which they assume them, are various. Instances of crystallisation, such as sea-salt, Epsom salts, saltpetre, are familiar to every one. Water, it is well known, when cooled to a certain degree, assumes the form of ice, which is crystalline. There are two modes of producing artificial crystals. First, by dissolving the substance of which we wish them to be formed in water, and allowing the *solution* (as the dissolved substance is termed) to cool; or by melting it by fire without water, and allowing it to cool slowly. The same body does not invariably exhibit the same form of crystals; there may be several forms of crystals belonging to one body, but in one or other of these it is sure to crystallise, and not according to any other form. It is also to be observed, that very different kinds of matter may crystallise after the same model.

Whether or not all the attractions subsisting between bodies be referable to one general cause, modified by circumstances, is still a question amongst philosophers; and such it must remain, until some great discovery be made in chemistry similar to the theory of gravity, which, although minutely described by Plutarch, was only explained and applied to astronomy by Sir Isaac Newton. The attraction of gravitation is foreign to our subject; that of cohesion has been already sufficiently explained; those dependent upon magnetism and electricity will come to be treated of in a number of this work which we intend to devote to these subjects. Therefore, there only remains chemical attraction to be adverted to.

CHEMICAL ATTRACTION OR AFFINITY.

We have already shown, that the attraction which has received this name is that which unites the atoms of two or more distinct substances, so as to form one perfect homogeneous compound. This process is, in chemical language, termed *Combination*. It is quite distinct from aggregation, which is the union of particles of a similar kind, forming a mass which has the general properties of the particles of which it is composed, whatever may be its structure and form. It is also to be distinguished from *Mixture*, in which the particles, although they may be intimately blended, are not, as it were, amalgamated with each other so as to lose their own individual natures, and become endowed with entirely new properties. The difference between the two will be clearly seen from the following example:—If into a crystal bottle we pour a quantity of oil and a quantity of water, and shake them well together, the two substances can never be made to unite permanently together. Although they appear to be so for a short while after the experiment is made, yet, if the vessel be allowed to stand for a sufficient length of time, the particles of water, being heavier than those of oil, will descend to the bottom, whilst those of the oil will settle upon the top. Here, then, it is evident that there has been no chemical attraction exerted between the particles of the two bodies, because no chemical change has taken place. In a word, there has been a mechanical mixture without any chemical combination. But if with the water in this experiment we mix a quantity of potash, so as to form a pretty strong solution, the results will be very different. The particles of the two bodies will intimately combine with each other, and a compound will be formed, having properties entirely different from either the oil or the potash. The substance obtained in this experiment, as we have already noticed, is soap. The general name for the substance formed by chemical combinations such as these, is a *Compound*; the substances of which it is composed are called its component or constituent parts or principles. The separation of these is termed *Decomposition*; and when decomposition is performed for the purpose of ascertaining the composition of a body, it is named *Chemical Analysis*. The reunion of the constituent parts is denominated *Chemical Synthesis*. Integrant particles of a body differ from the constituent particles thus:—The latter are the most minute parts into which a compound body can be resolved by decomposition, and are hence of a different nature, both with regard to each other and the substance itself which their mutual union gives rise to. The integrant particles are the most minute parts into which any body can be resolved *without* decomposition.

THE LAWS OF CHEMICAL COMBINATION AND DECOMPOSITION.

There are various laws connected with, and phenomena attendant upon, chemical attraction. Besides those already mentioned, which are, that it takes place only between bodies of a different nature, that the qualities which characterise bodies when separate are changed or annihilated by their combination, and that it takes place only between the atoms or most minute particles of bodies, there are the following:—Chemical attraction can take place between two, three, or even a greater number of bodies. A change of temperature always takes place at the moment of combination. The force of chemical affinity between the constituents of a body is estimated by that which is requisite for their separation. But the most important and perhaps most familiar law is, that the degree of attraction varies very considerably in different bodies. That bodies have a stronger tendency to unite more closely with some substances than with others—that, to employ the language of mental philosophy, the particles of matter exercise various degrees of likings and dislikings, is a fact upon which the whole science of chemistry depends. It is evident that, from the strength of affinity varying in different bodies, all chemical compositions and decompositions are effected. The preference of uniting with another substance which any given body is found to exercise, is metaphorically termed elective attraction, or affinity. It is of two kinds, each of which derives its appellation from the number and the powers of the principles which may be brought into contact with each other. When a simple substance is presented to a compound one, and unites with one of the constituents of the latter, so as to separate it from that with which it is combined, and by this means producing a decomposition, it is said to be effected by *simple elective attraction*. Some substances, however, will not be thus easily decomposed; and it is found necessary to introduce two or more principles, in order to effect the end in view. When two principles, therefore, are presented to a compound body, and when the principles unite each with one of those of the compound substances, two new substances are formed; and all instances of decomposition in this manner are said to be effected by *double elective attraction*. It is to be observed, that all changes effected in this manner are permanent, and that the new compound thus formed cannot be decomposed, until a substance having a more powerful attraction for one of their constituents than they have for each other, is brought into contact with them.

To the prince of philosophers, Sir Isaac Newton, we are indebted for the first attempt at a rational explanation of chemical combination. He was of opinion that the minute atoms of certain bodies attract each other with an unknown but enormous force, which begins to exert itself only when the particles are at very small distances from each other, and that, accordingly, this force exerts itself, and the bodies unite when they are brought within the requisite distance. These views slowly made their way into the science; but towards the middle of the eighteenth century, they seem to have been almost universally adopted. The term chemical affinity was substituted for that of attraction, and the strength of the affinity existing in bodies came to be measured according to the order in which they were decomposed. It is unnecessary to mention the various tables of affinity which were published previously to that of Bergman, who in 1775 gave to the world a copious table of affinities, and appears to have fixed the opinions of chemists in general to his own views of the subject. According to this philosopher, the affinity of each of the bodies, say *a*, *b*, *c*, *d*, for *x*, differs in intensity in such a manner, that the degree of affinity in each may be expressed by numbers. He supposed affinity to be elective, in consequence of which, if *a* have a greater affinity for *x* than *b*, if *a* be presented to the compound *b x*, a decomposition will ensue, *b* will be set at liberty, and the compound *a x* will be formed.

These views of Bergman were admitted until the beginning of this century, when Berthollet published his Chemical Statics. He believed atomic attraction to be similar to that which exists amongst the planetary bodies; but he supposed that the strength of affinity depended a good deal upon the state of the particles, as well as upon other circumstances. The force of attraction, therefore, according to this theory, must increase with the mass of the attracting body; and hence, affinity cannot be elective in the literal sense of that word. But if Berthollet overturned Bergman's notions regarding elective attraction, he did not place a better theory in its stead as explanatory of phenomena; for he was compelled to affirm, in consistency with his views, that bodies united in all proportions—an absurd hypothesis, which is refuted by

THE ATOMIC THEORY.

This theory was not discovered all at once and immediately acknowledged by chemists; it was gradually brought to light by the repeated experiments of successive philosophers, whose labours, however, it will be impossible to exhibit a view of in this place. To Mr Dalton, an honoured name, we are indebted for the first developement and demonstration of the fact that bodies unite in definite proportions; and of which we shall now attempt to present the reader with as clear and simple a view as possible. Whilst engaged in determining the composition of the two gases called severally carburetted hydrogen and olefiant gas, Mr Dalton discovered that for complete combustion they require *different* but *determinate* quantities of oxygen gas. A volume[a] of carburetted hydrogen requires two volumes, whilst a volume of olefiant gas requires three volumes of oxygen gas.

The conclusions at which Mr Dalton arrived are, that bodies consist of *atoms* incapable of further diminution or division; that in chemical combinations it is these ultimate particles which unite; and that, in the case above mentioned of the combustion of the two inflammable gases, carburetted hydrogen is a compound of one atom of hydrogen and one atom of carbon; whilst olefiant gas is a compound of one atom of hydrogen and *two* atoms of carbon. The atoms he considered as spheres, and represented them by such symbols as a circle with a dot in the centre, a circle with a vertical diameter, and the like. In this manner the composition of a number of the best known bodies was represented by him, and the ratios of the weights of the atoms of the simple bodies inferred. For instance, he concluded from his experiments that carburetted hydrogen is composed of, hydrogen one, and carbon five; while olefiant gas is composed of, hydrogen one, and carbon ten. Now, as the former gas consists of one atom of hydrogen and one atom of carbon, then the weights of these atoms are to each other in the relation of one to five. If the weight of the atom of hydrogen, therefore, be represented by one, that of carbon will be five. In this manner, the ratios of the weight of the atoms of all the simple bodies may be ascertained by a careful analysis of the compounds formed by the union of the simple bodies.

We shall recur to the gases again, but in the meantime will illustrate the doctrine of definite proportions by some familiar examples of the fact. The combinations of mercury or quicksilver with some other bodies, afford a striking proof of the truth of the theory. If this brilliant white fluid metal be agitated for some time in the open air, the surface becomes covered with a black, insipid, insoluble powder. This arises from the metal having combined with oxygen, one of the gases of which the atmosphere is composed, and hence is termed an oxide. It consists of two hundred parts of mercury and eight of oxygen. If, however, the metal be subjected to a considerable degree of heat, it will be converted into a red shining mass, which is also a compound of the metal with oxygen; but in the latter case, sixteen parts of oxygen have united with the two hundred parts of the metal. The combinations of mercury with sulphur are also striking on this point. Innumerable instances of the same kind might be adduced, but these are sufficient to prove the remarkable truth, that when different substances combine by chemical attraction, the proportions of the ingredients are always uniform; that for every atom present of one substance, there is exactly one, or two, or three, &c. of the other. Thus, if there be ten atoms of one substance, there are exactly ten or twenty, &c. of the other, but never an intermediate number, as thirteen or twenty-three to ten; for then a particle of the compound would consist of one atom of the first, and of one and three-tenths, or two and three-tenths, &c. of the second substance, which is absurd, as atoms are considered indivisible. If, for instance, any quantity of sulphur, intermediate between the two combinations of that substance with mercury, be added, it will not combine with it, but remain as a foreign ingredient in the sulphuret of mercury, as the compound is termed. All bodies, however, do not unite in several proportions, thus giving rise to several distinct compounds from two elements; there are many elementary bodies which will only unite with each other in one proportion, so that any two of such substances can only form one compound.

EQUIVALENT RATIOS.

The result of these investigations has been the formation of scales exhibiting the equivalent ratios of chemical bodies, and which are expressed by numbers. It is evident that some body must be fixed upon and expressed by unity. Hydrogen gas, being the lightest known body in nature, and combining in the smallest proportion by weight with the other simple substances, has been taken as a standard of comparison for the combining proportions, or *equivalent numbers* of all other bodies; and which, in all likelihood, are simple multiples of its number. Oxygen has also, by some chemists, been taken as the standard of comparison, and represented by ten. Water is a compound of eight parts by weight of oxygen, with one part by weight of hydrogen; which two gaseous bodies we shall afterwards describe. Whenever hydrogen and oxygen gases are burnt in any proportion whatsoever, they invariably form water; and they cannot be made to combine directly in any other proportion. From this, Dalton concluded that water is a compound of one atom of hydrogen and one atom of oxygen. But the weight of the latter gas being eight times that of the former, then it followed that the atom of oxygen was just eight times heavier than the atom of hydrogen. Hence, if the latter be represented by one, then will the former be represented by eight, according to those who take hydrogen as the standard. Those who take oxygen as the standard, and represent it by 10, make the equivalent for hydrogen 1.25; the result is of course the same for the proportion of 1.25 to 10, being exactly the same as that of 1 to 8.

These observations relative to water lead us to speak of the doctrine of volumes, so generally embraced by chemists upon the Continent. The union of gases is always effected in simple proportions of their volumes; and a volume of one gas combines with an equal volume, or twice or three times the volume of another gas, and in no intermediate proportion.

ELEMENTAL BODIES.

With regard to the elements of matter, chemists have agreed amongst themselves to consider all those bodies as simple which have not yet been decomposed. It is not implied that they are absolutely so, for the probability is, that the metals, as well as other substances, are compounds, and may yet be resolved into simpler constituents, when other agents shall be detected in nature, or other Davys shall arise to apply those which now exist, in a manner of which we are as yet in ignorance. It is also probable that the atoms of simple substances sometimes appear united in groups of two, three, or more atoms. On these suppositions we could explain some problematical phenomena, which otherwise cannot be accounted for.

There are at present fifty-four substances which are accounted simple, from their not having yet been decomposed. For the convenience of study, they have been artificially divided into two classes, according to the manner in which they arrange themselves at the poles of the voltaic pile. The first comprises those elements which are attracted by the positive pole, and have been called *electro-negative* bodies. The second consists of those which are attracted by the negative pole, and have been termed *electro-positive* bodies; of course, the electrical energies of these substances are merely comparative; for in a compound of two bodies of the same class—say the electro-positive—one will be less electro-positive than the other, and will consequently pass to the positive pole during decomposition. In order to understand what has been stated above regarding positive and negative electricity, it will be necessary to describe a voltaic pile, or rather battery, as by that apparatus the powerful fluid is now made to develope itself. A voltaic or galvanic battery is a wooden trough, divided into a number of compartments, in which are placed, at intervals, plates of copper and zinc soldered together. The trough is filled with fluid containing an acid, and from each end a wire proceeds, the extremities of which are brought into contact with the substance which is to be experimented upon. One of these wires conducts the negative and the other the positive electricity; and hence the extremities derive their respective names of negative and positive poles, round which, the constituents of the substance, undergoing decomposition, arrange themselves, the electro-negative bodies at the positive, and the electro-positive at the negative poles.

Tables have been formed representing the order in which substances are decomposed; but this order is not invariable, for the electrical state of bodies, which is influenced by the temperature, considerably affects their decomposition. From the small number of elementary substances, which, as already mentioned, amount to fifty-four, is all the beautiful variety of terrestrial matter composed!

HEAT OR CALORIC.

In our investigations of the phenomena of the material universe, we perceive two kinds of motion, which result from the two principles *Attraction* and *Repulsion*. Of the former we have already spoken, and it only remains to say a few words upon the latter. Repulsion, like attraction, takes place both at sensible and at insensible distances. The former is exemplified by the flying off of the same light bodies which have been first attracted, after they have been some time in contact with a piece of excited resin or glass, and also by the recession from each other of the two similar ends of two magnetised needles. Repulsion at insensible distances, which is chiefly excited by heat, or, as it is called in chemical language, caloric, is exhibited in a great variety of phenomena connected with the principle. Whether heat be a material substance pervading matter, or only a peculiar state or condition of matter, is still a doubtful point in philosophy, there being ranked on both sides of the question some of the greatest names of ancient and modern times. But the settling of this question is of comparatively little importance: the effects produced upon the material universe by the agency of heat are palpable to every one, and admit of no dispute. It is the great counteracting principle to attraction; for when a continued addition of heat is made to any body, the distances which exist between the constituent atoms is increased, and the bulk of the body is enlarged. Matter is capable of existing in three different states; namely, the solid, fluid, and aëriform. If the principle of heat did not exist, we can only conceive of matter existing in one state, which would of course be that of solidity. It is the application of heat which first softens a hard or solid body, and then causes it to assume the fluid and aëriform states. Thus, ice, when heated, becomes water, and water, when heated to a greater degree, becomes steam. If heat again be abstracted from the steam, it assumes the fluid state, and, if further cooled, it takes the solid form of ice. Thus there is kept up amongst material substances a continual struggle between the attraction of aggregation and the repulsive power of heat, which, combined with the various effects produced by heat upon different substances, gives rise to the beautiful variety of solids, fluids, and airs, exhibited in external nature.

EXPANSIVE POWER OF HEAT.

Heat exists every where, and can be obtained from every thing. All bodies, whether solid, fluid, or aëriform, can be made to evolve heat when subjected to certain processes; so that there is not in nature such a thing as absolute cold. Even ice contains a quantity of heat; for by chemical means it can be made colder than we find it in its natural state; and chemists are from time to time discovering processes by which a greater degree of cold can be obtained than any previously known. Heat being thus an agent universally present in matter, it becomes a question of some moment, what are the effects which it produces in matter? The first and most remarkable of its properties is that of *dilating* or expanding bodies. This fact must be so familiar to every one as scarcely to require illustration. It must have been frequently observed, that the iron rim or hoop of a coach or cart wheel is heated to a considerable degree before it is put upon the wheel. The reason of this is obvious: when hot, the circle is a good deal larger than when cold, and thus slips easily upon the wheel; as it cools, the circle decreases, and thus firmly binds the woodwork together. In the expansion of fluids, we have a familiar example in the measurer of heat itself, the *thermometer*. The mercury in the glass tube rises and falls, that is, expands or contracts according to the quantity of heat which is imparted to it. The expansion of aëriform substances is illustrated by a bladder being partly filled with cold air, and held before the fire. The air will swell out, or expand with the heat, and become in some instances so tense as to burst the bladder. The general law, therefore, is, that the expansion and contraction of matter are, with a few exceptions, dependent upon the increase and diminution of heat. The quantity or condition of heat that is discoverable by the simple measurer of heat above alluded to, or by the organs of sensation, is called *Temperature*. We are unacquainted with the extremes of temperature, relative either to heat or cold. It has been compared to a chain, the extremities of which are concealed

[a] Volume, in chemistry, is a term employed to denote any quantity in bulk of a substance. It is usually applied to the gases. Thus, one volume of hydrogen gas is, say, a cubic foot, yard, or any other quantity, then two volumes is of course just double the cubic foot, yard, or whatever other quantity was previously mentioned.

from view, whilst only a few of the middle links are exposed to observation. Although the universal result of an increase of temperature is an increase of bulk to the body thus subjected to heat, yet all bodies are not alike expanded by the application of the same quantity of heat. The same increase of temperature causes a liquid to expand more than a solid, and an aëriform body more than either. It of course follows as a general law, that different bodies at equal temperatures do not contain the same quantities of caloric. This quality of matter is called the capacity of bodies for heat, and the quantity of heat which is necessary to raise any particular body to a certain temperature, is called its *specific* caloric.

LATENT HEAT.

When a body changes from the solid to the fluid state, there is a quantity of heat absorbed, which has no effect in raising the temperature. This has been called *latent* heat, a discovery effected by Dr Black, and which we shall shortly explain. For a demonstration of this doctrine, we may have recourse to water. If ice at a temperature below 32° be exposed to a warmer atmosphere, it receives caloric, and gradually rises to that point of the thermometrical scale. But as soon as it reaches it, the rise of temperature ceases, the ice begins to melt, and during the whole period of its liquifaction, its temperature, as also that of the water flowing from it, remains stationary at 32°. It is evident, that, as caloric has continued to be communicated, a quantity of it has disappeared, and become absorbed during the fusion. The same phenomenon takes place when a liquid is converted into vapour; and the inference drawn from it is, that when a body passes from one state into another, a quantity of heat or caloric is lost, becomes latent, or passes into the body without raising its temperature. Dr Black was of opinion that this latent heat became chemically combined with the solid, and was the cause of fluidity. Dr Irvine, his pupil, took a different view of the subject. He supposed that the absorption of heat into the latent state is not the cause of liquifaction and vaporisation, but the effect. The absorption he attributed to what is called change of capacity for heat, or that quality of matter which causes one kind to be more or less heated than another, by the addition of the same quantity of heat. He concluded, as a general law, that the capacity of all solids for heat is increased by fusion, and that of all fluids by evaporisation. It is impossible to enter further into this interesting subject in this place; but, before quitting it, we may mention an exception to the law of expansion by heat in the case of water. It is well known that water freezes at 32°, but it does not increase in density below 39½°. It is then at its maximum, and above or below that point its density diminishes. Hence ice is specifically lighter. The earth alumina, which will be afterwards described, also possesses the remarkable property of being contracted by heat.

EQUAL DIFFUSIVE POWER OF HEAT.

We shall now shortly advert to some other phenomena connected with caloric. It has an invariable tendency to establish or maintain an equilibrium; that is, to *diffuse* itself equally over the material world. Thus, a bar of hot iron, when brought into contact with the colder atmosphere, gives forth its heat, until it becomes of the same temperature as the surrounding air. The facility with which bodies absorb or part with their caloric, depends upon the nature of the body; and the property is called the capability of bodies to *conduct* heat. Thus, if a piece of wood and a piece of iron be put into the fire, the iron soon becomes too hot to be touched, whilst the wood may be laid hold of with impunity by one extremity whilst the other is burning. The metal is a good conductor, therefore, and the wood a bad one. Solids are better conductors than fluids; and, generally speaking, the greater the specific gravity of the body, the greater is its conducting power. This observation, however, is not universally true. Besides their power of conducting heat, as it were from particle to particle in themselves, bodies have the power of *radiating* heat. Thus, the iron bar just alluded to threw off to the surrounding atmosphere heat in the form of radii or rays. Some bodies have greater power of radiating heat than others; and those that radiate quickest, cool in the shortest time. Hence, by the rapidity of cooling, the radiating power of bodies can be made manifest by experiment. For instance, if two vessels, both of tin plate, but one of them having its outside coated with lamp-black, be filled with boiling water, and two thermometers introduced, it will be found that the water in the blackened vessel cools a great deal more rapidly than that in the other. Upon this principle of the different radiating powers of bodies, a number of domestic utensils are formed; for example, teapots of shining metal, which retain the fluid which they contain hot for a length of time. Good conductors are bad radiators, and present bad receiving surfaces. Bodies have also the power of reflecting heat, in the same way as we see them reflect light. Metals are the best reflectors of caloric, and the worst radiators; and it is generally the case, that the reflecting power of bodies is strong in proportion as the radiating energy is weak. It is therefore necessary, that, for the reflection of heat, the reflecting surface must not only be hard and well polished, but it must also be of a material which is a bad conductor and absorber. Such are the principal phenomena connected with heat. We shall now shortly advert to a physical agent closely allied to it, namely,

LIGHT.

The nature of light, like that of heat, is still unknown to us. There are two theories respecting it: the first is, that light is a real substance emanating from the sun, and from all luminous bodies, from which it is projected in right lines with great velocity; the second is, that the sensation of light is produced by the vibration of a subtile fluid filling space—and is hence called the undulatory theory. An examination of these theories, however, does not belong to this place. The connection between light and heat is so obvious, that it is scarcely possible to examine the one independently of the other. If a mass of iron be put into a fire for some time, no change is produced except the expansion of the metal and the elevation of its temperature. Gradually, however, as the heat is communicated, a remarkable occurrence will be observed. The iron becomes ignited or red-hot; in other words, it emits light, and renders objects visible. The original sources of light are, first, the celestial bodies, as the sun and stars; and, secondly, terrestrial bodies, as a common fire or candle. Light passes freely through the atmosphere, and, striking upon objects, is reflected or thrown back by them; and thus they become visible. By means of a wedge of glass called a prism, light can be separated into seven colours, which are violet, indigo, blue, green, yellow, orange, and red. But it is only with the chemical agency of light that we have to do. Its influence in this way is conspicuous in a variety of natural and artificial processes. In vegetation it is indispensable, as without it plants are deficient of their due elementary constitution. They are weakly, inodorous, and of an unwholesome colour. Vegetables which grow in the dark have a blanched appearance. The power of light to dispel vegetable colours is manifest in bleaching, where a dingy web becomes pure and white by exposure to the sun's rays. Its energy is still more decisively seen in the influence which it exerts in promoting chemical combination and decomposition, and the latter effect has been made use of as a measure of its power. Light enters into a kind of transitory union with certain substances, rendering them visible in the dark. Bodies which possess this property are called phosphorescent; such are the shells of fish, the bones of land animals, marble, limestone, and the like. The glow-worm is a remarkable instance of phosphorescence in living animals.

COMBUSTION.

Combustion may be called the disengagement of heat and light, whilst certain substances are entering into chemical combination. It is entirely distinct from *ignition*, which results simply from an elevation of temperature, without being accompanied by any change in the chemical constitution of the body thus rendered incandescent. It is unnecessary to enter upon the various theories which have from time to time been brought forward to account for this every-day phenomenon. It is now generally admitted, that whenever the chemical forces which determine either composition or decomposition are energetically exercised, the phenomena of combustion or incandescence with a change of properties, are displayed. A question naturally arises, whence come the heat and light evolved during the process? To this interrogatory no satisfactory response has ever yet been given. They are sometimes referred to the condensation which usually takes place during chemical combination; but there are instances where light and heat are produced during the expansion of bodies, as in the case of the explosion of gunpowder. The fact is, that the whole is still a mystery; but no doubt, we think, can exist, that the generation of these imponderable substances, if substances they be, is intimately connected with the disengagement of the electric fluid. We must wait in patience for a solution of the problem, until the genius of man has discovered more delicate instruments of philosophical investigation than any with which we are as yet acquainted.

AIR AND WATER.

We prefer commencing our description of individual substances with the two above named, not only because they are familiarly known to us, but because they are composed of the three gaseous or aëriform bodies which hold the most conspicuous place in the material world. The air or atmosphere is an invisible fluid encircling the globe all round, and which rises above it to the height of about fifty miles. Its various uses in the economy of nature are so striking, and so conspicuous at every step of scientific investigation, that in ancient times it was looked upon as one of the primary elements of matter. By the practical philosophers of modern days, however, it has been discovered that it is a compound composed of two gases or airs, namely, oxygen, which signifies a generator of acidity or sourness, and azote, which literally implies no life, because it destroys animal life. Water was also looked upon by the ancients as a simple substance, but modern investigation has proved it also to be a compound. Its constituents are oxygen and hydrogen, which latter word signifies to create or form water. Atmospherical air consists of oxygen one-fifth, and azote four-fifths (estimated by volume under the same pressure), with a small proportion of what is called carbonic acid gas, and also watery vapour. Water consists of one volume of oxygen and two of hydrogen, and can easily be made by an electric spark being passed through a jar containing these two gases, mixed in the above proportions. We shall speak more in detail when we come to describe the elemental substances individually.

ACIDS.

Acids are a most important class of chemical compounds, and have the following characteristic properties:—The greater number of them have a sour taste, and most of them are very corrosive. They change vegetable blues to red, are soluble in water, and unite with the alkalis, earths, and metallic oxides, forming what are called salts; an order of bodies of the highest importance in the arts, manufactures, &c. Some acids are destitute of a sour taste, but their affinity for the three classes of bodies above-named is always characteristic. Acids are all compound bodies, and some of them have more than one basis or radical. There are a number of acidifying principles, but oxygen (which shall be immediately described) is the most extensive one. The acid is distinguished by the name of its base, and its degree of oxydation; that is, the quantity of oxygen it contains by the termination of that name in *ous* or *ic*, or the prefix *hypo* (under). The highest degree of oxygenation is marked by the termination *ic*, as nitric acid, and the salt which is formed from it is made to terminate in *ate*; the next by that of *ous*, as nitrous acid, and the salt which is formed from it is made to terminate in *ite*; and the lowest by *hypo*, as the *hypo*nitrous acid. Sometimes oxygen combines in a greater quantity with the acidifiable radicals, in which case the product is said to be superoxygenated. All acids are not susceptible of these various degrees of oxygenation, some being limited to only one. There are a considerable number of acids, and the number is continually increasing by the discovery of new ones; but of the most important there are few, and these we shall notice as we come to treat of their bases.

SALTS.

This term has been usually employed to denote a compound in definite proportions of acid matter with an alkali, earth, or metallic oxide. When the proportions of the constituents are so adjusted that the resulting substance does not affect the colour of infusion of litmus or red cabbage, it is then called a neutral salt, because the peculiar powers of both bodies are suspended and concealed; they are rendered neutral or inactive. When bodies combine in such a way as to satisfy their mutual affinities, they are said to *saturate* each other. When the predominance of acid is evinced by the red of these infusions, the salt is said to be acidulous, and the prefix *super*, or *bi*, is used to indicate this excess of acid. If, on the contrary, the acid matter appears to be in defect, or short of the quantity necessary for neutralising the alkalinity of the base, the salt is then said to be with excess of base, and the prefix *sub* is attached to its name. These compounds are denominated salts, because they generally have a saltish taste.

METALS, OXIDES, EARTHS, AND ALKALIS.

We arrange these classes of substances together, because, although they are to a certain extent distinct, yet they have all a very remarkable relationship, as we shall shortly see.

Many of the metals, such as iron, lead, &c., are familiarly known to every one, but there are a great many others which are very rarely to be met with. The following are some of the characters which distinguish metals from other bodies: They are hard, heavy, and opaque; insoluble in water; they possess a peculiar lustre; admit of being so highly polished as to reflect light; are capable of being melted by heat, and of recovering their solidity by cooling; most of them may be extended by hammering, and some of them into the thinnest films. They are of various colours, and require different degrees of heat to fuse or melt them. They occur in the earth in what are called *veins*, and are seldom found in the pure metallic state, but generally in combination with some other substance, in which state they are called *ores*. The metals, which are all simple bodies, will be individually described afterwards.

When metals are subjected to heat until they become melted, they combine with the oxygen of the atmosphere, and form what are called *oxides*. Oxides are destitute of those properties which distinguish the metal from which they are formed. Instead of being bright, shining, elastic, and ductile substances, they are generally a dry, earthy-looking powder. Other substances besides metals, however, are capable of being converted into oxides; and it must be kept distinctly in view, that in every case there is not so much oxygen imparted as will produce *acidification*. Oxygen frequently combines in various proportions with a substance rendering it an oxide, but without advancing it to the state of an acid. In order to distinguish each compound thus formed, the language of chemistry is very systematic. The first is called a *prot*oxide; the second, a *deut*oxide; and the third, a *per*oxide.

The term *Earths* was formerly, and is still, but in a modified sense, applied to several substances which compose all the various rocks, stones, gems, mountains, and soils covering the surface of the globe. They are tasteless, inodorous, dry, uninflammable, sparingly soluble, difficultly fusible, and of moderate specific gravity. Their number is ten, and their names are, silex, alumina, magnesia, lime, barytes, strontites, zircon, glucine, yttria, and thorine. The four first have long been known to mankind; the remainder have been discovered in our own times. These bodies will be more particularly described when we come to treat of their metallic bases. *Alkalis* may be defined—those bodies which combine with acids so as to impair or neutralise their activity, and produce what are called salts. They are distinguished by properties the reverse of acids, and the two classes are generally looked upon as antagonist substances. Besides the power of neutralising acids, there are four alkalis, namely, potash, soda, ammonia, and lithia, which possess the following properties in a high degree: They change vegetable blue to green, red to purple, and yellow to a reddish brown; they have an acrid and urinous taste; they are powerful corrosives of animal matter, with which they combine so as to produce neutrality; they also unite with oils and fats, forming the well-known substance soap; they combine with water and alkohol in any proportion. Four of the earths, namely, lime, baryta, strontia, and magnesia, possess alkaline properties to a considerable extent, and are hence called alkaline earths. These bodies differ from the pure alkalis, inasmuch as they become insoluble in water when neutralised by carbonic acid. Moreover, alkalis possess the power of changing vegetable colours *after* being saturated with carbonic acid, and by this criterion they are distinguished from the alkaline earths.

Twenty-five years ago, few substances seemed more likely to retain a permanent place in chemical arrangements than the solid and refractory earths which compose the crust of the globe; and also the alkalis so widely diffused in nature, and so useful in the arts and manufactures. It was long observed that the properties of earths very nearly resemble those of the compounds of oxygen and metals called metallic oxides; but it remained for the brilliant genius of Sir Humphry Davy to show that both the earths and alkalis are metallic oxides.* It thus appears, then, that the globe is one vast mass of various kinds of metals, disguised by various substances, but chiefly by oxygen. We have here a complete view of the method by which nature has elaborated the endless diversity of material substances around us. Oxides, we see, are produced by the combination of a certain quantity of oxygen with a metal or other substance. Earths and alkalis are simply metallic oxides; whilst a farther impregnation of these substances with oxygen produces an acid; and, lastly, the union of acids with alkalis, &c. gives rise to that very numerous and important class of substances called salts.

It will now be necessary to describe the fifty-four elementary substances of which all the various compounds of nature and art are formed. There is nothing either very wonderful or mysterious in the fact, that, from this small number of fundamental constituents, the infinite variety of objects should be produced; because, as we have seen, any given two of them, if made to unite in different proportions, can be made to produce the most opposite substances. These, again, united with each other, give rise to new compounds, which are susceptible of being combined, and so on through an almost infinite rotation of chemical union. Of the elemental substances at present known, five seem capable of combining with all the others. They are the most electro-negative of all known bodies. Hence, when they are disengaged from the compounds which contain them, by the agency of galvanism they always arrange themselves round the positive pole. When combined with a certain portion of the other simple bodies, they form *acids*; and when, with the rest, they constitute *bases* or *alkaline bodies*, are capable of uniting with and neutralising the acids, as we have formerly observed. To these five bodies the name of *supporters of combustion* has been given. The eighteen bodies, which, when combined with the supporters, become acids, have been distinguished by the name of *acidifiable bases*. The thirty-one bodies, which, when united with the supporters, become alkalis, have been called *alkalifiable bases*.† Here, then, are three sets of simple bodies; and as this classification of them is not only convenient, but justifiable on philosophical principles, we shall adopt it. The *simple* supporters of combustion are as follow:—Oxygen, chlorine, bromine, iodine, and fluorine. They are all most important in chemistry, as well as in the economy of nature; but the first is in every respect entitled to precedency.

OXYGEN.

Oxygen gas is a permanently elastic fluid; that is, one which no compressing force, or degree of cold, hitherto applied, has ever been able to reduce to a liquid or solid form. It forms, as we have already observed, one of the constituents of the atmosphere, is colourless, destitute of taste and smell, and possessed of all the properties of atmospherical air. Its specific gravity is 1.1111, that of common air being reckoned unity.‡ Combustible bodies burn in it with more brilliancy, and more light and heat is evolved, than when combustion takes place in the atmosphere. Animals breathe it without inconvenience for a much longer time than they can do the same bulk of common air; and it is indispensable to animal, perhaps vegetable, life. Oxygen has the power of combining with every other simple body; the multifarious compounds which it thus forms, such as oxides, acids, and bases, or alkalis, we have already adverted to. In the act of respiration, oxygen, in the nice economy of the human body, is made to unite with it, and becomes a portion of the human frame; perhaps it is nearly allied to the principle of animal life. Vegetables also inhale and exhale it at certain seasons, so as admirably to supply what is absorbed by animals. It is the intensely rapid chemical union of oxygen with the combustible body, which gives rise to the light and heat in our common fires, candles, &c. It may be readily procured from a variety of substances, as, for instance, from saltpetre or the black oxide of manganese. These may be introduced into a gun-barrel, with the touch-hole plugged up. From the orifice of the barrel let a tube be conducted into an inverted glass jar, filled with water. When the other extremity of the apparatus is subjected to heat, the oxygen gas is expelled from the manganese, and, entering the glass jar, displaces the water, and fills the vessel. This is a cheap and easy method of obtaining this remarkable aëriform body.

CHLORINE.

This is a gaseous body of a yellowish-green colour, a strong suffocating smell, and of a pretty strong astringent taste. Reckoning air as unity, its specific gravity is 2.5. If breathed undiluted, it destroys animal life; however, it not only supports combustion, but possesses the remarkable quality of setting fire to many of the metals, even at the common temperature of the air, when beaten out into thin leaves, and introduced into it. The combinations of metals with chlorine are called *Chlorides*. Chlorine possesses the property of destroying all vegetable colours, and of rendering vegetable bodies exposed to its action white. This property has occasioned the introduction of chlorine into bleaching; for if unbleached linens be exposed to its action, the matter which gives them their grey colour is destroyed, and the substance assumes its natural whiteness. Chlorine, however, must be used cautiously, for if applied in its pure and not sufficiently diluted state, it destroys the fibre of the cloth. Chlorine combines with oxygen in four different proportions: two of them contain so much oxygen as to form acids; these are, chloric acid and perchloric acid; but as the other two do not manifest any acid properties, they are to be considered as oxides, and are called protoxide of chlorine and peroxide of chlorine. Besides uniting with oxygen, chlorine combines with hydrogen, and forms the well-known acid called

Muriatic Acid.—If chlorine and hydrogen be mixed together in equal volumes, and exposed to common daylight in a glass flask, they will in a little time combine, and even explode in combining, if exposed to sun-light or the light of a candle; two volumes of muriatic gas result. Its specific gravity is 1.2844; in its pure state this gas is transparent, colourless, and elastic; under very strong pressure it condenses into a liquid. Water absorbs this gas with avidity. One cubic inch at 69° absorbs 417,822 cubic inches of the gas; heat is produced, and, when cold, the bulk of the water is increased to 1.3433 cubic inches. This is liquid muriatic acid. With these proportions of constituents, its specific gravity is 1.1958; one hundred grains of it consist of 40.39 of real acid, and 59.61 of water. It is a colourless liquid, and, when exposed to the air, it smokes, because the gas exhaled condenses the moisture of the atmosphere. It extinguishes both flame and life, and is not inflammable. It is of a pungent, suffocating, and somewhat aromatic smell. It powerfully reddens vegetable blues. The best method of obtaining it is by pouring sulphuric acid upon an equal weight of sea-salt, and collecting the gas which is given off over mercury. An immense number of salts are formed from the combination of muriatic acid with oxides; such as common sea-salt, which is a muriate of soda. These are very extensively used, both in the arts and medicine. Chlorine combines with azote, and forms what is called

Chloride of Nitrogen.—This is an oily liquid, and the most powerfully explosive compound known. In this respect it is one of the most dangerous substances of nature; it consists of four volumes of chlorine combined with one of azote. Chlorine combines with carbon, but the compounds are unimportant.

BROMINE.

The term bromine is from a Greek word, signifying "a strong disagreeable odour." This substance was discovered only so lately as the year 1826; it resembles chlorine in many of its habitudes. It is of a brownish-red colour, very disagreeable smell, sharp strong taste, powerfully corrosive of organic bodies, and, when taken internally, a violent poison. Its specific gravity is 2.96; it destroys vegetable colours almost as powerfully as chlorine. Like chlorine, it sets fire to certain metals when brought into contact with it; it is not combustible, and it extinguishes combustion; it becomes solid at a little below zero; but if combined with water; so as to form a hydrate, it affords fine red crystals at 32°. An acid is formed by the combination of bromine with oxygen, and is called bromic acid; another with hydrogen is called hydrobromic acid. Chlorine also combines with it, and forms a chloride. There are numerous other combinations of bromine, but the compounds are unimportant.

IODINE.

This substance was first discovered in 1811 by a saltpetre manufacturer of Paris. It is derivable from sea plants, and in some of its properties much resembles chlorine, which is also a marine production. If common sea-weed be powdered dry, and treated with sulphuric acid whilst subjected to heat, a violet-coloured vapour is expelled, which, if collected in a vessel, condenses into scaly dark-grey crystals, somewhat of a metallic lustre. These are iodine, so called from the violet colour of its vapour; iodine being a Greek word, and signifying "violet coloured." Its specific gravity is 3.0844. Its smell is disagreeable, its taste acrid and hot, and it possesses poisonous properties. It is a powerful stimulant, and has of late been much employed as a medicine. It destroys vegetable colours, but not so completely as chlorine. It melts when heated to 224½°, and volatilises at 351½°. It forms a beautiful blue colour when mingled with water holding starch in solution; it is itself slightly soluble in water, but more so in alcohol and ether. Iodine combines with oxygen in three proportions, forming iodic acid, iodous acid, and oxide of iodine, with chlorine, forming chloriodic acid, with bromine in two proportions, forming bromides, and also with azote and hydrogen. But a particular account of these substances does not require to be given in this place.

FLUORINE.

The existence of this substance, strange to say, is conjectural; yet its separate identity is supported by the strongest analogies. It exists, or rather is supposed to exist, in fluor or Derbyshire spar, and is thus provisionally called fluorine. If some of this mineral in powder be distilled with strong sulphuric acid, from a leaden retort (a vessel somewhat of the shape of common Rupert drops) into a leaden receiver kept cold with ice, an intensely active fluid is produced. "It has," says Davy, "the appearance of sulphuric acid, but it is much more volatile. When applied to the skin, it instantly disorganises it, and produces very painful wounds. When it is dropped into water, a hissing noise is produced, with much heat, and an acid fluid is formed." This substance has been called *hydrofluoric acid*, because it is conjectured to have fluorine as a base, combined with hydrogen, to form an acid upon the principle which we have formerly described. Other views have been adopted with respect to this substance, but the above is the one now generally admitted.

Such are the properties of the supporters of combustion. Their atomic weights, according to Dr Thomson, are as follow:—Oxygen, 1; fluorine, 2.25; chlorine, 4.5; bromine, 10; iodine, 15.75. There exist, therefore, as we have seen, *oxygen*, *chlorine*, *bromine*, *iodine*, and *fluorine* acids, and the same number of sets of *bases*. Let us now direct our attention to the *simple acidifiable bases*, which are the following eighteen substances:—

HYDROGEN.

Hydrogen gas is a permanently elastic fluid, transparent and colourless, and, when *pure*, destitute of taste or smell. It can scarcely be said to exist in an isolated state, but it forms one of the constituents of water, from which it can be disengaged by various simple processes. It is the lightest body with which we are acquainted, and is employed in combination with other gases to inflate balloons. A bladder filled with this gas will ascend in the atmosphere, in the same manner as a piece of cork or wood plunged by force to the bottom of a vessel of water. Hydrogen will not support combustion, but is itself remarkably combustible. When one volume of oxygen is mixed with two of hydrogen, it burns with a loud explosion, by an electric spark, or the contact of a red-hot wire. The product of this experiment is water. It is said that a few cautious draughts of this gas may be taken, but it cannot be inspired for any length of time without occasioning death. Frogs live in it for a long time, so that these animals must take a tenacious hold of animal life. By far the most important compound of hydrogen with any other substance is that with oxygen, forming the indispensable fluid which covers nearly two-thirds of our globe, water. This substance in scientific language should be entitled an oxide of hydrogen. It unites with the other supporters of combustion; but the compounds, except muriatic acid, already mentioned, are not of any great importance.

AZOTE OR NITROGEN.

This gas is permanently elastic, transparent, colourless, and inodorous. It is a very little lighter than oxygen. When breathed, it destroys animal life; and a burning body, if immersed in a jar containing it, is instantly extinguished. It is not combustible; it enters extensively into combination; it is an abundant element in animal matter; and its existence in such large quantity is a chief distinction between the constitution of animal and vegetable life. Its existence in the atmosphere we have already adverted to. Whether it is chemically united with oxygen in that compound, or only mixed with it, is unestablished. That it has the property of combining with all the supporters of combustion, there can be little doubt; but the subject has not yet been thoroughly investigated. With oxygen it unites in no fewer than five proportions; by far the most important chemical compound is

Nitric Acid, or *Aquafortis*.—This virulent substance is a compound of one volume azotic, and two and a half volumes of oxygen gas. Common nitric acid is of an orange colour, on account of its containing a little muriatic acid, as also a little sulphuric acid and water. Light has likewise an effect upon it. The specific gravity of the strongest procurable nitric acid is 1.55.

* See Chambers's Journal, No. 26.

† Article Chemistry, in the Encyclopædia Britannica, seventh edition, one of the best treatises extant, and written by the able chemist Dr Thomson.

‡ Specific gravity is explained in a note at the end of the sheet.

and then it contains one-seventh of its weight of water; that of commerce is about 1.423, and contains two-fifths of its weight of water. Nitric acid has very remarkable effects upon water with regard to the production of heat. If diluted with half its weight of water, heat is evolved; but if the water be in the state of snow, intense cold is the result. Hence, this compound is employed to produce great degrees of cold. If nitric acid very concentrated be thrown upon phosphorus, charcoal, or oil of turpentine, it inflames them. It is very extensively used in the arts, and forms a numerous and important class of salts, having the generic name of *Nitrates*, such as nitrate of silver, nitrate of potash, &c. Some of these we shall notice afterwards. *Nitrous acid* is a compound of the same kind, but with a lesser quantity of oxygen. Amongst the other compounds of azote and oxygen, that entitled the *protoxide of azote*, or, as it was formerly called, *nitrous oxide*, is the most remarkable. Davy discovered that we may breathe it for a short while without any effect being produced, except an exhilaration of the mind similar to that which takes place during the earlier stages of intoxication. Combustibles burn in it more brilliantly than in common air. It is probable that this gas may yet be found available in medicine. There is also a *deutoxide of azote* and a *hyponitrous acid*, but these do not require minute detail. Azote combines likewise with chlorine and bromine; but the next most important compound is that which it forms with hydrogen, and which is familiarly known to us by the name of

Ammonia, or *Hartshorn*.—It is obtained in the state of gas, by means of the salt called *sal ammoniac*, which is a compound of muriatic acid and ammonia. This substance is to be introduced into a retort, along with quicklime, and then subjected to heat. Ammonia is driven off in the form of gas, and is to be collected in glass jars standing over mercury. Ammoniacal gas is colourless, has a strong pungent smell, an acrid caustic taste, and cannot be drawn into the lungs. Its specific gravity is 0.59027. Water absorbs 780 times its volume of this gas, and in this state it is employed for chemical purposes. When the gas is mixed with chlorine, a sudden combustion and detonation takes place. The chlorine unites with the hydrogen of the ammonia, and forms muriatic acid, whilst the azote is disengaged in the state of gas. The muriatic acid formed, combines with a portion of ammonia, and forms sal ammoniac. Ammonia is an alkali, and possesses the properties distinguishing this class of substances in a very decided manner. It of course neutralises acids, and the salts which it forms are numerous, and of considerable importance.

CARBON OR CHARCOAL.

Charcoal is the substance which remains when wood or any vegetable substance is exposed to red heat in close vessels. The properties of this substance are various and remarkable, and it affords a most striking proof of the extraordinary differences of appearance which the same body may assume, and also of the intrinsic worthlessness of some of those objects upon which we set so high a value. We are all aware of the enormous price which is paid for a good diamond, and yet chemical investigation has proved it to be, beyond all question, only a bit of carbon! The diamond burns in oxygen with a brilliant flame, and, like charcoal, forms carbonic acid; like charcoal, it also forms steel, in combination with iron. The difference between the two bodies seems to be chiefly in their state of aggregation, the diamond being harder, and crystallised. Charcoal is destitute of taste and smell. When new made, dry, and warm, it absorbs gases in very large quantities. It is probably on account of this property that it acts so powerfully as an antiseptic, and removes the tainted odour given out by bodies during the process of putrifaction. No effect is produced upon carbon by the most intense ordinary heats, except that it is rendered harder, denser, and more sonorous. Carbon combines with all the supporters of combustion, and also with hydrogen and azote. When it is burned in oxygen, intense light and heat are produced, and a compound is formed, entitled

Carbonic Acid Gas.—This gas possesses very remarkable properties; its specific gravity is 1.5277. It is colourless, has an acrid taste, and, when applied to the nose, excites a pungent sensation. No combustible will burn it; and its effect upon animal life, when inhaled into the lungs, is evinced by the fate of persons who incautiously expose themselves to the vapours of charcoal burning in ill-ventilated apartments, or who venture into large vessels in which fermentation had been conducted, as in breweries, distilleries, &c. Animals give out this gas during expiration; and it is also generated by the combustion of wood and coal; so that it is not surprising that a portion of it should always exist in the atmosphere. This gas combines with bases, and forms a genus of salts called *Carbonates*. Like all weak acids, it unites in various proportions with most of the bases. With one half the quantity by volume of oxygen gas, carbon forms what is called *carbonic oxide*. This gas, if inspired, acts as a poison. Those who breathe it become immediately deprived of sense and volition. Carbonic oxide cannot be condensed by pressure into a fluid. It possesses no acid properties, and is not absorbable by water. It unites with chlorine, but the compounds are unimportant. There is another combination of carbon with oxygen, called

Oxalic Acid.—This substance is derivable from digesting sugar along with nitric acid. The acid is deposited in small crystals, which have an intensely acid taste, and, when taken internally even in small quantities, destroys life. It combines with bases, and forms a genus of salts called *oxalates*. Carbon and chlorine are capable of uniting in three different proportions, with bromine in one or two, and with iodine in two. But we must pass from these compounds to those of far greater moment, which it forms with hydrogen.

There are many combinations of carbon with hydrogen, and much uncertainty prevails, both with regard to their number and nature; they are all designated by the name hydrocarbons, or more properly hydrocarburets. Marsh gas, fire damp, or carburetted hydrogen, is that which bubbles from the bottom of stagnant pools, and issues from the fissures of coal mines. It is transparent, colourless, elastic like common air, and has a disagreeable smell, if not well purified, when it is nearly inodorous. If it be mixed with twice its volume of oxygen gas, and a lighted taper applied, or an electric spark passed through, an explosion takes place with a loud report, and carbonic acid and water are the results. Carburetted hydrogen consists of one volume of carbon vapour and two volumes of hydrogen gas. Its specific gravity is 0.5555. It is fatal to animal life if breathed. Olefiant gas or bicarburetted hydrogen is similar to the former, but contains double the quantity of carbon vapour. It burns with great splendour, producing a dense white flame.

COAL GAS.

Carburetted and bicarburetted hydrogen bear very different relations to the wellbeing of man: the former, when a spontaneous production of nature in mines, is one of the most terrific instruments of destruction, and a great obstacle to human industry; for, by mixing with a certain quantity of common air, it acquires the property of exploding when accidentally kindled, and thousands of human lives have fallen sacrifices to its violence, until the splendid invention of the safety-lamp divested it of its terrors. Bicarburetted hydrogen is the chief, although not the most abundant ingredient in *coal gas*, now so generally used for illumination; the other ingredients are carburetted hydrogen, hydrogen, and carbonic oxide. Coal gas is made by introducing a quantity of bituminous coal into a large iron cylinder called a retort, close at one end, and furnished with a mouth-piece at the other, for closing or opening it; there is also a tube for carrying off the gas and other products as they form. A quick strong heat is applied round the cylinder, and a vast quantity of gas, composed of the four ingredients just mentioned, is thus extricated, with tar and an ammoniacal liquor, both of which are condensed by passing through pipes immersed in cold water. There is a great difference in the relative proportions of the gases in the mixture, as also in the quantity of tar, according to the quality of the coal, and the mode of applying the heat. The more tar the gas holds dissolved, the more dense will be the flame when the gas is made to burn, and the more disagreeable will be the smell when it is not burning. A slow heat gives much tar and little gas, and that little of a poor quality; a quick heat gives much gas, of good quality, and less tar. Owing to these and other causes, the illuminating power of coal gas varies much. Before it is let through the conducting tubes for public consumption, it is well agitated in contact with a mixture of lime and water, or passed through strata of loosely strewed hydrate of lime; it is thus deprived of much of its smell, and also of some of its illuminating power. On an average, a chaldron of good Newcastle coal, weighing 25 cwt., will afford 12,000 cubic feet of gas, provided that the retorts are new. After being used a few months, the product will not exceed 11,000 feet, or even 10,000. On the whole year, the average may be about 11,000. The quality of this gas is such, that half a cubic foot per hour is equivalent, in burning, to the light of a mould candle of six to the pound, during the same space of time; hence, one pound weight of coal will afford light equal to such a candle for four hours and a half. An illuminating gas of this kind is sometimes presented ready formed by nature. A village of Fredonia, in the western part of the state of New York, is lighted with this gas as it naturally issues from a rock; the flame is large, but not quite so brilliant as that of coal gas.* *Oil gas* being of a similar nature, it need not be particularly described. There are other less important compounds of carbon and hydrogen, and the whole correspond with the law of multiple combination already described. *Naphtha* and *naphthaline* are hydrocarburets; the former is a transparent volatile fluid, the other is a transparent volatile solid, which assumes the form of crystalline plates; both are obtained from coal tar by distillation.

Cyanogen.—This substance is a gaseous compound of azote and carbon. It burns with a purple flame, but it destroys life on being breathed. Cyanogen unites with a variety of bodies, and forms many important compounds.

BORON.

The borax of commerce is a compound of boracic acid and the alkali called soda. Boracic acid is a compound of oxygen and boron, in the proportion, it is supposed, of one atom of the latter to two of the former. Pure boron is an opaque brownish olive powder, infusible, and not volatile at any temperature to which it has as yet been subjected. It neither dissolves in nor acts upon water. At about 600°, it takes fire, and combines with oxygen, forming

Boracic Acid.—This substance evinces the usual properties of an acid, but it is not a powerful one. When it is detached from borax, by vitriol being poured upon that compound, it exhibits itself in scaly crystals. It dissolves in rectified spirits, and, if the solution be set on fire, it burns with a green flame. Borax itself, when heated, melts into a perfectly clear glass, which is the basis of some artificial gems of considerable beauty. Borax communicates its own fusible nature to other bodies, and hence is used as a flux. Flux is a general term made use of to denote any substance or mixture employed to assist the fusion of minerals. There are a considerable number of such bodies; the alkalis are those most generally used. Boracic acid is the only known compound of boron with oxygen. There has been no compound yet discovered of boron with either bromine or iodine, but it combines with chlorine, forming a gaseous acid, to which the name of *borochloric acid* has been given; and also with fluorine, forming

Fluoboric Acid, which exists in the gaseous state. It is colourless, has an exceedingly acid taste, and a smell similar to muriatic acid. It contains no water, but possesses a powerful affinity for that fluid, and is on that account sometimes used as a test of the presence of moisture in gases. Its specific gravity is 2.362; and it seems to consist of one atom of fluorine and two of boron. The combinations of boron with hydrogen, azote, and carbon, are still unknown.

SILICON.

Quartz, or *rock crystal*, which constitutes so considerable a portion of the crust of the earth, consists essentially of a peculiar acid substance, called *silica*, or *silicic acid*. It is a white tasteless powder, which combines with the different bases forming compounds, analogous to the salts. This substance is a compound of oxygen, with a base which has been entitled silicon. It is a powder of a deep brown colour, and very similar to boron in its appearance, and in its relations to other matter. It stains the fingers, and adheres to every thing that comes in contact with it. It can be exposed to a very high temperature without being fused; after ignition, the specific gravity of silicon is about 1.837. It dissolves in a mixture of fluoric and nitric acids with great facility, although it is not acted upon by them singly. When mixed with dry carbonate of potash or soda, and heated far below redness, it burns vividly at the expense of the carbonic acid; carbonic oxide is disengaged, and the residue is tinged black by carbon being deposited. By this process silicon is converted into silica, which is a compound of one atom of silicon and one atom of oxygen. Silicon combines with chlorine, forming a *chloride of silicon*. This is a colourless volatile liquid, having a suffocating smell, and probably acid properties. With fluorine, silicon unites and forms

Fluosilicic Acid.—This is a gaseous substance, transparent, colourless, and having a smell like muriatic acid. It smokes when mixed with moist air, and it is rapidly absorbed by water. Its specific gravity is 3.6. It combines with carbon, but no other compounds are known.

SULPHUR.

Sulphur, or brimstone, is a substance whose appearance is too familiarly known to require particular description. In many parts of the world it is found in a state of great purity. It occurs plentifully in volcanic countries, and is an abundant ingredient in various minerals. It is a non-conductor of electricity, and, when rubbed, becomes highly electric. It has a specific gravity of 2.0332. When heated to 170°, it is volatilised, and the result is a fine powder called *flowers of sulphur*. It melts at 218°, but at 340° it becomes thick, and from 482° to its boiling point, about 750°, it gets thinner. When suddenly cooled, it remains soft, in which state it is used for taking impressions. It is extensively used in the arts; for instance, in the manufacture of gunpowder. With oxygen it combines in five proportions, forming five compounds, all of which possess acid properties.

Sulphurous Acid.—When sulphur is heated to 300° in the open air, it takes fire, and burns with a pale blue flame, at the same time emitting abundance of fumes of a suffocating nature, which are sulphurous acid. It is colourless, extinguishes flame, is not inflammable, converts vegetable blues to red, forms a class of salts called *Sulphites*, and has a specific gravity of 2.2222. This gas bleaches various textures, as those of silk, wood, and straw; the liquid acid bleaches sponge. Sulphurous acid is supposed to consist of equal bulks of oxygen and sulphur.

Sulphuric Acid, or *Oil of Vitriol*.—This acid is made in great quantities for the use of bleachers, and other manufacturers, by burning sulphur in leaden chambers. At the same time, a quantity of nitric acid from the decomposition of saltpetre is admitted into the chamber. The sulphur is converted into sulphurous acid. Five atoms of this acid unite with one atom of nitric acid, and two atoms of water, and form a white solid salt, which falls to the bottom of the chamber into a quantity of water placed to receive it. As soon as it comes in contact with the water, a strong effervescence takes place; the nitric acid is decomposed, and converts the sulphurous into sulphuric acid, while at the same time a quantity of deutoxide

* Donovan's Chemistry, p. 117.

of azote is disengaged. This gas, coming in contact with the oxygen of the air, is converted into nitric acid, which combines with an additional dose of sulphurous acid, and is decomposed as before. Thus the process goes on as long as sulphurous acid and oxygen gas exist in the leaden chamber.* Sulphuric acid thus obtained is a colourless liquid, possessing some viscidity; and when as much concentrated as possible, its specific gravity is 1.837. A stronger acid, however, can be obtained by another process, in which state it is entirely destitute of water. Sulphuric acid is one of the most powerfully corrosive bodies known to us. The following are some of its principal properties. When mixed with water, to which it has a very powerful attraction, a decrease of volume occurs, and a considerable degree of heat is generated. It freezes when sufficiently cooled, and the crystals are sometimes large, distinct, and hard. When exposed to the air, this acid discharges whitish-grey vapours, which are sulphuric acid in a dry state. Acid of specific gravity 1.896, contains about one-tenth of water, and is so volatile that it boils at 120°. The constitution of sulphuric acid is, sulphur two parts, and oxygen three parts. It forms a very numerous and important class of salts called *Sulphates*. The other compounds of sulphur and oxygen it is unnecessary to notice. Sulphur unites with chlorine in two proportions. It also combines with bromine, iodine, and fluorine, but its next most important combinations are those with hydrogen.

Sulphuretted Hydrogen.—This is a colourless gas, having a strong fœtid smell, something like rotten eggs, and a sweetish taste. It is a non-supporter of combustion, and, when breathed, destroys animal life. Its specific gravity is 1.1805. It is combustible, and burns with a bluish-red flame. Water absorbs 3.66 times its bulk of this gas; and if it be passed through water tinged with a vegetable blue, it will change the colour to red. A few drops of nitric acid let fall into a vessel filled with sulphuretted hydrogen, sets fire to it. This gas blackens silver, and darkens the wood-work of rooms painted with white lead, from human exhalations containing a portion of it. Its atomic constituents are said to be one atom of sulphur and one atom of hydrogen. Double the quantity of sulphur to the same proportion of hydrogen forms what is called the *bisulphuret of hydrogen*. No compound of sulphur and azote is known, but with carbon there is more than one. With boron and silicon, sulphur forms sulphurets.

SELENIUM.

This is a substance nearly allied to sulphur in its nature, although it in some respects partakes also of the character of a metal. It melts at about 212°, and on cooling becomes solid, in which state it has a metallic lustre, and a deep brown colour. It is soft and easily reduced to powder, which is of a deep red. Its specific gravity is 4.3. It is a bad conductor of heat, a non-conductor of electricity, and is also non-electric. Like sulphur, it sublimes into flowers; such are its leading characteristics. It combines with oxygen in three proportions, forming *oxide of selenium*, a gaseous body, *selenous acid*, which has an acid and acrimonious taste, and, lastly, *selenic acid*, which resembles sulphuric acid in its consistence, and in many of its properties. It is to be remarked, that the compounds of selenium and oxygen bear a strong analogy to some of those of oxygen with sulphur. Selenium combines also with sulphur, chlorine and carbon.

TELLURIUM.

This substance is a metal, having a silver-white colour, and considerable brilliancy. It has a laminated texture, is brittle, may easily be reduced to powder, and has a specific gravity of 6.1379. It fuses at a temperature rather higher than that which is necessary to melt lead. It combines with oxygen, and forms *oxide of tellurium*. This compound possesses at once acid and alkaline properties. When tellurium is heated before the blowpipe, it burns with a blue flame, emitting a white smoke, which is the oxide. Tellurium burns spontaneously in chlorine gas, and forms a *chloride of tellurium*. It also unites with iodine, hydrogen, and carbon. The other combinations of this metal are still unknown.

PHOSPHORUS.

This well-known substance is commonly prepared from the earth of bones, which consist chiefly of the phosphate of lime. This salt is decomposed by sulphuric acid, and after going through a difficult process, the phosphorus is distilled into a receiver in the shape of melted drops. It is an amber-coloured and semi-transparent solid. Its specific gravity is 1.748. It is so very combustible, that it takes fire in the air, emitting a white smoke having the smell of garlic, and appears luminous in the dark. At the temperature of 148°, it burns with a large resplendent flame, giving out a white smoke, which is

Phosphoric Acid.—This substance can be obtained by other processes, in which case it exhibits itself as a transparent solid body like glass, having an acid taste. It has no smell, but an exceedingly sour taste; it is not corrosive. Its atomic constituents are supposed to be one atom of phosphorus and two and a half atoms of oxygen. With oxygen, phosphorus forms a weaker acid, called *pyrophosphoric acid*, and also *phosphorous acid*, both feeble acids.

Phosphuretted Hydrogen.—This gas is colourless, has a smell like garlic, and a very bitter taste; its specific gravity is 1.7708. It burns spontaneously. When mixed with oxygen, *rarefaction* causes them to explode, as *condensation* produces explosion in other gases—a very remarkable property of this substance. This gas may be detonated, also, with protoxide and deutoxide of azote. When mixed with chlorine gas, it burns with a greenish-yellow flame. It is composed of equal volumes of hydrogen gas and phosphorous vapour. There are other compounds formed of these two substances; and phosphorus combines also with chlorine, bromine, and iodine, in two proportions each. It likewise unites with fluorine, carbon, sulphur, and selenium.

ARSENIC.

The *White Arsenic* of commerce is a combination of arsenic and oxygen. When mixed with *black flux* (which is cream of tartar exposed to a red heat in a covered crucible, till it ceases to smoke), and subjected to heat, it is reduced to the metallic state. It has a bluish-white colour, is soft, brittle, and easily reduced to fine powder. Its specific gravity is 5.672. When moderately heated, it evaporates, combining with oxygen, and forming the arsenic of commerce, so well known for its destructiveness to animal life. With oxygen, arsenic forms two acids, the *arsenous* and *arsenic*. *Arsenous acid* is a white, brittle, compact substance, having a weak, acrid taste, which at last leaves an impression of sweetness. It is one of the most virulent poisons known. *Arsenic acid* is quite similar in its constitution to phosphoric acid. Arsenic combines with chlorine, bromine, iodine, fluorine, hydrogen, sulphur, phosphorus, and selenium.

ANTIMONY.

This is a metal, which, when pure, possesses a silver-white colour. It is well known, being much used as a medicine. Its texture is fibrous, and it is easily reduced to powder by being pounded in a mortar. Its specific gravity is 6.4366. It melts when heated to redness, and at a higher heat it evaporates. It combines with oxygen in three proportions, and forms three compounds, two of which possess acid properties. The other is an oxide, which constitutes the base of all the active medicinal preparations of this metal. With chlorine it combines in two proportions, forming two chlorides, which are analogous to two of the compounds formed with oxygen. It also combines with bromine, iodine, fluorine, sulphur, selenium, phosphorus, and arsenic. Antimony is extensively used in the arts, particularly in typefounding and in stereotyping.

CHROMIUM.

This is a metal of a whitish colour and a brittle consistency. Its specific gravity is 5.9. It requires a very high degree of heat to melt it, and is only obtained pure in small grains. No acid readily dissolves it, except the fluoric. Chromium combines with two proportions of oxygen, forming two compounds, which have received the names of *green oxide* and *chromic acid*. Chromium unites with chlorine, sulphur, phosphorus, and probably fluorine. It is used in coloured glass making, and glass and porcelain painting. It is also used in enamelling, and as a rich, strong, and durable pigment. To glass and enamel it communicates a green colour, but to the painter it affords one of his prettiest yellows.

VANADIUM.

This is a metal which was only discovered four years ago. It is white, resembling silver, brittle, a good conductor of electricity, and is easily dissolved in nitric acid and aqua regia. When heated rather under redness, it takes fire, burns with a dull flame, and is converted into a black-coloured oxide. It combines with oxygen in three proportions, forming, first, *black oxide* or protoxide, *blue oxide* or binoxide, and *vanadic acid*. It combines also with chlorine, sulphur, and phosphorus, but its other compounds are unknown.

URANIUM, MOLYBDENUM, TUNGSTEN, COLUMBIUM, AND TITANIUM.

These substances are all metals, but on account of their scarcity, or on account of the difficulty of reducing them to the metallic state from their ores, are but imperfectly known, and have not been applied to any useful purpose. *Uranium* has an iron-grey colour of considerable lustre, and, when heated to redness, takes fire. Its specific gravity is 9. *Molybdenum* has a silvery-white colour, is brittle, and has a specific gravity of 8.636. *Tungsten* is of a greyish-white colour, is very hard and heavy, having a specific gravity of 17.4. *Columbium*, when burnished, assumes a yellowish-white colour and a metallic lustre. *Titanium* has a copper-red colour, and considerable brilliancy. It crystallises in cubes, is hard enough to scratch rock crystal, and has a specific gravity of 5.3. All these metals combine with oxygen and some of the other supporters, but the oxides and acids so formed are not deserving of particular mention.

We have now described the *simple acidifiable bases*; let us turn, therefore, to the *simple alkalifiable bases*, which, as far as at present known, are thirty-one in number. These Dr Thomson divides into five families; namely, alkaline, earthy, difficultly fusible and easily fusible bases, and the noble metals.

ALKALINE BASES.

This family consists of seven metallic bodies. Their oxides constitute the most powerful alkalis, and the latter readily combine with acids, forming *salts*. The chlorides, bromides, and iodides of these bodies, are also salts. We shall shortly notice them in detail.

Potassium is the base of that well-known and very useful article potash. The properties of potassium were first determined by Sir H. Davy, to whom we are indebted for the discovery of the composition of the alkaline bodies. It is a white metal, like silver. At 32° it is hard and brittle, at 50° is soft and malleable, at 132½° melts, and nearly at red heat evaporates. Its specific gravity at 60° is 0.8507, water being 1.000. When exposed to the air, it rapidly absorbs oxygen, and forms potash. This body in commerce is always combined with water, which cannot be expelled by heat. When thrown on the surface of water, which it swims upon, it decomposes that fluid with such rapidity that the metal takes fire, and burns with a red flame. Potassium combines with two proportions of oxygen; it also unites with chlorine, bromine, iodine, hydrogen, sulphur, and several other bodies.

Sodium is a metal so similar in most respects to the foregoing, as to stand in no need of particular description. It is the base of the alkali called soda, which is formed when the metal is brought into contact with water, or when it is heated in oxygen. It decomposes water, and in its relations to other bodies bears a strong resemblance to potassium.

Lithium.—This metal is the base of the alkali called lithia, which is of a white colour, and has a taste fully as caustic as that of potash itself. It is of course an oxide of lithium. Lithium likewise unites with chlorine, but its other combinations are unknown.

Barium.—This metal is the basis of barytes, an alkaline earth. It is of a white silvery appearance, absorbing oxygen rapidly by exposure to the air, thus forming barytes; and it also rapidly decomposes water. Barium combines also with sulphur and phosphorus, and forms salts with chlorine, bromine, and iodine.

Strontium.—This metal is the base of strontia, an earth very similar to the foregoing. Strontium and barium resemble each other very much in most of their properties, and their combinations with oxygen have also a very strong resemblance. Strontium also unites with chlorine, phosphorus, and sulphur.

Calcium.—This metal is the base of the well-known and indispensable commodity lime. *Lime* has been known from the remotest ages, and appears always in combination with an acid, most commonly with the carbonic, constituting *limestone*, *marble*, *calcareous spar*, *chalk*, and frequently, with sulphuric acid, constituting *gypsum*, *selenite*, and *sulphate of lime*. It combines also with various other acids. Calcium is white, like silver, solid, and much heavier than water. When heated in the open air, it burns brilliantly, and quicklime is produced. Calcium unites with oxygen in two proportions, forming lime and peroxide of calcium. Pure lime is tasteless, and insoluble in water. It, however, readily absorbs water poured upon it, and swells, producing at the same time a great heat. The fact is, that the water becomes solidified, and of course gives out a great quantity of heat, which accounts for the rise of the temperature. This process is called slacking lime. Lime combines with chlorine, and forms *chloride of lime*, a substance which has become an important article of commerce under the name of *bleaching powder*. It is a white powder, with a hot taste, having the power of destroying vegetable colours. Calcium combines with sulphur and phosphorus.

Magnesium.—This metal is the basis of magnesia, a substance universally known from its frequent employment in medicine. Magnesium is obtained in brown scales, which, when rubbed against agate, leave a metallic stain of a leaden colour. It burns with a red light, and, by thus combining with oxygen, becomes *magnesia*. This is a soft, elastic, tasteless powder, not sensibly soluble in water, and slowly changing vegetable blues to green. Magnesia forms salts with chlorine, bromine, and iodine.

EARTHY BASES.

This family comprehends six substances, the oxides of which are white tasteless powders, formerly distinguished by the name of *earths*.

Aluminum.—Alumina, which, when pure, is a fine light powder of brilliant whiteness, is an essential constituent in every kind of clay, and constitutes the base of *alum*, from which substance it may easily be obtained. It is a compound of oxygen and aluminum, consisting of eight parts of the former to one hundred of the latter. This metal, when burnished, assumes the metallic lustre and splendour of tin. It is not easily fused, but at a red heat it burns with great splendour, and is converted into alumina. This substance, so useful in the manufacture of every species of pottery, is the only compound known of oxygen with aluminum. Alumina possesses the remarkable property of shrinking into less bulk according to the intensity of the heat which is applied to it; hence, it has been employed as a kind of thermometer, or rather pyrometer, for measuring very high degrees of temperature, in furnaces for instance. A guage is used for measuring the amount of the contraction. Aluminum combines with chlorine, phosphorus, sulphur, and selenium.

Glucinum.—Glucina, which is the oxide of glucinum, exists to about fourteen per cent. in the beryl or emerald, from which it can be extracted. Glucinum

* Thomson.

is a dark-grey powder, which, when burnished, acquires the metallic lustre. It is very difficult of fusion. When heated in air or oxygen, it burns brilliantly, and affords the oxide glucina—the only compound which it forms with oxygen. Glucina, which consists of 100 metal and 44.44 oxygen, is a soft, tasteless, white powder, which, when wet, is somewhat plastic, like alumina. It neither dissolves in water, nor melts in the fire. Its salts have a sweetish taste, like those of alumina; and both of these earths are in this respect opposed to magnesia, which with acids affords salts of a bitterish taste. Glucinum combines with chlorine, phosphorus, sulphur, selenium, iodine, and bromine.

Yttrium.—Yttria, which constitutes the oxide of this metal, is obtained from a scarce mineral called gadolinite. Yttrium is procured from it in iron-grey scales. If heated in common air or oxygen, it burns brilliantly, forming the earth yttria; and as far as is known, this is the only compound formed by the union of oxygen and yttrium. The latter substance combines with chlorine and the combustibles.

Cerium.—This metal exists in a reddish-coloured mineral found in Sweden, called *cerite*. Cerium is a dark-grey powder, having a metallic lustre, but its properties have not yet been properly determined. It, however, combines with oxygen, chlorine, carbon, sulphur, and phosphorus.

Zirconium.—The earth called zirconia is a harsh, whitish powder, destitute of taste or smell. The base zirconium is composed of brilliant scales, which are probably metallic, although the substance has not as yet evinced the metallic lustre. When heated in common air, it takes fire, and is converted into zirconia, which is perfectly white. This is the only compound which it forms with oxygen. It unites with chlorine, carbon, and sulphur.

Thorium.—This is a newly discovered metal, of a leaden-grey colour, heavy, and under the burnisher shows metallic lustre. If it be heated in open air, it burns with much splendour, and the resulting snow-white oxide is the earth called thorina. This is the only compound of thorium with oxygen, and the resulting substance is distinguished from the other earths by various properties. Thorium, when heated in vapour of sulphur, burns, and it also unites with chlorine and phosphorus.

DIFFICULTLY FUSIBLE BASES.

This family comprises some of the most useful bodies in existence. The oxides of these bases, which are four in number, cannot be reduced to the metallic state by heat alone, but they readily dissolve in acids, and from this solution they cannot be precipitated in the metallic state by the introduction of zinc.

Iron.—This well-known substance is one of the seven metals with which the ancients were acquainted; these were gold, silver, copper, iron, tin, lead, and mercury. Iron is a metal of great utility, and it is fortunately found abundantly. Almost every mineral contains it. The ore from which the iron of Great Britain is obtained, is a *carbonate of iron*. Iron, after passing through a fiery ordeal, has a grayish colour, a metallic lustre, and, when burnished, a good deal of brilliancy. Its hardness exceeds that of most metals, and, when in the state of steel, it may be rendered harder than most bodies. Its specific gravity is 7.843 after hammering. It is attracted by the magnet and may itself be converted into a permanent magnet. It is malleable at every temperature, very ductile, and very combustible, for we see a thin wire burn in the flame of a common candle. It burns brilliantly in oxygen, with which it combines in two proportions, forming oxides. It combines also with chlorine, bromine, iodine, boron, sulphur, selenium, phosphorus, arsenic, chromium, and antimony; but the most important of its combinations with simple substances are those with charcoal, which form the important compounds *cast-iron* and *steel*. Iron forms with the acids a numerous and valuable class of salts.

Manganese.—When this substance is pure, which is rarely the case, it is rather whiter than cast-iron, of a granular texture, and may be reduced to powder by pounding. Its specific gravity is 8.013. It is not attracted by the magnet. It gradually absorbs oxygen from the atmosphere, and decomposes water, a property which it loses when alloyed with iron. It is much in use. Glass-makers use it for two purposes; first, for communicating a purple or violet colour, or for destroying all colour, and rendering the glass colourless. Manganese has a strong affinity for oxygen, with which it combines in four proportions, forming oxides. It unites also with chlorine, fluorine, carbon, and sulphur.

Nickel.—This metal, when pure, has a white colour, like silver; is rather softer than iron; is malleable both hot and cold; is attracted by the magnet; and, like iron, can be converted into one. Its specific gravity is 8.380 after fusion. The preparations of this metal contain poisonous qualities. Nickel combines readily with oxygen, forming two oxides. It also unites with chlorine, carbon, sulphur, phosphorus, and arsenic.

Cobalt.—This metal has a grey colour with a shade of red, and is not brilliant. Its texture is granular; it is rather soft and brittle; its specific gravity is 8.7. It is used for giving a blue colour to glass and porcelain; the tint is beautiful; and hence the metal bears a high price. It unites with oxygen, and forms two oxides; these are the preparations of cobalt used in the arts. It also combines with chlorine, sulphur, selenium, and phosphorus.

EASILY FUSIBLE BASES.

Of the eight metals composing this family, all are malleable except bismuth, which is not very brittle. They melt at a comparatively low heat. A rod of zinc throws down these metals from their acid solutions in the metallic state.

Zinc.—This metal is of a bluish-white colour, and is composed of plates adhering together. It is rather soft, and, after fusion, its specific gravity is 6.896. It becomes malleable at 212°, and melts at 680°, or before it is quite red. When heated red-hot with access of air, it takes fire, burns with an exceedingly beautiful greenish or bluish-white flame, and is at the same time converted into the only oxide of zinc with which we are acquainted. It is of a snow-white colour, is tasteless, and insoluble in water. With an alloy of copper, zinc forms that well-known and useful substance *brass*. Zinc combines with, and is set on fire by, chlorine; it enters into union with phosphorus, sulphur, selenium, iodine, and various metals.

Cadmium.—This metal, which is commonly associated with the ores of zinc, has a white colour with a shade of bluish-grey, and resembles tin in its appearance. It is very malleable, and has a specific gravity after fusion of 8.6040. It unites with oxygen, chlorine, and some other supporters, but the compounds are unimportant.

Lead.—This is one of the most abundant of all the metals, and one of the softest and most fusible. Lead has a bluish-white colour, and a good deal of lustre, but it soon tarnishes. Its specific gravity after fusion, which takes place at 606°, is 11.351. Lead is very malleable; it is also ductile, but its wire possesses little tenacity. By exposure to a very strong heat, it is volatilised, and at the heat of burning hydrogen, urged by oxygen, it burns with a bluish flame. While exposed to the atmosphere during fusion, it imbibes oxygen, and is converted into an oxide. There are three oxides of lead—the protoxide, which is known in commerce and the arts as a yellow paint, under the name *massicot*, or, if it be semi-vitrified, *litharge*; the deutoxide is also a paint of a brilliant red colour, inclining to orange; it obtains the name of *minium*, or *red lead*; and the peroxide, which is of a deep puce *brown* colour. When triturated with sulphur, spontaneous combustion takes place. Lead also combines with chlorine, bromine, iodine, sulphur, selenium, arsenic, &c. It is rendered hard by antimony, and the alloy, mixed with a little tin, constitutes the material from which printers' types are elaborated. The salts of lead are numerous and very important. *White lead* or *cerure*, the only white used in all oil paintings, is made by subjecting thin plates of lead, rolled up spirally, to the fumes of vinegar. The lead soon becomes corroded, and assumes a white appearance and a brittle consistency. If this substance be dissolved in acetic acid or vinegar, it becomes *sugar of lead*. Lead is never found native; by far the most common state in which it occurs in nature, is mineralised by sulphur. The common name for sulphuret of lead is *galena*. It is abundant in all quarters of the globe.

Tin.—This metal resembles lead in many of its properties. It possesses a fine white colour, with a slight shade of blue, and has a good deal of brilliancy. Its specific gravity after fusion is 7.285. It is very malleable. Tin leaf or *tinfoil*, as it is called, is about the one-thousandth part of an inch thick, and it might be made much thinner, if requisite. It is ductile, but of inferior tenacity. It is very flexible, and produces a remarkable crackling noise when bended. It melts at 442°, but a very violent heat is required before it will evaporate. It soon tarnishes with the air, and, when intensely heated, oxygen being supplied, it burns with great brilliancy. Tin combines with oxygen in two proportions, forming the protoxide, which is *black*, and the peroxide, which is *yellow*. It also unites with chlorine, bromine, iodine, sulphur, selenium, phosphorus, and fluorine. It alloys with various metals. The coat of tinning which is given to the inside of copper vessels, is a mixture of lead and tin; for although lead be a poisonous metal, the presence of tin renders it innoxious. Pewter is composed of lead and tin; the latter rendering the former safe, as in the preceding instance. English tin is the best of all, and it is affirmed that it was exported from this island 2200 years ago.

Copper.—This metal, in point of general utility, ranks next to iron. It possesses a rose-red colour, and a great degree of brilliancy. Its specific gravity, after being rolled out into plates, is 8.953. It has great malleability, and very considerable ductility. A bar of cast copper, one quarter of an inch thick, requires 1192 lbs. to break it, whilst hammered copper requires nearly 1000 lbs. more to break it. It melts at 2548°; and if the heat be increased, it evaporates in fumes, which are visible. When rubbed, it emits a smell. When heated in a hydrogen flame urged by oxygen, it burns brilliantly, emitting a dazzling green light; a piece of copper in a coal fire tinges the blaze green. When exposed to air, it rusts into *verdigris*, but slowly, without moisture. With oxygen it combines in three proportions, forming three oxides, two of which occur native; the other is not a permanent compound. Copper combines also with chlorine, iodine, sulphur, phosphorus, arsenic, and tin. Its alloys with the latter metal are very important. From eight to twelve parts of tin, combined with one hundred parts of copper, compose *bronze*, and the *metal of cannons*. Three parts of copper and one of tin compose *bell-metal*. The alloy used for the mirrors of telescopes was employed by the ancients for the composition of their mirrors. It consists of about two parts of copper united to one part of tin.

Bismuth.—This metal has a reddish-white colour, and is composed of broad plates adhering to each other. It is one of the most fusible of the metals, and communicates its fusibility to other metals. Its specific gravity is 9.833. Although not very brittle, it is not malleable, nor can it be drawn into wire. A mixture of tin, lead, and bismuth, is so fusible, that it melts when thrown into boiling water. A toy of this kind is well known; it is a spoon, which, when immersed in a very hot liquid, immediately melts. Bismuth combines with oxygen, chlorine, bromine, iodine, sulphur, and selenium. What is called Newton's fusible metal, is a compound of eight parts by weight of bismuth, five of lead, and three of tin. It melts at 212°.

Mercury or Quicksilver.—This metal has a silver-white colour, possesses great brilliancy, and remains fluid at the common temperature of the atmosphere. Its specific gravity, at 60°, is 13.56846; at 38°66, when it assumes the solid form, it is 14.465. When solid, it may be beaten out with a hammer, or cut with a knife. When heated to 656°, it boils; and when heated in the open air, or when agitated for a long time in the open air, it oxydises. The oxides and chlorides of mercury afford an admirable proof of the truth of the atomic theory. It combines, also, with bromine, iodine, sulphur, selenium, and phosphorus. The compounds which mercury forms with the other metals are usually termed amalgams. This metal occurs in South America and in Spain, in great abundance. But the mine of Idria, in Carniola, an Austrian province, is perhaps the greatest in the world, and has been wrought for more than three centuries.

Silver.—This metal is of a fine white colour, with a slight shade of yellow. When polished, it displays a great deal of brilliancy and beauty. It is very malleable, and may be beaten out into leaves so thin as one 100,000th of an inch. It is softer than copper, and harder than gold; but its tenacity is inferior to the former metal. When melted and cooled slowly, its specific gravity is 10.3946; when hammered and rolled, it is a little higher. Its melting point is 1830°; and if it be kept melted for a long time, it absorbs oxygen, and forms a brown oxide; but it possesses the very singular property of parting with the oxygen on solidifying. Gay Lussac, a great French chemist, says that the presence of a little copper deprives it of this property. Silver combines with oxygen in three proportions, forming three oxides. It also unites with chlorine, bromine, iodine, sulphur, selenium, phosphorus, and arsenic. There are numerous alloys of silver, but few of much consequence. One pound of standard silver is coined into sixty-six shillings; the mint price of silver, therefore, is 5s. 6d. per ounce at present. Silver is found in all parts of the world, sometimes alloyed with a variety of other metals and substances, and sometimes in the native state.

NOBLE METALS.

This family comprehends six metals, which all require a violent heat to fuse them. The name noble metals has been given to the family, because it contains gold and platinum, the most esteemed of all the metals; and because the other four metals belonging to it are usually associated with native platinum. They are insoluble in nitric acid, and their oxides are reducible to the metallic state by the application of heat alone.

Gold.—This is the most valuable of all the metals. It always occurs in the metallic state, although seldom pure. It has a beautiful yellow colour, and considerable lustre, which it retains, not being liable to tarnish by exposure to the air. It is rather softer than silver, and after fusion, it has a specific gravity of 19.2. It is the most malleable of metals, and may be beaten out into leaves no thicker than one 282,000th of an inch, and the gold leaf with which silver wire is covered is only 1-12th of that thickness. Its tenacity is considerable, but inferior to that of silver. It melts at 2590°. It is insoluble in sulphuric, nitric, and muriatic acid; but it readily dissolves in aqua regia, which is a compound of the two latter. It is difficult to oxydise gold, and still more to burn it; but both can be accomplished. Oxygen combines with gold in two proportions, forming two oxides. Gold also unites with chlorine, bromine, iodine, sulphur, phosphorus, and arsenic. There are a number of alloys of gold; the standard gold coin of the realm is an alloy of twelve parts of gold to one of copper or silver, or sometimes both. Gold occurs in almost all parts of the world; but Africa and America supply the chief European consumption.

Platinum.—This metal is white, like silver; its specific gravity is 21.47, so that it is heavier than gold. Its hardness is intermediate between copper and iron. It is very ductile and malleable, though much less so than gold. Its tenacity is considerable. It will not melt in the heat of our most powerful furnaces, but it may be fused by the oxyhydrogen blowpipe. Its property of resisting high temperatures without fusion, is a most important one, and on this account it has been employed in the formation of vessels which it is necessary to subject to an extraordinary degree of heat. Like gold, it resists the action of all the single acids, but dissolves in aqua regia. It combines with oxygen in probably four proportions, forming oxides. It unites, also, with chlorine, bromine, iodine, silicon, sulphur, selenium, and phosphorus. There are numerous alloys of platinum, but they are not of much importance. There is a form of this metal which possesses extraordinary properties; it is called *spongy platinum*. It is prepared by dissolving platinum in a mixture of nitric and muriatic acids by heat; muriate of ammonia is added, when a precipitate falls, which must be filtered and dried. If a small quantity of this powder be heated by a candle, it will become incandescent, as if it took fire. It is, when cold, fit for use. If a jet of hydrogen, from a tube of a very slender bore, be directed on it from a little distance, the metal immediately becomes red-hot, and it sets fire to the hydrogen. This may be repeated a great number of times, but the sponge at last loses its power; the smaller the quantity, the sooner its power is lost.

Palladium, Rhodium, Iridium, and Osmium.—These four metals occur in the platinum of commerce. They are procurable in very small quantities; they have not been applied to any use of moment; they possess no very remarkable qualities, and therefore do not require to be minutely described. They all unite with oxygen and chlorine, and some of them with the other supporters.

Such is a brief sketch of the fifty-four simple substances, whose numerous combinations give rise to the infinite variety of objects which are found ready formed in the laboratory of nature, or have been discovered in that of the philosopher.

GENERAL OBSERVATIONS ON ACIDS, BASES, & SALTS.

Of these various compounds, a general account was given in the early part of this article, and, as we have gone along, we have endeavoured to point out the most important, and to describe them as far as our limits would permit. We have attempted to give a view of the constitution of the various classes of bodies entitled *acids*, *alkalis*, *oxides*, and *salts*. We have shown the affinity which acids manifest for metallic oxides, including alkalis and earths, and the resulting compound formed, which is called a salt. The oxygen acids are by far the most numerous and best known. They are of two kinds: those which are united to a single base or a single supporter, as sulphuric acid and carbonic acid (they amount at present to thirty-six in number); and those in which the oxygen is united at once with two and sometimes with three bases (they amount at present to above sixty in number). Thus, *acetic acid* is a compound of *oxygen*, *carbon*, and *hydrogen*, while *uric acid* is a compound of *oxygen*, *carbon*, *hydrogen*, and *azote*. The second set of acids are very numerous, and they either exist ready formed in the vegetable or animal kingdom, or they are formed from vegetable or animal bodies by chemical processes. A number of the most common acids belonging to the first division, we have already described; and some of those which belong to vegetables, we shall allude to shortly. To those who are desirous of obtaining complete information upon the subject, we recommend Dr Thomson's System of Inorganic Chemistry. The *salts* which are formed by these various acids are so immensely numerous as entirely to preclude the possibility of giving even the shortest description of them here. Besides the salts formed by the acids of the five supporters, there are those formed by cyanogen acid, sulphur acid, &c. Let us now advert to a most important branch of chemistry, namely, that of

ORGANISED STRUCTURES.

The substances constituting the subjects of this branch of chemistry are the principles of which vegetables and animals are composed. In the former, for example, we have sugar, starch, gums, resin, &c.; and in the latter, albumen, muscle, bone, &c.

Vegetables.—Notwithstanding the infinite diversity of form which vegetable substances assume, it has been proved that they are all composed of the same ultimate elements, and these are only *four* in number; namely, oxygen, hydrogen, carbon, and azote. These, again, by uniting amongst themselves, form various compounds, each form of combination producing a substance of a different kind. These substances associated with each, more or less numerously, compose the vegetable structure; and being the more immediate objects of sense, in the investigation of any organisation, they are called their proximate principles. Existing ready formed in woods, roots, &c., we find a considerable number of *proximate principles*, as acids, alkalis, sweet principles, bitter principles, oils, exudations; some poisonous, others wholesome; some spontaneously separating, others remaining obstinately combined. We shall give a brief outline of these:—

Citric Acid.—This acid exists in the juice of lemons, and, when crystallised, one hundred grains consist of water $23\frac{2}{3}$, and pure acid $76\frac{1}{3}$, which is a compound of 42.1 oxygen, 31.58 carbon, and 2.63 of hydrogen. *Sorbic acid* is the sour principle of apples, sorbus berries, and other fruits. It consists of the same ingredients as the former. *Tartaric acid* is the sour principle of grapes, when a large quantity of them are left to ferment; the result it is well known is wine. On the side of the vessel containing this liquor, crystals of the acid form, which, when purified, are *cream of tartar*. Twelve parts in the 100 are water; and the remaining 88 consist of oxygen, 52.97; carbon, 32.39; and hydrogen, 2.64 parts. *Oxalic acid.*—The plant called sorrel is valued for its acidulous taste, which is conferred upon it by this acid. It has no hydrogen in its composition, consisting merely of oxygen and carbon. It is an active poison, and from resembling Epsom salts in appearance, many persons have fallen victims to its virulence. The antidote is powdered chalk. *Gallic acid* is obtained from nut-galls. Its most remarkable property is that of changing the colour of solutions containing iron to an intense blue-black colour, as in the case of common writing ink. 100 grains consist of 56.25 carbon, 37.5 oxygen, and 6.25 hydrogen. There are a number of other acids, which, being of little use, are not worth naming. Those just described exist ready formed in fruits, &c.; they are simple *educts*. But there are others formed by chemical changes produced on certain elements contained in vegetables, which afford the base of the acid; these are acid *products*; some are produced by the agency of fire, others by the action of nitric acid. Several acids, when distilled at a high temperature, undergo decomposition, and new acids are formed. Their names remain the same, with the word *pyro* as a prefix. Thus we have *pyrocitric acid*, &c. There are other acids generated by similar means, but they have simple names without any prefix.

Vegetable Alkalis.—It has been ascertained that alkalis, as well as acids, exist ready formed in plants as one of their constituent parts. Those which evince alkaline properties of a weak character are entitled *alkaloids*. The alkalis are *quinina* and *cinchonia*, which resemble each other, have a bitter taste, and neutralise acids. *Morphia*, which is obtained from opium, is a white crystalline powder; *strychnia*, one of the most powerful bitters and poisons, which has of late been much used in medicine; *brucia*, also a violent poison; *digitalia*, which is procured from the leaves of foxglove; *hyoscyama*, *atropia*, *veratria*, *emetina*, &c., which are derived from henbane, deadly nightshade, &c. Of the other proximate vegetable principles, the first deserving of notice is the woody fibre which constitutes the solid bases of all vegetable structures. It is called *lignin*, from *lignum*, wood; and consists of 52 carbon, and 48 of oxygen and hydrogen, in the ratio which forms water. With lignin are associated various other bodies, such as *resins*, which are various and abundant. In the different species of the pine-tree we discover that peculiar liquid resin called *turpentine*. From resins are obtained what are called *essential oils*; because, after the resin has been heated in a distilling apparatus, an odoriferous oil distils over, and leaves the resin hard, dark, and odourless. The *essence* of the substance is supposed to have passed away in the aëriform state, hence the name. From its speedily evaporating on being exposed to the air, it is also called *volatile oil*. The seeds of plants yield another oil, which, not evaporating, is called *fixed oil*. To these two oils there are two substances bear some analogy, *wax* and *camphor*. The former, when melted, possesses the properties of a fixed oil, and the latter seems to possess the properties of a concrete volatile oil, although it possesses qualities distinct from those of all other bodies. *Gum*, for instance gum arabic, possesses the following properties: They are—transparency, tastelessness, perfect solubility in water, viscidity of the solution, capability of cementing fragments, and of affording a varnish, and total insolubility in spirit of wine. There is a class of bodies called *gum resins*, whose properties are intermediate between those of gum and resin; and somewhat allied to resins, although essentially different in most of its properties, is the substance called *caoutchouc*, or *Indian rubber*. It is the exuded juice of a peculiar tree, and is composed of carbon and hydrogen. From wheaten flour a substance is obtained, called *gluten*, from its glutinous nature. There are two principles in this substance—the one is called *gliadin*, and the other *zimomin*. There is a substance called *vegetable albumen*, distinct from animal albumen. It constitutes, according to some chemists, no less than one quarter of the whole weight of sweet almonds, and seems to be the basis of all emulsive grains in place of starch. *Starch* is a fine white sediment, precipitated from the white and brittle parts of vegetables, particularly the tuberous roots, and the seeds of the gramineous plants. One of the most remarkable properties of starch, or, as it is called, *fecula*, is that of being convertible into sugar by the action of diluted sulphuric acid. Starch is not only afforded from various grains, but from potatoes; and, as extracted from this vegetable, it is much in demand as an article of food. *Arrow root*, which is obtained from the roots of a West India plant, is the same kind of substance.

Sugar.—Every one, we suppose, should know what sugar is; being in particular a sweetener of the kindly beverages tea and coffee. It is derived from many sources—from the sugar cane, maple tree, beet root, and grapes. Nothing is easier than its formation from grapes. Grape juice is to be saturated with chalk, clarified with white of eggs, or blood, and evaporated; after a few days it assumes the form of a crystalline mass. From oak bark, or nut galls, a peculiar substance is obtained, called *tannin*; so named from being the material employed in tanning leather. It is inodorous, colourless, and possesses a rough astringent bitter taste.

THE ANIMAL COMPOUNDS.

The materials of which animals are composed, are nearly similar to those which we have described as belonging to plants. The difference is in the relative quantity, and in the mode of combination. The combustible substances phosphorus and lime, exist in the bones of animals in considerable quantities. They have also been detected in some plants, as in the onion, but in very minute proportions. The chief substances, then, which enter largely into the composition of animal matter, are oxygen, hydrogen, azote, carbon, phosphorus, and lime. We also find some other kinds of matter, as certain acids and metals, but in quantity so small, as not to affect the truth of the above statement, that the foregoing six ingredients constitute the great bulk of the animal fabric.

Bone consists of phosphate and carbonate of lime, and two other ingredients, *cartilage* and *gelatine*. The latter is the coagulating, or rather elastic, principle in all *animal jellies*. When bones are burned in a close vessel, they form *ivory black*. *Fibrin* is obtained from the vessels; when recently obtained, it is elastic; but when perfectly dry, it is somewhat horny and transparent. There is an important substance, called *osmazome*, which communicates to soups and broths their peculiar taste and smell, and the greater the quantity present, the better is the soup. The *tendons*, *ligaments*, and *membranes*, are nearly allied to gelatin in their nature.

Albumen is a substance very abundant in animal matter. It occurs nearly pure in the white of eggs. Of this substance in the coagulated state, along with gelatin, are *horns*, *nails*, and *hoofs* composed.

The *brain*, the thinking organ of man, consists of water 80, white fat 4.53, red fat 0.7, osmazome 1.12, albumen 7, phosphorus 1.5, sulphur and various salts 5.15, parts in the hundred. *Blood*, when left to rest a few hours after being drawn, separates into two parts; one quite liquid, of a greenish whey-like appearance, and hence called *serum*; the other is an elastic firm jelly, of a crimson-red colour, and is called the *crassamentum*. If evaporated to dryness, a very dark-red substance remains, which is the *colouring matter* of the blood. In animal structures there are numerous fats and oils of a peculiar character, and also some acids, &c.; which, however, we have not space to describe.

FERMENTATION.

The spontaneous decomposition which animal and vegetable matter undergoes when placed under proper circumstances, is called fermentation. The most remarkable result of this process is either alcohol, acetic acid, or a putrid smell. The production of these different results gives origin to three distinct stages of the process, each characterised by different phenomena. If grape-juice be exposed to a moderate temperature, it soon begins to effervesce, and loses its transparency; a viscid scum rises to the surface; the taste changes from sweet to viscous; and under proper management, the liquor is concocted into wine. Solutions of sugar and all sweet liquids are capable of undergoing similar changes, and of being converted into a kind of wines. The process by which these changes are effected, is, on account of the nature of the product, called the *vinous fermentation*, and the result of it is the formation of *alcohol*, or spirit of wine. This is the principle which confers ardency upon brandy, whisky, gin, rum, &c. By the action of acids upon alcohol, a peculiar class of volatile liquids, called *ethers*, are formed. When equal parts of sulphuric acid and alcohol are distilled, a light, odorous, colourless, highly volatile fluid, of a penetrating taste and smell, comes over. This is called *sulphuric ether* for distinction, because there are various other *ethers*.

If the liquor which has undergone the *vinous fermentation* be exposed to the temperature of about 75°, it, from being transparent, again appears somewhat muddy; the taste changes to sour, for the alcohol is now changed into vinegar; and from *acetum*, the Latin for vinegar, this stage is called the *acetous fermentation*. Vinegar, when long kept, loses its acidity and its transparency; it exhales a putrid smell, and has now undergone its last stage, or the *putrifactive fermentation*.

These processes, as well as the other parts of practical chemistry, we shall not describe in detail at present, as it is our intention to devote a number of the Information to the subject of Chemical Science applied to the Arts and Manufactures.

Note.—Specific gravity is the relative gravity or weight of any body or substance, compared with that of some other body which has been fixed upon as a standard. By universal consent, pure distilled water has been assumed as the standard; and it fortunately happens that a cubic foot of pure water weighs exactly 1000 ounces avoirdupois. Water is indicated by unity—thus, 1. When, therefore, it is expressed that any body has a specific gravity of 2, then, bulk for bulk, it is just twice the weight of water. If there be more figures than one, and there be a dot or point between them—thus, 2.5—the unit is here divided into ten parts, and the body is twice and five-tenth times, or two and a half times, heavier than water. If two figures occur—thus, 10.40—the unit is supposed to be divided into an hundred parts, and the body is ten and forty-hundredth part times heavier than water. If there are three figures, the unit is supposed to be divided into a thousand parts; if four, into ten thousand parts, and so on; the number and value of the figures always indicating the exact specific gravity of the body according to the above principle. Common air is sometimes taken as a standard with which to compare gases, as in the instances mentioned in the text. It is a simpler and more intelligible way of comparing the relative weights or densities of aerial substances. But all the solids and fluids are estimated with regard to water.

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MANUFACTURES AND COMMERCE OF THE WORLD.

The most important art pursued by human beings is that of manufacturing, producing, or preparing commodities for their subsistence or bodily comfort and convenience. Strictly speaking, the term Manufactures applies only to those articles which have been converted from raw materials into all sorts of useful and ornamental articles, promoting the comforts and luxuries of society; but by a wider signification, when treating of the principles which guide the production, preparation, and sale of commodities, the term Manufactures may be applied to all articles whatsoever, suitable to human wants, and upon which a greater or lesser degree of skill and labour has been bestowed in making them ready for use. Thus, agricultural produce, from not being prepared or fashioned like commodities which have passed through the fingers of the artificer, has not usually been classed under the general head of national manufactures; inasmuch, however, as corn and other agricultural produce neither spring into existence nor are made fit for market till certain processes by hand and by machinery have been performed by the producers, it is obvious that, in the above wide definition of the term, agricultural produce may correctly be stated as manufactures. By adopting this simple and comprehensive idea of what constitutes manufactures, the political economist has his way wonderfully cleared in his endeavours to seek out and make manifest the principles which ought on all occasions to govern the commercial policy of a country. Including the producers of raw or partly prepared commodities, the manufacturing class is not only the most numerous, but the most useful in communities. Still, by their efforts alone, society would be but to a small extent benefited. Their uses would be confined to only the scene of their labours, were their operations not encouraged by the large and respectable body of individuals who practise the business of merchants and dealers, and whose functions consist in purchasing the commodities from the manufacturers after they are prepared, and transferring them to countries or localities where they are required for use by the consumers. By the interference of merchants in this traffic, they lend immense assistance to the manufacturers, whom they relieve of their commodities without any trouble, and by that means allow them to devote the whole of their time to their peculiar pursuits; wherefore, by this division of labour, they indirectly increase the quantity, and facilitate the processes of manufactures. Unless, therefore, for the operations of the mercantile classes, the manufacturing energies of a nation would soon decline, and the inhabitants degenerate into a very rude condition. The operations of the mercantile classes of men with the manufacturing and consuming classes, are indicated by the term Commerce, which applies equally to traffic carried on at home or with foreign countries.

Commerce is of great antiquity, and, both in the earliest times and in our own day, has been one of the principal engines of civilisation. Among the industrious nations which at a remote period of history were planted on the borders of the Mediterranean Sea, it became a means of spreading knowledge in the interior of Asia, and many parts of Africa and Europe. Unfortunately, the intelligence which was so disseminated was afterwards obliterated by the overruling powers of barbarous and warlike nations; but the efficacy of commerce in modern times is likely to be permanent wherever its influence is extended, seeing that the greatest manufacturing and mercantile people are at the same time the most powerful and most capable of offering protection to those who sustain a commercial intercourse with them. It is exceedingly pleasing thus to reflect on what commerce is capable of effecting, independent of the actual comfort which it produces, wherever it is fairly introduced. By its appeals to the selfishness, the vanity, and other passions, good and bad, of mankind, it appears to be the best of all forerunners to the inroads of the schoolmaster and the missionary. Its influence in this respect has been remarkably exemplified in the boundless regions of Hindostan, which, by the efforts of a company of merchants, have been laid open to the settlement of cultivated men from Europe, who, though by slow degrees, will ultimately spread the blessings of education, and the decencies of social life, among many millions of human beings. In the remote islands in the Pacific Ocean, the influence of commerce has been recently of marked utility. The introduction of articles of a fanciful nature, both for the ornamenting and covering of the person, has induced a desire of following European manners and customs; and as these commodities cannot be procured but by the exchange of native commodities, a spirit of industry has consequently been produced, which cannot fail to be of both moral and physical advantage to the natives. It is always thus with the intercourse which commerce necessarily involves. New tastes are created, and, to be gratified, industry must be exerted. But to witness the extraordinary influence of commerce in producing civilised and refined habits, we need not look beyond our own country. Commerce, in this its chosen seat, has caused roads every where to be cut, canals to be opened, railways to be formed, expeditious modes of travelling by sea and land to be effected; all of which great accessaries to our comfort have tended in the most wonderful manner to introduce not only useful commodities and personal luxuries, but highly cultivated sentiments, literature, and the arts, into districts which at no distant period lay in a comparatively primitive condition. The intercourse which commerce in this manner requires, is the grand lever which, it is apparent, must in the first place be employed to lift the load of ignorance from off the natives of Africa; and when this lever is properly insinuated, the way will soon be prepared for the introduction of those measures of melioration which philanthropists so anxiously design.

QUALITIES OF A COMMERCIAL PEOPLE.

The establishment of systems of manufactures and commerce in particular countries, seems to be dependent on certain moral qualities, as well as on various geographical properties. A country possessing materials for manufacture and commerce, may neither be a manufacturing nor a commercial country, perhaps because the climate is fine, and wants so easily supplied, that few think of exerting themselves. The abundance which nature provides, furnishes an excuse for sloth, which it would be needless to stop here to condemn; but no such apology can be allowed in cases where nature is less bountiful, and where poverty and misery predominate from the conjunct influence of pride, bigotry, and indolence. It would appear that, without a due share of common sense, no people can be successful either as manufacturers or merchants, certainly not as the latter. This principle is very observable in the present condition of commerce in the different quarters of the world. In proportion as steadiness of exertion is practised by individuals, and, what is more, *left at liberty* to act, so is commerce successful, and national prosperity established. It has unfortunately happened that singularly few nations have possessed this species of industry, and this independence. Europe generally has long taken a lead in universal traffic; but among about thirty principal nations into which Europe is divided, only two have hitherto demonstrated a well-regulated aptitude in commercial operations. These nations are the Dutch and the English, both of whom have set an example to the rest, and shown how the people of countries of very limited dimensions—spots hardly recognisable on the map of the world—may, by their industry, their economy, their probity, and their enjoyment of free institutions, attain a pitch of opulence and comfort which nations of ten times their size, and fully as fertile in resources, have, by their mismanagement or their laziness, failed to accomplish. As will hereafter be seen, the commerce of the Dutch, from national misfortunes and other circumstances, has declined in favour of that of Great Britain, which, both as regards the operations of the manufacturer and the merchant, has, for a considerable period, stood at the head of all nations in the two hemispheres. The British are hence a remarkable people. They seem to be endowed, above all other tribes of men, with a spirit of industry and commercial enterprise—a spirit which renders them actually unhappy, unless when busily engaged in some pursuit calculated to enrich them, or at least to produce for their families the means of a respectable subsistence. The Americans, who are but a branch of the same British stock, are equally, if not more, remarkable for this fervent spirit of industry, and, though only set up as a separate nation within a period of fifty years, have already distanced many of those dignified European principalities and powers which first discovered and colonised their country. The French, the Germans, the Spaniards, the Portuguese, the Italians, and others, though each possessing a larger or smaller extent of manufactures and commerce, are obviously deficient, in a national sense, of the eager spirit of industry which is so characteristic of the people of Great Britain. Taken in the gross, they are too apt to addict themselves to amusement in preference to business. They delight in holidays, and will at any time leave their work to mingle in a dance or some kind of buffoonery, in which an Englishman would be ashamed to appear. Scarcely one of the continental nations, moreover, has yet settled down under a well-conducted government appointed by the people. There indeed seems to be little which is settled amongst them. Some of the principal are yet at that stage of social life which was common in England about the reign of Henry VII.; others are not farther advanced than a period considerably earlier; and all have yet a great deal to suffer and to learn before they attain that state of quietude and security to life and property, that condition of domestic comfort and national prosperity, which Great Britain, with all its faults, so amply enjoys.

REGULATING PRINCIPLES OF COMMERCE.

The nature of the principles which should regulate the manufacturing and commercial industry of a nation, has been discussed by many writers at great length, and with much warmth, though in few instances either soundly or with that clearness which can render them intelligible to the people. The subject, however simple, has been so effectually and strangely mystified, that many yet labour under an idea that it would require to be studied as a science before it could be thoroughly understood. There could hardly, however, be a greater mistake; for the principles which regulate manufactures and commerce are so intelligible, that a child might comprehend them.

The beneficent Creator has bestowed upon each particular country certain peculiar properties and commodities, which the others want, but which, by a mutual process of exchanging, or commercial intercourse, may be made common to all. Some countries are totally destitute, by nature, of articles of luxurious consumption, as wines, teas, and spices; but by possessing coal and iron ore, they are enabled to manufacture cutlery, which they can give in exchange for the wines, teas, and spices of the countries possessing these commodities, and which have no coal nor iron ore of their own. It is obvious that this scheme of mutual interchange among nations, of the commodities which they respectively produce, is agreeable to every rational principle, and must have been designed by a wise Providence for the universal benefit of his creatures. In order that manufactures may be produced, and commerce brought in to disseminate them both at home and abroad where they are wanted, no species of legislative enactment is requisite either to encourage or direct. The law which governs production and consumption is a law of nature—it is the overruling principle of *self-interest*, by which only that quantity of manufactures are produced which can be advantageously disposed of, and only those commodities purchased and consumed which the wants of individuals require. And, curiously enough, this principle of self-interest, if allowed free scope, is uniformly and sufficiently competent to regulate both the production and consumption of commodities to a degree more nice and satisfactory than could be attained by the best-devised statutes which the wisest legislators could enact. The grand principle, therefore, which can alone regulate commerce and manufactures, is found in the natural passion for gain; and the sole essential requisite for the successful advancement of mercantile and manufacturing industry and wealth among the people, is for the people to be let alone.

DUTIES AND RESTRICTIONS.

Evident as these principles must be to all who have any knowledge of social life, they have either from ignorance, or some other cause, been generally lost sight of by governments in all ages of the world, and plans have been contrived to regulate that which, if left alone, would have much better regulated itself. To such an extent have regulating and restrictive laws been carried in some countries, that they have nearly annihilated both manufactures and legitimate commerce, and reduced masses of the people to the condition of paupers, besides encouraging the pernicious and demoralising pursuits of the smuggler. The restrictions and regulations which governments usually impose upon commerce, do not perhaps originate so much in the plea that manufacturers and merchants stand in the condition of children, and require to be taken care of lest they should hurt themselves, as from the unfortunate exigencies under which the governments happen to be placed. They have all less or more engaged in wars which have been conducted at an enormous expense to their respective countries. In order to liquidate these expenses, all kinds of taxes are levied directly and indirectly; but as the levying of these taxes breeds discontent, large bodies of military have usually to be kept up, to act as an armed national police. Thus, the people of these countries have for ages to go on paying not only the price of the wars, or the interest of the sums borrowed and laid out upon the wars, but as much more for the military force afterwards imposed upon them. What is more distressing, the people have probably to give a deal of money, in order that their respective governments may be the more able to secure the attachment of men of consequence to assist in allaying the general clamours for a redress of grievances. This is a very rough view of the matter, but it is enough to show the dreadful exigencies into which nations fall, by their engaging in wars or other expensive follies. In whatever manner, however, national exigencies originate, the plan pursued for relief consists chiefly in the imposition of duties on certain commodities much in demand, and at various stages of their manufacture, transmission, and sale. The mechanism which produces them is taxed; the food which the manufacturers eat, the clothes they wear, and the houses they live in, are taxed; the goods are taxed if they be sent out of the country, and they are taxed if brought into it; they are taken to market by taxed horses fed on taxed corn; they are sold in taxed shops by taxed shopmen; and when transferred at last to the consumer, the bit of paper certifying their payment is also an object of taxation. It is easy to perceive that this illimitable process of taxation on commodities must tend not only to raise the value, but decrease the amount, of manufactured produce, to the manifest injury of the manufacturer, the merchant, and the consumer.

FREE TRADE.

Were duties imposed only for the honestly confessed purpose of furnishing the necessary means of support to government, it would be of little comparative consequence; they are fully as frequently exacted for the specious purpose of preventing foreign manufacturers injuring those of the country to which the government which imposes them belongs. Some nations are more enlightened than others on this point; yet each separate country has still a terror of being overreached by others. They all strive to be sellers without being buyers. They are all anxious to send their goods to their neighbours, but will take nothing but money in return. In other words, each nation gives a facility to exportation, but lays heavy duties on the importation of commodities. We shall endeavour to explain how this illiberality originates. The advocates for restrictions on the importation of foreign goods, into Britain for instance, give two reasons for the necessity of the imposition. The first reason is, that the importation would injure the native manufacturer; and the second is, that unless the exporting country takes our goods free of duty, we should not take theirs free of duty—or, that there must either be reciprocity of trade, or no trade at all. With regard to the first, we shall take the very obvious case of Prussia and Great Britain. Prussia, we shall say, could furnish this country with corn at half the price it can be manufactured for here—a circumstance arising from superiority of soil, cheapness of labour, &c. Nevertheless, Great Britain will not buy Prussian corn for fear of hurting the English and Scotch corn manufacturers. These persons have in all directions cultivated lands, good and bad, at a dear rate, and therefore cannot sell their commodity so cheap as to compete with the *foreigner*. If you admit foreign corn, say they, we are ruined, and the country is ruined also. But the country would not be ruined. If the cheap Prussian corn were admitted free of duty, all the bad lands, which should never have been cultivated, would go out of cultivation, and be devoted to that purpose for which nature intended them. As for those who farmed or wrought upon these lands, they would take up some other trade as a matter of course. By this means, a competition would take place betwixt British and foreign farmers, and the superior skill of the farmer would compensate for many disadvantages in circumstances. The free importation of cheap corn might do a little injury for a time to a *few*—to a class—but it would wonderfully benefit the *many*. It would lower the price of provisions to the working classes, and at the same time encourage manufactures. This may seem a paradox; for it is alleged that foreigners who would sell us corn would not take our British goods in return; and as our present farmers take these goods, we should therefore lose customers for our manufactures. But if the Prussians, or others, would not take goods, they would at least take money. This brings us to the matter of reciprocity. It would at all times be advantageous to deal with countries which admitted our goods free of duty; but seeing that some countries will not do this, we must not on that account refuse to buy from them in any shape. If they will sell cheap, we should buy, even though solid gold were paid for the commodities. Suppose that we were to receive cheap corn from Prussia without duties, and that the Prussians were resolute in excluding British merchandise from their country, and would take payment only in money, the importer consequently sends his payment in money; but this money is only goods under a convenient form. The money was not got for nothing; it did not come into England for nothing; it was paid for in some way or other in goods, and is only the representative of goods. The merchant who originally imported it in the shape of bullion from South America, either paid for it in British commodities, or, what is more probable, sent a draught on London to the exporter, and he sent it back to England to pay for goods which he had previously purchased. In short, in whatever manner we examine the matter, it always turns out that the money which pays the foreigner for his corn was originally got in exchange for goods; and, therefore, it comes to the same thing whether the Prussians take goods in barter, or take gold for which goods have already been bartered. The manufacturers of goods are equally well employed in either case; although there can be no doubt, that, if Prussia would buy our goods freely, another would be added to the list of our customers. If this definition of the value of free buying be not sufficiently explicit, it may be made still more so by an example nearer home. The publishers of this sheet send their goods to the Shetland islands, and at intervals receive sums amounting to twenty pounds sterling, in payment. The staple commodity of these remote islands is fish; but it would never enter the mind of our agent there to oblige us to take that commodity in return for our goods—for the obvious reason, that money is a more convenient form in which to effect a transfer. Besides, the twenty pounds which we from time to time receive are only the representatives of fish. The twenty pounds were previously got by the industrious Shetlanders for their fish; *where* they got the money is of no consequence to the argument; it might be got from the Portuguese for fish to eat during Lent, or from merchants for fish to send to the West India slaves; it is all the same, for it is clear the money must have been got somewhere and for something, otherwise it could not have been given. The Shetlanders thus lose nothing by our not taking their native produce, and no more would the British nation lose by paying foreigners in money on similar commercial principles. It is as ridiculous for nations to refuse buying at the cheapest market, as it would be for the butcher not to buy from the wine-merchant, because he did not buy his meat from him. In the large congregation of tradesmen in a city, each buys where he chooses, and at the cheapest and best shop. When we wish to purchase a hat, we seek out the best hatter, and buy from him, even although he does not deal with us "on principles of reciprocity." The money we give him we got from some one else for our commodities, and that is sufficient. Thus it is with the inhabitants of large communities, and in a wider sphere it ought always to be thus with nations, which are but communities on a more extended scale.*

An able writer on this topic has well remarked: "As the same country is rendered the richer by the trade of one province with another; as its labour becomes thus infinitely more divided and more productive than it could otherwise have been; and as the mutual supply to each other of all the accommodations which one province has, and another wants, multiplies the accommodations of the whole, and the country becomes thus in a wonderful degree more opulent and happy; the same beautiful train of consequences is observable in the world at large—that great empire, of which the different kingdoms and tribes of men may be regarded as the provinces. In this magnificent empire, too, one province is favourable to the production of one species of accommodation, and another province to another; by their mutual intercourse they are enabled to sort and distribute their labour as most peculiarly suits the genius of each particular spot. The labour of the human race thus becomes much more productive, and every species of accommodation is afforded, in much greater abundance. The same number of labourers, whose efforts might have been expended in producing a very insignificant quantity of home-made luxuries, may thus, in Great Britain, produce a quantity of articles for exportation, accommodated to the wants of other places, and peculiarly suited to the genius of Britain to furnish, which will purchase for her an accumulation of the luxuries of every quarter of the globe. There is not a greater proportion of her population employed in administering to her luxuries, in consequence of her commerce; there is probably a good deal less: but their labour is infinitely more productive: the portion of commodities which the people of Great Britain acquire by means of the same labour, is vastly greater."*

There can be no doubt that the full developement of the universal principle of free trade, which we have now explained, would have a tendency to granulate all the nations of the earth down to a uniform level; but it remains to be proved that the Creator of the world has intended that one or more nations should for ever by force or fraud maintain a superiority over the rest. Nature has no preferences. There cannot be a code of commercial principles for one country, and another code for another country, any more than there can be two different codes of morals, or two kinds of truth. The interests of the human race are the same in all regions, whatever be the arrangements or exigencies of governments. It is not, therefore, by force that any nation can remain permanently prosperous. Armies may be raised and fleets manned to maintain national monopolies; but inasmuch as it is an eternal law of Providence that the hand of the diligent can alone make rich, so the only true way of gaining as well as retaining a true national supremacy, is by the general and individual exercise of superior skill, industry, and just dealing.

GREAT BRITAIN.

England at an early period began to manifest a fitness for manufactures and commerce; but the industrious habits of the people were, for centuries after the Norman conquest, depressed by all kinds of restrictions, corporate and baronial privileges, and engrossing monopolies. Even in the reign of Henry VII., in which the middle classes may be said to have arisen, and assumed a respectable station in the community, commerce was restrained by regulations, which, however well meant, were destructive to national industry. The reigns of Henry VIII. and Elizabeth were still more distinguished for the encouragement of injurious monopolies in trade; and till this period, the country produced no manufacture of any description which was not surpassed in quality by the same commodity in one or other of the continental nations. It is in the reign of James I. that we have to look for the origin of the commercial prosperity of England. In the year 1624, a law was passed, declaring "all monopolies, grants, letters-patent, and licences, for the sale, buying, selling, and making of goods and manufactures, not given by an act of the legislature, to be altogether contrary to the laws of this realm, void, and of non-effect." This well-devised statute, as might be expected, immediately excited national industry. The hands and the genius of the people were let loose; and as it was also about this period that trade began to be carried on with the American colonies, we may correctly state that the energies of the nation were not fairly demonstrated, in a manufacturing or commercial point of view, till the end of the first quarter of the seventeenth century, or about two hundred years ago. These energies were, however, dreadfully checked by the subsequent disasters of the nation; although it ought to be allowed that commerce was in the interim considerably indebted to the establishment of the British power in the West Indies, during the protectorate of Cromwell, and to the destruction of much of the Dutch influence in the East. The Revolution of 1688, by defining public and private rights, and giving security to property, very much accelerated the progress of the useful arts in Britain; still we have to attribute, to a period of comparatively recent date, the final establishment of England's commercial greatness. Up till the middle of last century, the nation could boast of none of the great interior works useful to commerce for which it is now so celebrated. Till 1756, it had not a single line of artificial navigation, and possessed, for inland traffic, only a small number of roads injudiciously cut and ill kept up. The cutting of the Duke of Bridgewater's canal, to convey coal to Manchester, gave a sudden impulse towards improved modes of communication, which very soon intersected the country in all directions with canals and turnpike roads, and otherwise produced immense improvements, both in the interior and in the various seaports. The successful institution of various railroads, in latter times, and the introduction of vehicles of all kinds for conveyance, on improved principles, may be said to have, along with what was previously accomplished, given quite a new character and appearance to every portion of the United Kingdom. More has thus been done for commerce in Great Britain within the last eighty years, than had been done for eighteen hundred years previously. Dupin, an intel-

* See our article "Political Economy," for further illustrations of the value of free trade.

* Mill's Commerce Defended.

ligent French writer, in speaking of the unexampled commercial power of the British empire, has fallen into an error with regard to the cause of this greatness. While very properly eulogising the English for their industry, their economy, and their general probity, as sources of national wealth, he states that the great public works of Britain have arisen, in a great measure, from the fostering care of the government, "which," he says, "has allowed commerce a free course, and has thought that it served it sufficiently in securing to it protection without, liberty within, and justice every where." This is decidedly a fallacy, though one which a foreigner might very excusably commit. The British people have owed almost nothing to the state, besides mere legislative protection of life and property. They have, in reality, become a great people in spite of the various administrations which have managed their affairs. The fundamental charter of commerce was wrung from James I. only by the greatest exertions on the part of the Parliament, and by the prospect of subsidies being granted to him. Since that period, the monopoly of the East India trade has been uniformly supported by government at the expense of the public interests; and it can never be forgotten that the imposition of restrictions and taxes on the North American trade lost to this country, by violence, by far the most valuable of its exterior provinces. It would be tiresome to recapitulate the extent of recent and existing restrictions on the British import, export, and home trade; and it would also be needless to mention the number of cases in which great internal improvements, projected by the people, have been prevented from being executed, by the withholding of the consent of the legislature.

British Manufactures.

England has been properly called "the workshop of the world." It supplies manufactured commodities to all nations, even to those from which it has imported the raw materials for manufacture. The greatness of England in this respect is derived from those elementary principles of society already noticed, and from the extraordinary division of labour and employment of machinery, which have created capital ready to be applied to any useful line of industry. A singularly striking instance of the advance of British manufactures from the employment of machinery, is found in the case of the cotton manufacture. The entire value of this manufacture, in 1760, did not amount to L.200,000. It now (1834) may be estimated at about L.40,000,000, employing 850,000 weavers, spinners, bleachers, &c., and 111,000 engineers, masons, smiths, joiners, machine-makers; whose joint wages amount to L.5,330,000 annually. The capital invested in this manufacture is calculated at upwards of L.75,000,000. British manufactured cotton goods are exported to all parts of the world, and in the East Indies, from whence a portion of the raw cotton is procured, undersell the native manufacture. Such are the results of the combination of capital, the division of labour, and the wonderful powers of machinery. The goods which are produced are equal to the work of eighty millions of men.

The manufacture of silk goods has also made extraordinary progress, especially since 1823. Since 1825, the consumption of silks in Great Britain has increased 60 per cent., and the value of the exports has augmented from L.160,000 to L.500,000. The British are fast approaching the French in this branch of manufacture; and nothing can prove this more decidedly, than the fact that the value of our exports of silks to France increased from 119,570 francs in 1826, to 643,720 francs in 1830. The consumption of French silks in this country is correspondingly decreasing. The annual value of the British silk manufacture is estimated at L.8,000,000; 700,000 workmen are employed, and 1,500,000 persons directly or indirectly concerned in the trade. The woollen manufacture is another of the great staples of industry: its annual produce is estimated at L.22,300,000, and gives employment to above half a million of men, women, and children. To supply this manufacture, above 22,000,000 lbs. of wool are annually imported from Germany, independent of what is produced at home. The linen manufacture, which comes next in point of national importance, employs 300,000 persons, and the gross produce annually is valued at L.11,000,000. The manufacture of leather, including the making of saddlery, gloves, boots, shoes, and other articles, is also very extensive. It is computed that it employs 254,000 persons, which, we think, must be below the mark, and that the annual produce amounts to L.15,000,000. No country produces such excellent and cheap hardware as Britain: here the division of labour has been carried to an exquisite pitch of perfection. The annual value of the goods manufactured from iron, steel, copper, brass, tin, pewter, &c., may be estimated at about L.18,000,000, and the number of persons employed at 370,000. The earthenware, china, and porcelain manufacture, has been greatly improved, and now excels that of any other country. Its annual produce is estimated at L.3,500,000, and that of the glass manufacture at L.2,500,000. The restrictions and duties on the glass manufacture oblige nearly all classes to use the coarsest kinds, and as small a quantity of the article as possible. A considerable manufacture is carried on in jewellery, gold and silver plated articles, and gold and silver lace. The annual produce of this elegant branch of manufacture now far exceeds that of France, and was estimated at L.2,500,000 in 1811, since which period the consumption of the various articles must have greatly increased. The annual produce of the following manufactures—paper, pasteboards, hangings; book and printing apparatus; fine arts and engravings; paints, colours; household furniture; coaches, waggons, and carriages—is estimated at L.9,000,000. The miscellaneous manufactures of Britain are almost endless; as salt, alum, soap, tobacco, beer, porter, spirits, gunpowder, candles, cooperage, straw, hair, oil-cloths, tinnery, musical instruments, toys, corks, ships, houses, bricks, tiles, &c. The annual produce of the miscellaneous manufactures is estimated at L.31,200,000. Reckoning all branches of these manufactures in Great Britain, in which raw materials are converted into all sorts of useful and ornamental articles, the amount of the annual produce is estimated at L.148,050,000.

Immense as the amount of the foregoing manufactures appears to be, the value of the commodities raised by cropping the ground, and generally included in the term farm and dairy produce, is much greater. It is computed that the enormous sum of L.1,901,000,000 is invested in the business of farming in Great Britain, and that the total annual produce amounts to L.246,000,000. The quantity of grain raised amounts to about 52,000,000 of quarters, and the average quantity of corn imported may be taken at 900,000 quarters, which is less than two weeks' consumption. The annual value of the produce of the mines, including those of coal, amounts to L.21,400,000. In the year 1830, the total number of vessels employed in commerce belonging to Great Britain, was 23,723, having a burden of 2,531,819 tons, and employing 154,809 men. Calculating profits of all kinds derived from the commercial marine, the total produce amounts to L.34,398,059. Having in our article "The British Empire and its Resources" given a list of the value of the inland trade, fisheries, and other sources of national wealth, we may briefly mention, that the total amount of public and private property in the United Kingdom is estimated at L.3,679,500,000, and that the produce and property annually created is L.514,823,059.

The vast sum of happiness and comfort which might be supposed to flow from the possession of such enormous capital, is reduced to a comparatively inconsiderable amount from the incessant paralysing action of the national taxation. The sum of forty-one millions is levied annually upon consumption—upon the necessaries of life, food, coals, malt, sugar, tea, dress, household articles, raw produce, and the materials of manufactures. The exaction of this prodigious sum, and the restrictions it naturally creates, deprives British manufacturing and commercial industry of innumerable advantages, and prevents the enjoyment of the full benefits of our extraordinary mechanical inventions. "Those (says the accurate Pablo Pebrer, in his excellent work on the Resources of the British Empire) who cannot resolve the perplexing problem, that, in Great Britain, with an immense increase of maritime power, with equally increasing improvements in agriculture, with unbounded commerce and industry, and with immense wealth, individual happiness does not accompany these transcendant advantages, but, on the contrary, marches rapidly in the contrary road, may here find the key to its solution!" The extent to which the commercial greatness and moral elevation of England would be carried, were the national industry relieved of its burdens and restrictions, no human being could calculate.

British Commerce.

The chief exports of Great Britain are, to the north of Europe, cotton and woollen cloth, glass, hardware, pottery, lead, tin, coal, East India and colonial wares, dyestuffs, salt, and refined sugar. In return, Great Britain receives from the north, corn, flax, hemp, iron, turpentine, tar, tallow, timber, linen, pearl and pot ashes, cordage, and hogs' bristles. To Germany, Holland, France, Italy, Spain, and Portugal, it exports cotton and woollen fabrics, cutlery, dried and salt fish, pottery and glassware, colonial and East India goods, and all kinds of the finer manufactures. From Germany it imports corn, flax, hemp, linen cloth and thread, rags, hides, timber, and wine. From Holland, flax, hemp, madder, gin, cheese, butter, rags, and seeds. From France, wine, brandy, lace, cambric, silk ornaments, and fancy goods and fruit. From Italy, Spain, and Portugal, silk, wool, barilla, sulphur, salt, oil, fruit, wine, brandy, and cork. To Turkey it sends cotton and woollen goods, hardware, colonial and East India goods, lead, tin, iron, clocks, and watches; receiving in return, coffee, silk, fruits, fine oil, dyestuffs, carpets, &c. To North America it sends woollen and cotton manufactures, hardware to a large extent, linen, glass, and other wares: the imports from thence are, flour, cotton, rice, tar, pitch, pot and pearl ashes, provisions, ship timber, &c. The export trade to North America has been greatly injured by the duties imposed by the American tariff. The chief imports from South America are cotton, hides, skins, tallow, cochineal, dyewood, sugar, indigo, cocoa, gums, &c.; and the exports from England are the same as above mentioned. The same exports are likewise sent to the West Indies; and, in return, Great Britain receives rum, coffee, tobacco, sugar, ginger, pimento, pepper, indigo, dyestuffs, drugs, gums, cotton, mahogany, Campeachy wood, &c. To the East Indies, China, and Persia, it sends woollen goods, iron, copper, lead, tin, foreign silver money, gold and silver in bars, hardware, and a variety of manufactures; for which it obtains muslins, calicoes, silks, nankeens, tea, spices, arrack, sugar, coffee, rice, saltpetre, indigo, opium, drugs, gums, quicksilver, precious stones, pearls, &c. To the colony of New South Wales, the common English manufactures and colonial goods are exported, and exchanged for train-oil, seal-skins, wool, &c.

Internally, Great Britain trades in the following commodities. England receives from Scotland, corn, cattle, woollen, linen, and cotton goods, canvass, and iron manufactures; the Scottish fisheries also furnish an important article of commerce. For these things, Scotland receives the productions of Ireland, and articles of luxury, of all kinds, from England. Ireland buys of England and Scotland, woollen, cotton, and silk goods, East and West India goods, pottery, hardware, and salt; and, in exchange, gives its linen, hides, potatoes, and other provisions, &c. Ireland exports its productions and manufactures to France, Spain, Portugal, the West Indies, and North America, for wine, fruit, sugar, rum, &c. The commercial intercourse between Ireland and the north of Europe is mainly through England, and its trade with the East passes exclusively through the same channel. The chief articles of export from Ireland are linen, potatoes, and other provisions, corn, whisky, herrings, and salmon.

Within a recent period, the manufactures and commerce of Scotland have wonderfully increased. The iron manufactures of Carron, and the cotton and silk manufactures of Glasgow and Paisley, are known all over the world. The sail-cloth and coarse linen manufactures of Dundee, now one of the most flourishing ports in the empire, have greatly tended to the advancement of the Scottish export trade. The annual value of the Scotch manufactures was recently calculated to exceed L.14,000,000. The tonnage of vessels on the Clyde is nearly as great as that of all Ireland, the tonnage of which, in 1828, only amounted to 97,370 tons—not one-third of the total tonnage of Scotland; the tonnage of Aberdeen is as great as that of Dublin and Belfast, the two principal Irish ports put together.

The foreign possessions, settlements, and colonies of Great Britain, of which it possessed twenty-six prior to the French revolution, and has gained seventeen more by conquest, are Heligoland, Gibraltar, and Malta, with Gozo, and the Ionian Isles, in Europe; its possessions in India, under the administration of the East India Company, and Ceylon, in Asia; the Isle de France, or Mauritius, with the Sechelles and Amirante Isles, the Cape of Good Hope, Sierra Leone, Cape Coast, and Annabon, the islands of Ascension and St Helena, in Africa; Canada, New Brunswick, Nova Scotia, Cape Breton, St John's, Prince Edward's Island, Newfoundland, Hudson's Bay, and the Bay of Honduras, in North America; Berbice, Essequibo, and Demerara, in South America; Jamaica, Barbadoes, Antigua, St Vincent, St Christopher, Nevis, Montserrat, the Virgin Islands, Grenada, Tobago, Dominica, Trinidad, and the Bahamas, in the West Indies; also the Bermudas; in Australia, New South Wales, Van Diemen's Land, and the colony of New Zealand, and Melville's Island.

The most important commercial cities of England, besides London, are Liverpool, Bristol, and Hull; the most important manufacturing towns are Manchester, Birmingham, Leeds, Nottingham, Halifax, Rochdale, &c. In Scotland, the principal commercial places are Glasgow, Greenock, Leith, Dundee, and Aberdeen. The foreign trade of Glasgow and Greenock extends to the West Indies, the United States, the British American colonies, Brazil, and the whole continent of Europe. The foreign trade of Leith, Dundee, and Aberdeen, extends to the West Indies, America, the Mediterranean, and the Baltic. The greatest commercial cities of Ireland are Dublin, Cork, Wexford, Waterford, and Belfast.

Nearly two-thirds of the traffic of Great Britain is carried on in London, and about one-sixth of the whole shipping of the empire belongs to that port. London is likewise the centre point for the negociation of all the great commercial and pecuniary transactions in the United Kingdom. Through it proceed nearly the whole of the foreign bills of exchange, and upon it drafts are made payable from all quarters of the globe. The amount of accounts balanced every day by bankers in London is eight millions sterling!

Both the export and import trade of the United Kingdom have been steadily increasing for a number of years, in proportion as restrictions have become less harassing, as duties have been remitted, and as population has advanced. Not counting odd thousands, the following presents a view of this increase:—In 1800, the official value of the exports from Great Britain, of British manufactures and Irish produce, was twenty-two millions; in 1810, thirty millions; in 1821, thirty-seven millions; in 1828, fifty-one millions; and in 1830, fifty-five millions. This is not estimating the export of foreign and colonial produce, or exports from Ireland. The value of imports into Great Britain has risen in a similar manner, from twenty-four millions in 1800, to forty-two millions in 1830. The following tables will exhibit in the clearest manner the exact extent of the commerce of Great Britain with its colonies and with other foreign countries:—

TABLE I.

An Account of the OFFICIAL and DECLARED VALUE of the IMPORTS to and EXPORTS from the UNITED KINGDOM, from and to each of the BRITISH COLONIES and POSSESSIONS, for the Year ending 5th January 1831; being the last account laid before the House of Commons; distinguishing British and Colonial and Foreign Produce.

Names of the British Colonies, &c.	Official Value of Imports into the United Kingdom.			Official Value of Exports from the United Kingdom. British and Irish Produce and Manufactures.			Official Value of Exports from the United Kingdom. Foreign and Colonial Merchandise.			Declared Value of British and Irish Produce and Manufactures exported from the United Kingdom.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
EUROPE.												
Heligoland	98	17	11	122	15	8	152	12	8	78	5	5
Gibraltar	24,186	3	6	547,465	14	1	127,360	17	5	292,760	1	4
Malta	42,462	12	5	340,920	14	1	49,622	18	6	189,135	3	10
United States of Ionian Islands	100,570	9	9	72,617	11	1	21,075	16	11	56,962	15	4
Isles of Guernsey, Jersey, Alderney, and Man	257,783	8	2	399,184	3	5	108,552	16	7	344,035	[illegible]	11
AFRICA.												
Sierra Leone and Settlements on the Western Coast	312,610	16	5	368,566	9	10	133,770	17	10	252,123	6	2
Cape of Good Hope	171,572	5	9	476,500	2	9	78,752	16	9	330,035	13	8
St Helena	57,570	9	6	26,045	3	7	2,341	2	2	38,915	2	0
Mauritius	675,345	3	5	228,279	19	4	19,408	3	4	161,028	11	2
ASIA.												
E. I. Company's Territories, Ceylon, &c. (including China) the trade with which country cannot be separately distinguished	7,555,632	16	11	6,644,132	3	6	438,706	0	8	3,905,997	9	5
New South Wales	68,276	6	8	213,230	4	11	49,602	13	7	206,204	12	5
Van Diemen's Land	49,282	11	3	89,651	9	6	12,239	12	3	94,429	16	11
Swan River	. . . .			12,794	16	7	4,119	4	6	14,042	0	3
AMERICA.												
British Northern Colonies; viz., Settlements of the Hudson's Bay Company	32,857	3	3	81,899	19	7	8,244	8	1	91,136	2	3
Newfoundland and Coast of Labrador	264,031	16	6	278,352	14	0	48,302	7	9	294,249	17	9
Canada	682,202	6	8	1,388,201	9	5	181,818	18	3	997,501	19	2
New Brunswick	220,094	6	6	245,898	12	9	30,592	7	10	215,448	6	2
Nova Scotia, Cape Breton, and Prince Edward's Island	66,664	6	4	321,413	6	7	34,749	9	8	258,726	12	4
British West Indies; viz.												
Antigua	267,654	11	11	106,091	3	8	8,198	18	7	92,316	9	8
Barbadoes	541,707	19	0	337,082	4	6	21,495	1	8	271,796	11	0
Dominica	149,322	0	1	13,816	9	4	2,085	1	7	14,147	10	8
Grenada	337,921	14	10	74,416	15	0	4,669	17	10	75,365	13	10
Jamaica	3,653,265	17	8	1,699,691	0	0	106,364	1	4	1,246,995	6	0
Montserrat	32,581	7	3	7,417	12	2	569	17	2	8,077	2	9
Nevis	80,333	14	10	13,947	17	1	335	12	8	16,068	13	5
St Christopher	202,917	10	4	68,657	19	2	3,508	15	3	53,084	10	10
St Lucia	148,394	0	11	28,344	19	7	3,715	6	3	21,305	[illegible]	[illegible]
St Vincent's	394,912	18	10	79,863	17	3	3,052	16	0	77,370	8	1
Tobago	164,735	14	4	38,074	5	8	3,266	0	9	41,131	11	5
Tortola	25,211	12	7	2,807	3	4	28	16	0	3,531	1	0
Trinidad	354,788	0	10	173,078	2	9	24,552	14	3	139,517	1	5
Bahamas	21,428	3	1	56,949	6	10	1,769	11	7	41,410	1	10
Bermudas	4,014	1	0	43,708	3	9	16,652	4	11	40,923	18	3
Demerara	1,627,060	19	6	419,363	8	11	31,876	3	5	426,316	3	8
Berbice	370,985	6	8	66,556	11	4	6,823	14	3	69,442	0	6
Honduras	221,855	1	3	520,531	10	1	51,851	9	11	199,610	7	4
British Whale Fisheries	195,591	6	0	—			2,108	2	0	—		
Total . . . £	19,375,924	2	1	15,485,275	0	1	1,642,489	4	9	10,531,329	6	2

TABLE II.

An Account of the AMOUNT of the OFFICIAL and DECLARED VALUE of the IMPORTS to and EXPORTS from the UNITED KINGDOM, from and to all FOREIGN COUNTRIES, for the Year ending 5th January 1831; being the last account laid before the House of Commons; distinguishing each Country, and British and Colonial and Foreign Produce.

Names of the Foreign Countries.	Official Value of Imports into the United Kingdom.			Official Value of Exports from the United Kingdom. British and Irish Produce and Manufactures.			Official Value of Exports from the United Kingdom. Foreign and Colonial Merchandise.			Declared Value of British and Irish Produce and Manufactures exported from the United Kingdom.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
EUROPE.												
Russia	4,203,504	14	7	2,261,295	13	10	770,728	15	11	1,489,538	7	3
Sweden	156,747	2	4	60,666	17	0	94,190	6	8	40,437	18	4
Norway	74,930	4	10	99,277	15	2	35,104	15	5	63,925	13	6
Denmark	370,847	15	8	221,786	7	3	99,177	3	10	118,812	15	2
Prussia	1,595,801	0	10	219,184	17	11	416,065	18	3	177,922	19	9
Germany	2,010,539	7	1	8,641,693	5	1	1,566,380	12	4	4,463,527	4	4
The Netherlands	1,415,881	2	8	2,896,277	10	3	1,735,266	0	2	2,022,458	8	9
France	2,317,686	2	7	478,021	11	0	181,065	1	5	475,884	3	2
Portugal, Proper	445,394	17	9	2,088,361	3	4	38,024	4	1	1,106,694	16	10
——— Azores	16,337	19	6	40,804	19	4	2,188	5	2	23,620	8	2
——— Madeira	18,635	8	0	58,092	14	11	7,677	1	3	38,444	6	0
Spain and the Balearic Islands	1,115,534	13	8	976,907	17	3	146,550	19	8	607,067	11	9
Canaries	86,063	14	6	71,326	10	9	14,372	12	10	42,619	18	1
Italy and the Italian Islands	1,104,309	15	4	5,655,341	1	3	787,145	17	3	3,251,378	10	5
Turkey and Continental Greece	726,065	11	3	2,745,723	18	1	140,038	14	7	1,139,616	9	0
Morea and Greek Islands	9,236	4	6	28,274	8	2	598	10	0	9,694	0	0
AFRICA.												
Egypt	129,169	10	11	237,184	7	5	1,908	17	0	110,227	6	6
Tripoli, Barbary, and Morocco	40,767	11	0	1,648	3	10	493	19	0	1,138	6	11
Senegal	—			—			—			—		
Cape Verde Islands	—			2,513	3	11	418	10	3	1,710	6	0
Isle of Bourbon	30	12	0	9,733	18	1	—			10,041	10	0
ASIA.												
Ports of Siam	—			17,870	4	5	1,495	13	4	10,467	10	0
Sumatra, Java, and other Islands of the Indian Seas	86,026	9	1	257,680	13	8	4,329	8	7	151,634	2	8
Philippine Islands	58,589	19	9	172,317	8	5	1,350	5	7	71,219	15	4
New Zealand and South Sea Islands	5,299	10	8	1,298	6	6	223	13	4	1,396	3	3
AMERICA.												
Foreign West Indies; viz.												
Hayti	102,885	6	1	822,076	0	7	9,880	1	9	321,792	17	10
Cuba	287,440	8	3	550,229	18	11	6,155	3	7	371,669	17	11
Porto Rico	26,015	8	9	522	11	2	192	8	2	744	18	6
Guadaloupe	1	0	0	—			—			—		
St Croix	7	14	5	1,878	2	9	—			1,558	11	0
St Thomas	4,328	7	2	472,738	8	7	29,010	16	4	232,569	16	2
Cayenne	10,843	15	9	11,221	9	8	39	7	8	11,486	0	0
Surinam	898	19	5	—			—			—		
United States of America	8,055,962	7	1	7,843,907	4	11	392,769	16	2	8,132,345	15	3
States of Central and Southern America; viz.												
Mexico	169,222	18	7	1,574,410	14	1	320,406	13	0	978,440	11	0
Columbia	52,869	13	4	427,718	2	0	5,854	1	2	216,751	8	10
Brazil	1,530,557	19	5	4,270,748	18	1	45,457	19	7	2,452,103	3	11
States of the Rio de la Plata	583,946	12	7	1,067,884	1	0	12,679	11	1	632,171	15	8
Chili	25,074	17	10	835,566	0	8	23,094	6	6	540,626	1	11
Peru	85,254	14	10	513,894	14	11	15,569	13	2	368,469	6	11
Total . £	26,923,709	12	5	45,667,078	16	2	6,905,905	4	1	27,690,267	14	1

In the year ending January 5, 1832, Great Britain exported of British and Irish produce and manufactures, official value, L.60,090,123—exported of colonial and foreign produce, L.10,729,943; and imported to the value of L.48,161,661. The Irish exports for the same year amounted to L.608,939, and the imports to L.1,[illegible].

FRANCE.

This large and fine country, which ranks after Great Britain in political power, and from whence many of the refinements of social life have been imported into this country, has never been conspicuous as a manufacturing or commercial nation. It wants the iron ore and coal which England so abundantly possesses; and the industry of the people has taken a direction towards the producing of articles of a light fabric, more for ornament than use. Though possessing an extensive seacoast, France has very few good harbours; and this has powerfully tended to restrict its commercial greatness. Moreover, the attention of its various governments has for a very long period been directed more to military conquest than the arts of peace; consequently, internal improvements have not advanced, the division of labour has not yet been exercised on a great scale, machinery has hardly been brought into use, and spare capital has not been created to foster skill and labour. Besides these causes for the backwardness of manufactures and commerce in France, the existing government, from a mistaken, though common policy, and following the footsteps of Napoleon, has placed the most vexatious restrictions on the foreign and home trade. "Notwithstanding the vast importance to a country like France of supplies of iron and hardware at a cheap rate, that which is produced by foreigners is excluded, though it might be obtained for half the price of that which is manufactured at home. A similar line of policy has been followed as to cotton-yarn, earthenware, &c. And in order to force the manufacture of sugar from the beet-root, oppressive duties have been laid, not only on foreign sugar, but even on that imported from the French colonies. The operation of this system on the commerce and industry of the country has been most mischievous. By forcing France to raise at home articles for the production of which she has no natural or acquired capabilities, the exportation, and consequently the growth, of those articles, in the production of which she is superior to every other country, has been very greatly narrowed."—*M'Culloch's Com. Dic.*

The chief branch of industry in France is that connected with the producing and preparation of wines. It is calculated that 3,000,000 of individuals, or a tenth part of the population, are employed in this great trade, and that the value of the produce of the wine is about L.40,000,000. But the traffic in this valuable commodity is exceedingly hampered by restrictions; and both this and the silk trade have declined in late years.

The commerce of France may thus be summed up. The exports are wine, brandy, oil, corn, meal, liqueurs, snuff, silks, woollens, fancy goods of all kinds, watches, porcelain, crystals, carpets, bronze, linen, lace, cambric, tapestry, hemp, flax, fruits, capers, salt, jewellery, paper, &c.; and France receives the raw produce of all countries, but very few manufactured goods. In the year 1824, the value of all the exports of France amounted to 440,542,000 francs, of which 163,056,000 were in natural products, and 277,486,000 in manufactured goods. In the same year, goods imported into France to the amount of 189,635,000 francs in 3387 French vessels, to the amount of 108,307,000 francs in 4183 foreign vessels, and to the amount of 150,929,000 by land; the whole importation amounted to 454,861,000 francs. The principal ports are Bordeaux, Marseilles, Nantes, Havre de Grace, St Malo, L'Orient, and Dunkirk. The commerce of Marseilles is mostly with the Levant and the West Indies; that of Bordeaux with Asia, the West Indies, and the north of Europe. Calais and Dunkirk carry on a very lucrative contraband trade with England. Havre de Grace is the seaport of Paris, which has a very extensive indirect trade and dealings in bills of exchange with foreign countries. Amiens exports great quantities of velvet; Abbeville, Elbeuf, Louvier, and Sedan, trade mainly in cloths; Cambray, Valenciennes, and Alençon, in cambrics and fine laces. Cette, the port of Montpellier, has an extensive trade in Spanish and colonial goods. The commerce of Bayonne is chiefly with Spain. Silks form a principal article of the commerce of Lyons, which is situated in the centre of the roads leading to Switzerland, Spain, Italy, and Germany, and has annually four fairs. For Strasburg, its excellent turpentine is an important article of trade. Lisle has a direct intercourse not only with all the commercial states of Europe, but also with the French and Spanish colonies, and with the Levant. The other commercial towns of importance are Rheims, Troyes, Grenoble, Nismes, Angouleme, Cognac, Nantes, Rouen, Rochelle, and Caen. Grenoble supplies France, Italy, Spain, and even Great Britain, with fine gloves. Beaucaire has an important fair. The French colonies are Martinique, Guadaloupe, St Lucia, and Mariegalante, in the West Indies; Cayenne, in South America; Pondicherry, Chandernagore, and some other possessions in the East Indies; with several factories on the western coast of Africa, and on both sides of Cape Verde.

HOLLAND.

The Dutch, by their industry and enterprise, their free institutions, which gave perfect security to life and property, and other causes, were at one period the greatest commercial nation in Europe. They were at the height of their commercial glory at the middle of the seventeenth century, and by the greater number of their ships, and their superior skill in navigation, they at this time engrossed nearly the whole of the trade of carrying goods. But they soon after this period began to decline as a commercial people. Their republican freedom merged in corruption and abuse; the most burdensome taxes, or excise duties, were imposed; and their power, which was hence paralysed at its very root, was gradually subverted abroad by the enterprise and perseverance of the British. Holland at length sunk into the character of a second or third-rate commercial nation; though the trade which it still possesses is very considerable. Its chief exports are butter, cheese, linen, cloth, drugs, and paints, fish, wheat, linseed, clover-seed, genera (gin), dye-stuffs, paper, &c. The principal commercial cities in Holland are Amsterdam, Rotterdam, and Groningen. Before the decline of Dutch commerce, Amsterdam was one of the greatest commercial cities of the world, the mart of goods from the East and the West, and from the principal states of Europe. To the exchange and banking business, of which the channel was Amsterdam, the Dutch were also, in part, indebted for their great prosperity. With Hamburg, Amsterdam is yet the centre of the exchange business between the north and the south of Europe, although from the time that the credit of the bank of Amsterdam diminished, this branch of business has declined, a great portion of it being transferred to Hamburg and London. The imports are grain, wood, coal, tallow, wax, rags, &c. For the colonial trade of Holland, the possession of Batavia, Amboyna, Banda, Ternate, and Macassar, in the East Indies, is of importance, as are also the commercial settlements on the Coromandel and Malabar coasts, and those at Bantam, Padang, Japan, &c. In Africa, Holland has some forts in Guinea; in America it possesses Surinam, and the West India islands of Curaçao, St Eustatie, and St Martin.

The commerce of Belgium, which lies adjacent to, and was recently politically joined with Holland, has never been of any great importance. Belgium has few manufactures, the principal being lace and carpets; it has no colonies, and little foreign trade; what is worse, it has no vigorous industry, and no capital. Its chief towns are Brussels, Antwerp, Ostend, and Ghent. Corn, tapestry, lace, fine linen, and flax, are its principal articles of export.

GERMANY.

On account of its navigable rivers, the commerce of this country is considerable. The chief articles of export are linen, linen yarn, raw wool, rags, quicksilver, corn, timber, flax, hemp, wax, lard, salt, wine, and metals. Its imports are woollens, cottons, and silks, hardware, watches, tanned leather, leather goods, tea, cocoa, dyewoods, hides, colonial and East India goods. The principal ports of Germany are Hamburgh, Lubeck, Bremen, Trieste, and Dantzic. In the interior its chief commercial cities are Vienna, Magdeburg, Leipsic, Frankfort on the Maine, Frankfort on the Oder, Augsburg, Berlin, Breslau, Cologne, Nuremberg, Brunswick, Mentz, Bautzen, and Prague. Hamburg, in particular, is the channel through which flows, for the most part, the extensive trade between Great Britain and the German States. By means of the rivers running into the Elbe, the navigation of which has now become free, the numerous and valuable productions of Upper and Lower Saxony, of Austria, and Bohemia, go to Hamburg. By the Havel, the Spree, and the Oder, its commercial operations are extended to Brandenburg, Silesia, Moravia, and Poland. The business of Hamburg consists, in part, of the consignments of foreign merchants, and, to a great extent, of the purchase and sale of domestic and foreign goods. Its money transactions are very considerable. Bremen has important articles of export in the products of Westphalia and Lower Saxony, which it sends to England, Spain, and Portugal; and with America it has more intercourse than any other seaport of Germany. The trade in linens which foreign countries carry on with Germany, passes wholly through the hands of the Hamburg and Bremen merchants, to whom all foreign orders are directed. The importation of tobacco from America into Germany is almost wholly through Bremen. Leipsic, the centre of European trade with the interior of Germany, and the place of deposit for foreign and Saxon goods, has, besides other mercantile privileges, three fairs (Easter, Michaelmas, and the New Year), to which merchants resort from all parts of Europe, and from Asia, and each of which lasts three weeks: there is, besides, at this place, a considerable market for Saxon wool. The chief articles of traffic are Bohemian, Silesian, and Saxon linen; leather, hides, wax, and wool, from Poland; woollen goods and pigments, from Prussia; silks, velvets, and corals from Italy; leather, various manufactures, and dyestuffs, from Austria and Hungary; laces, silk goods of all kinds, ribbons, porcelain, watches, bronze and other manufactures, including fancy articles, from France; leather, hemp, and flax, from Russia; colonial commodities and manufactures, from England and Holland; and literary productions from all Europe. There is also in Leipsic an important horse-market. Augsburg, by means of its agents and bankers, is the medium of mercantile communication between Germany and the south of Europe. The exchange business of Vienna is commonly transacted by drafts on Augsburg. It also derives considerable advantage from the forwarding of goods to and from Italy. Frankfort on the Maine, a place of great commercial activity, especially at the time of its two great fairs, in the spring and autumn, has, besides, a very important business, owing to the opulence of its old and new banking-houses.

AUSTRIA

is entirely separated from Germany by its system of imposts and its commercial regulations. Its trade is mostly carried on by land, or on the rivers. Vienna, the storehouse of the inland trade of all Austria, has a very extensive commerce with England, the Netherlands, and France, and important dealings with Italy, Hungary, Poland, and Turkey. By the way of Vienna, Germany receives great quantities of raw cotton from Turkey. The commerce of Trieste, in the Littorale, consists chiefly in the exportation of German productions and of colonial goods, which go from thence to the Levant, and the coasts of the Black Sea. Trieste may be regarded as the depôt of the productions of the Levant. It is also actively engaged in the importation of British wares, and of the produce of the fisheries of Newfoundland. Except this city, the commerce of Austria is confined to Venice and Fiume. The most considerable places of inland trade in the monarchy, besides Vienna, are Lemberg, Prague, Brunn, Brody, Botzen, Pest, and Cronstadt. The allowed imports consist mainly of raw produce, cotton and wool, silk, rice, oil, spices, colonial articles, leather, cattle, &c. The articles of export are woollen cloths, linens, cordage, mineral productions, grain, and glass. Great profit is derived from the transportation of goods, especially of those of the Levant. In Bohemia, far the greater portion of the trade is in the hands of the Jews, who are numerous in the country. The trade is chiefly in exports: linens, woollens, silks, dyewood, leather, and glass. The glass is superior in polish and cheapness to that of other countries, and the exportation of it is very considerable. It is thought that the goods exported to Spain, Russia, the Levant, and America, amount to 2,500,000 guilders annually. The countries with which Bohemia has the most commercial intercourse, are Austria, Holland, Spain, Portugal, Italy, and Turkey. The exports are rated at from 5,000,000 to 6,000,000 dollars, and the imports (colonial goods, articles of luxury, &c.) at from 4,000,000 to 5,000,000 dollars. Prague is the first commercial city of the country; Reichenberg the second.

PRUSSIA.

The commerce of this monarchy is promoted by the Baltic, by many navigable rivers, and by canals. The commerce in domestic productions is more important than the transportation and commission trade, which flourishes mainly in Cologne, Magdeburg, Stettin, Minden, Dantzic, Königsberg, Breslau, &c. The exports by sea are grain, wax, tallow, wool, linseed, flax, hemp, wood, linen, yarn, woollen and cotton goods, fine works of art, including articles made of amber. The chief port is Dantzic, which is situated on the Vistula, and, after Petersburgh, is the most important centre of commerce in the northern part of Europe. This city is the great warehousing depôt for receiving corn from the interior, and exporting it to other European countries. Of the different commercial places, Frankfort on the Oder has three considerable fairs. Magdeburg sends corn, linen, cotton goods, cloths, leather, salt, and copper, to Hamburg, and to the fairs of Leipsic and Brunswick. It has, besides, a transit trade in colonial goods, wine, grain, &c. Timber is exported from Elbingen, Stettin, Königsberg, Anclam, and Berlin; staves and ashes from Dantzic, Memel, and Stettin; hemp, flax and linseed, tallow, wax, and hogs' bristles, from Memel and Königsberg. Tilsit carries on a brisk trade in corn, linseed, hemp, and flax. The exports of Brunsberg are woollen yarn, corn, and flax. Colberg exports corn, and the other produce of Poland. The trade of Stralsund, likewise, consists chiefly in the exportation of corn. Of all the articles of Prussian commerce, the Silesian linen holds the first rank, and for the manufacturing of it, the Silesian towns Hirschberg, Landshut, Schmiedeberg, Friedland, Waldenburg, Schweidnitz, and the Prussian section of Upper Lusatia, are celebrated. This linen is particularly in demand among the Hamburg, English, Dutch, Italian, and South American merchants. The imports which have the readiest sale in Prussia are colonial goods, dyewood, salt, Buenos Ayres hides, indigo, groceries, wine, silk, cotton goods, hardware, &c.

HANOVER

is not distinguished for its mercantile activity. The exports consist of horses, horned cattle, lead, wax, linen, leather, salt, oats, barley, timber, boards, and the ferruginous copper of the Hartz mountains. The linens are ordinary; the tablecloths and Osnabruck damask are inferior in quality to those of Prussia and Friesland. The surplus of the domestic consumption is exported to South America through the medium of the Hanseatic cities. The principal imports are English manufactures, especially woollen cloths and calicoes, colonial goods, Prussian and Friesland linen, fine French cloths, silks, jewellery, and French wines, with all kinds of small articles of luxury, which the Hanoverian merchant brings with him from the fairs of Brunswick, Leipsic, and Frankfort on the Maine. The chief commercial towns are Emden, Hanover, and Münden.

DENMARK AND HOLSTEIN.

Although the Danish merchants have formed connections with all the commercial states of Europe, and act an important part in the commerce both of the

Mediterranean and the Baltic, their own country possesses but few productions important as articles of export. Most of what they export are the productions of their East and West India possessions. To the ports of Petersburgh, Riga, Stockholm, and Memel, Denmark carries the woollen goods of Iceland and the Faroe Islands; salt from Spain, France, and Portugal; and the productions of the East and West Indies, and of China. To Germany it sends its horses, its cattle, colonial and West India goods, and woollen stockings, receiving, in return, linen, wool, brandy, and wine. To Holland it exports rape-seed, fish, &c., in exchange for groceries. To France, Spain, and Portugal, it carries horses, fish, and other articles from Russia, in exchange for salt, wine, fruits, sweet-oil, brandy, silk, &c. Its trade with England consists, mainly, in exchanging timber, &c. for English manufactures. To Iceland it exports rye-meal, rye, barley, brandy, and other spirituous liquors, together with the common articles of consumption; receiving, in return, fresh, dry, and salt fish, train-oil, tallow, eider down, wool and woollen stockings. It supplies Greenland with flour, spirituous liquors, &c., in return for train and seal-oil, seal-skins, eider down, and peltry.

The largest commercial towns of Denmark are Copenhagen and Elsinor in Zealand, Aalborg in Jutland, Flensborg and Tonningen in Sleswic, Altona and Kiel in Holstein. The West India colonies of Denmark are St Croix, St Thomas, and St John's. On the coast of Coromandel, it possesses Tranquebar; on the coast of Guinea, Christianborg and other small places. It has also small factories on the Nicobar Islands. In Europe it possesses Iceland. The chief commercial companies in Denmark are, the Asiatic or East India Company, the Iceland Company, the Maritime Insurance Company, the African, or Danish West India, and the General Commercial Society.

ITALY.

Although Italy possesses the most excellent harbours on the Mediterranean and Adriatic Seas, and has a geographical situation uncommonly favourable for commerce, its trade, both domestic and foreign, is very limited. The cause is to be sought in the impolitic restrictions, heavy taxes, and imposts, to which the commercial cities are subjected in this most fruitful, but, for the most part, badly governed country. The chief articles of export from Italy are corn, olive-oil, wine, brandy, silk, cotton, wool, hemp, flax, velvet, damask, barilla (soda), sulphur, sumach, gall-nuts, madder, velani or velonia, and other dyestuffs; senna leaves, liquorice juice and root, juniper berries, and other drugs; anchovies, almonds, figs, nuts, olives, currants, raisins, and other fruits; rags, chip and straw hats, the skins of sheep and kids, and marble. The principal commercial cities are Florence, Genoa, Leghorn, Naples, Venice, and Ancona. Leghorn is the main channel of the trade of Italy with the Levant and the Barbary States, and the central point of the commerce of England in the Mediterranean. A great part of its trade is in the hands of the Jews. Silks, taffeta, satins, brocades, light woollen goods, velvets, &c., are the main articles of export from Florence. These pass through Leghorn, and sell readily in the Levant. Milan and Turin carry on a very extensive trade in their silk, which is celebrated throughout Europe for its admirable fineness and lightness. Ancona has intercourse with the first commercial cities of Europe. Its business is chiefly agency and commission business. Some silk is exported from Nice. The exports of Lucca are olive-oil, silk, damasks, fruit, &c. Much olive-oil is exported from Gallipoli. The trade of Genoa continues considerable. Its exports are velvet, damask (which, next to the Venetian, is the most esteemed in Europe), raw silk, fruit, olive-oil, alum, marble, corals, coarse paper, &c. Venice, once the greatest mart of the world, notwithstanding the disappearance of its ancient splendour, is still an important place for commerce, a great part of the trade of Europe with the Levant being yet in its hands. The Venetian velvets, damasks, mirrors, and manufactured silks, in great quantities, form the most considerable constituents of the foreign trade of Venice. The exports of Naples are olive-oil, wool, silk, tartar, wines, raw and manufactured silk, fruit, sulphur, and staves.

THE ISLANDS OF THE MEDITERRANEAN SEA.

The exports of Sicily, a country on which nature, with profuse generosity, has lavished in abundance all her gifts (the benefit of which, however, is almost destroyed by the weakness of the government), consist of silk, grain, barilla, sulphur, olive-oil, wine, cantharides, sumach, manna, coral, rags, almonds, figs, raisins, nuts, anchovies, amber, goat, buck, and sheep skins, pomegranates, oranges, lemons, &c., and pine apples of remarkable size and exquisite flavour. The chief port is Messina; next to this comes Palermo.

The exports of Sardinia are, chiefly, grain of uncommon excellence, tunny-fish, hides, barilla, and salt. Cagliari is the most considerable commercial city.

Corsica exports silk, olive-oil, and black, white, and red corals. The silk goes mostly to Genoa and Lyons, and the corals are sold at Marseilles, where they are manufactured and polished, to be sent to Africa, to be sold to the Moors and Negroes. The Corsican ports are, Ajaccio, Bastia, and Porto Vecchio.

Malta, which is, like Gibraltar, a depôt for British and colonial goods that are to be disposed of in the Mediterranean, exports cotton, oranges, and other fruits.

The Ionian Islands (Cephalonia, Zante, Corfu, Santa Maura, &c.) export wine, brandy, olive-oil, raisins, currants, citrons, melons, pomegranates, honey, cotton, and salt. The raisins and currants are superior to those of the Morea in quality. The wine is Muscadel.

The commerce of the island of Cyprus is inconsiderable. It exports cotton, wool, silk, wine, salt, turpentine, Turkish leather, &c. Its largest commercial cities are Larnica and Rhodes.

The exports of the island of Candia, which, by its situation, is designed for the mart of the European, Asiatic, and African trade, consist of oil, soap, wax, wine, linseed, rasiins, almonds, laudanum, &c.

RUSSIA.

This large empire has greatly increased its commerce in modern times, but its merchants engaged in foreign traffic are mostly foreigners, who are placed under various restrictions injurious to trade. The main element of the Russian commerce lies in the immensity of the raw produce of the country, as tallow, hides, and flax; and unless these commodities found a vent in foreign countries, among which Great Britain takes most, the greatness of Russia, which is founded on no proper principle, would speedily crumble in pieces. The principal commercial city of Russia is Petersburgh, at the confluence of the Neva with the Gulf of Finland: Riga is second in importance, and commands the Baltic trade. The chief exports from these and other ports are tallow, hemp, flax, iron, copper, grain, deals, ship masts, potashes, bristles, linseed, hempseed, oils, furs, leather, hides, and skins of various kinds; canvass, cordage, wax, isinglass, tar, and other raw and partially manufactured articles. The principal imports are cloths, cotton goods, silks, salt, wines, and all foreign articles of luxury. By the Black Sea, and the Sea of Azoph, Russia carries on a tolerable trade with various Turkish ports. It likewise carries on trade to some extent with Persia, and other countries in the East. by means of land carriage.

SWEDEN AND NORWAY.

The articles exported from the twenty-eight Swedish ports are iron, steel, copper, pitch, tar, fir, alum, and fish. The chief commercial cities are Stockholm, Gottenburg, and Gefle. Carlscrona carries on considerable trade in iron, timber, pitch, tar, tallow, potash, linseed, &c., which articles are sent mainly to the French, Spanish, and Italian ports, commonly in exchange for salt. The exports of Gottenburg are fish, iron, steel, and boards. The institutions of Sweden for the promotion of commerce are, the Bank, the East India Company, the West India Company, the Levant Commercial Company, the Association of Industry, &c. From Norway are imported fish, oak and fir timber, deal boards, masts, alum, vitriol, fish, and seal-oil, pitch, hides, woollen stockings, iron, copper, and tar. The chief commercial cities are Christiania, Bergen, Drontheim, Christiansand, Drammer, and Stavanger.

SWITZERLAND.

Switzerland has a considerable foreign trade. Its exports consist chiefly of fine linen, silks, velvets, imitations of East India goods, and shawls, fine calicoes, clocks, watches, ribbons, wine, cheese, honey, &c. The most important articles of importation are colonial and East India goods, from Holland; salt, grain, wool, and cloths, from Germany; raw cotton, silk, &c. from Italy; manufactures of various kinds, from England; wine and brandy from France. The principal commercial cities of Switzerland are Basle, Berne, Zurich, Geneva, and Neufchatel.

SPAIN.

For three centuries, with the decrease of the industry of Spain, its trade has been on the decline. This country might have monopolised the commerce of the world, if it had understood and improved its situation. The natural wealth of the soil is, nevertheless, still the prop of its trade. The most important productions are wool, silk, salt, iron, copper, coal, quicksilver, barilla, rice, saltpetre, sugar, almonds, olives, oranges, lemons, figs, wines, brandy, and fruit. In Segovia and Leon, about 1,000,000 arobas of fine wool are annually collected, of which about four-fifths are disposed of to the French, Dutch, and English. The excellent Spanish wines, brandy, fruit, barilla, &c. are profitable articles for the country. From the port of Barcelona, excellent silks, coarse cloths, and cotton goods, with wine, brandy, almonds, nuts, and other productions, are exported; in return for which, the same port receives the silks of Lyons, the hosiery of Nismes, various kinds of stuffs and cotton goods, German linen, and dried stock-fish from England, amounting to about 3,000,000 dollars. The exports of Valancia consist principally of silk, barilla (soda), coarse wool, dried fruits, wine, and brandy. The latter is exported chiefly by the Dutch, and carried to Normandy and Bretagne. The English carry to Spain chiefly woollen cloth; the French, linen, woollen cloth, cutlery, groceries, &c. From the port of Alicant, the Spaniards export chiefly dried fruits, silk, wool, barilla, wine, Castile soap, olives, saffron, a kind of cochineal called *grana*, and salt; of which last, the English and Swedes annually take upwards of 9,000 000 pounds. In Carthagene and Malaga, also, much business is done. From the latter, wines, dried fruit, almonds, sumach, anchovies, olive-oil, &c. are exported. Seville carries on a considerable trade in oil and oranges, which are exported from Cadiz—a port once of great commercial power, but now partaking of the declension of Spain. Almost the whole Spanish coasting trade is in the hands of the French, Dutch, and English. The independence of Spanish America has almost annihilated the colonial power of Spain.

TURKEY.

The Turks are as yet very far from being a commercial nation, although their commerce with Austria, France, Italy, Great Britain, Holland, &c., by means of the Jews, Armenians, and Greeks living in Turkey, who have the trade of this country almost wholly in their hands, is by no means insignificant. They offer cotton for linen, silk for cloths, gold for iron. Nature and habit recommend to them intercourse with Austria. On the other hand, the commerce with European Russia, by way of Constantinople to Odessa, was very much restricted by the Porte, subsequently to 1823, by the necessity of re-lading, to which it subjected the European vessels destined for Odessa, and by other burdensome regulations. This, however, has been changed by the peace concluded with Russia in 1829. Every vessel can at present pass the Dardanelles unmolested. This must soon have a great influence upon the Turkish trade also. In the Archipelago, the Greek struggle for freedom has given rise to many dangers to the commerce of neutrals. The chief commercial place is Constantinople, particularly in regard to the trade with Russia. Till within a short period, it distributed the Russian products through the ports of the Mediterranean. The exports of this city, which, under a wise and active government, might become the true mart of the world, are of such little importance, that the great quantities of goods imported for the use of Turkey have to be paid for almost wholly with gold and diamonds. In this port, the English, French, Italians, and Dutch, obtain the produce of Poland, the salt, the honey, the wax, the tobacco, and the butter of the Ukraine; the hides, the tallow, the hemp, the canvass, the peltry, and the metals of Russia and Siberia, and in exchange give the productions of their own countries. This business is transacted without the Turks having the slightest part in it.

ASIA.

The commerce of Asia is mostly inland, carried on chiefly in Western and Middle Asia, by means of those caravans (called by a poet *the fleets of the desert*), in which sometimes more than 60,000 merchants and travellers are collected, while the number of camels is far greater. The central point of this trade by caravans is Mecca, which, during the presence of the caravans, offers to the eye of the traveller a more active trade and a greater accumulation of merchandise than any other city in the world. The muslins and other goods of the East Indies, the productions of China, all the spices of the East, the shawls of Cashmere, &c., are transported on the backs of camels to Mecca, from whence they are scattered over, not only the Asiatic, but also the African continent.

The Arabs, who were, before the discovery of the passage to the East Indies around the Cape of Good Hope, the first commercial people of the world, have now no commerce of consequence. Coffee, aloes, almonds, the balsam of Mecca, spices, and drugs, and their African imports of myrrh, frankincense, and gumarabic, are their chief articles of export. Yemen, rich in the costly productions of nature, resorts for a market to Mecca. The Arabian Gulf and the Red Sea connect the commerce of Arabia with that of Africa, especially with that of Egypt and Abyssinia.

The chief places for Persian trade are the Turkish cities of Bagdad and Bassora. The harbour of Abuschar, or Buschir, on the Persian Gulf, is also a mart for Persian and Indian goods. Bagdad, once the centre of a brilliant and extensive commerce, may still be considered as the great mart of the East, though it is by no means what it has been. From Bassora, the productions of Arabia, India, Persia, and the Asiatic islands, are sent to Bagdad, where they find a very good market, and from whence they are scattered through the other cities of the Turkish empire. By means of the Arab caravans, Europe supplies Persia with goods of all kinds, and even with the productions of America. On the other hand, it has nothing to give but dates, tobacco, and a very moderate quantity of woollen stuffs, its whole trade consisting in the distribution and sale of the products of other countries. Bassora is, by its situation, the mart of the active East Indian, Persian, and Arabic trade, carried on in the Persian Gulf. Its trade with the East Indies is very considerable, it being the channel through which the Ottoman empire is supplied with the groceries of the East, and with the manufactures of the British possessions in the East Indies.

The principal port of the Levant is Smyrna, a very important depôt of the merchandise of the East and West. The articles exported from the Levant are coffee, cotton, wool, silk, madder, camels' and goats' hair, hides, raisins, figs, pearls, rotten-stone, whet-stones, nut-galls, opium, rhubarb, and other drugs. Angora sends to Smyrna, by caravans, considerable quantities of Angora goats' hair, and stuffs made of the same material; for the Angora goats' hair is manufactured into camlet, in the Levant itself, and in Europe, especially in England, France, and Holland, some of whose camlet manufactories keep agents in Angora, through whom they make their purchases. Damascus is the centre of trade in Syria, and does a good deal of business through the caravans, which go from the north of Asia to Mecca, and from Bagdad to Cairo. Aleppo has much commercial intercourse with Constantinople, Bassora, Bagdad, Damascus, and Scanderoon, or Alexandria, to which places caravans go every year through Aleppo. Its exports are its own silk and cotton goods, the shawls and muslins of the East Indies, the gall-nuts of Curdistan, copper, and drugs.

EAST INDIES.

For the long period of 4000 years, the products of India, so important in commerce, have remained the same; for all the commodities and treasures of India mentioned by the ancients are to this day those for which the nations of the other quarters of the world resort thither, viz. rice, indigo, cochineal, and other dyestuffs, opium, cotton, silk, drugs, cinnamon, cassia, cocoa-nuts, &c. The East India trade is mostly in the hands of the English, under the management of the East India Company. Next to the English, the United States are most extensively engaged in the East India trade. Denmark carries on but an inconsiderable trade with the East Indies, and that once carried on by Sweden is now almost annihilated, although, prior to the late great changes in the government of that country, the Swedish East India Company was, of all the commercial societies of Europe, the best regulated, and the most successful in its operations, next to the English. The trade of Portugal with the British possessions in the East Indies is of importance; that of Spain, on the other hand, inconsiderable. Calcutta is the most important commercial city of the East Indies.—For complete information on the trade of the East Indies, we refer to our article on that country.

The trade which China carries on with Europe, British India, the United States of America, Cochin-China, and Siam, with Japan, and the other Asiatic islands, is very considerable. The British imports into China have hitherto been partly shipped by the East India Company, partly by private merchants. From 1781 to 1791, the Company sent thither to the amount of L.3,471,521 in goods, and L.3,588,264 in bullion; from 1792 to 1809, L.16,502,338 worth of goods, and L.2,466,940 in bullion. The exports which the Company made to England amounted, from 1793 to 1810, including duties, freights, &c. to L.41,203,422, and they were sold for L.57,896,274, leaving the Company a net profit of L.16,692,852. From the different ports of the British possessions in the East, thirty-five ships entered the port of Canton in the years 1818 and 1819, and the value of their cargoes was 8,714,272 dollars; and including what was shipped to Macao, the total was 11,999,272 dollars. The exports of the English merchants not connected with the Company, to China, probably amount annually to L.500,000. Next to the English, the people of the United States have the most trade with China. Its amount has increased 387 per cent. in 25 years. The exports of tea by the East India Company, in this time, have also greatly increased.—For information on the subject of the tea trade and Chinese commerce, we refer to our article on China.

From Siam and Tonquin are exported tin, ivory, diamonds, and other precious stones, gold dust, copper, salt, betel, pepper, wax, silk, timber, and lackered wares, and the commerce of these two countries is mostly in the hands of the Chinese and Portuguese. The import trade of China is conducted to a great extent by smuggling, on account of the restrictions of the government.

Since the expulsion of the Portuguese from Japan, the commerce of this country has been almost wholly domestic. The only foreigners with whom the Japanese still have any trade, are the Chinese and the Dutch, and these are limited to the single port of Nangasaki. The Chinese supply the Japanese with rice, common porcelain, sugar, ginseng, ivory, silks, nankeen, lead, tin plates, alum, &c.; and, in return, receive copper, camphor, lackered wares, pearls, corals, and a metallic composition called *sowas*, consisting of copper and a small quantity of gold. The Dutch obtain chiefly copper, camphor, lacker, and lackered wares. The Japanese sabres and daggers are very excellent, and are perhaps surpassed only by the sabres of Damascus.

AFRICA.

The want of navigable rivers, and the immeasurable deserts by which the fruitful regions of Africa are separated, form an insurmountable obstacle to that extension of commerce which the great fertility of this quarter of the globe would promise. In addition to the intercourse of the interior, the commerce of Africa has its sources in Egypt, the Barbary States, on the west coast of Guinea, in the neighbourhood of the rivers Gambia, Niger, and Senegal, at the Cape of Good Hope, and the Portuguese colonies, and on the coasts of the Red Sea. The inland trade is carried on by means of caravans. The African caravans consist of from 500 to 2000 camels. The three principal countries from which they proceed are Morocco, Fez, and Egypt. The chief articles of the inland trade of Africa are salt, gold, and slaves. The greatest caravans go from the western coast and from the interior by way of Timbuctoo, the great mart of the inland trade, and other places of depôt, to the eastern coast. There is a considerable trade between the British settlements in the East Indies and Mozambique, and the English obtain elephants' and hippopotamus' teeth, tortoise-shell, drugs, cowries, gold, &c.

The commercial intercourse of the Barbary States with Europeans is very inconsiderable and vacillating, and the little business which is transacted is mainly in the hands of the French, British, and Americans. The exports consist of olive-oil, wax, wool, wheat, gums, almonds, dates, aromatic seeds, ivory, leather, hides, and ostrich-feathers. Even the coral fisheries on the coasts (from Cape Rosa to Cape Rouax) are in the hands of the French and Italians; and the annual produce of about 50,000 lbs. of coral is worth more than 420,000 dollars. But a far more important commerce is pursued by the Barbary States with Arabia, Egypt, and the interior of Africa. Tunis is the most important commercial state in Barbary. Tripoli has little trade, and its exports consist mostly of saffron, ashes, senna leaves, and madder.

The trade with the Cape of Good Hope is extremely advantageous to Great Britain. In 1820, the importation of English goods exceeded L.330,000, while the exports of the colony (mostly Cape wine) did not amount to L.6000. The amount of the trade has since been very much enlarged by the increase of colonisation. The average exports from Great Britain to the Cape of Good Hope amounted to 2,119,000 dollars, and the imports into England from the Cape to 1,501,000 dollars.

From its uncommonly favourable situation, in the centre of three portions of the globe, Egypt seems destined by nature to be also the centre of their commerce; but it has lost much of its former rank in the commercial world, since it has ceased to be the channel of the India trade; nevertheless, for some time great efforts have been making by its sovereign, Mohammed Ali, to restore and enlarge its traffic. The exports of Egypt are rice, corn, cotton, myrrh, incense, opium, dates, mother-of-pearl, ivory, gums and drugs of various kinds, hides, wax, &c., most of which go to Constantinople, the Barbary States, Great Britain, Venice, and Marseilles. It also exports the productions of Arabia. The chief commercial cities are Cairo and Alexandria, united by a complete canal since 1810. Cairo has two ports, Rosetta and Damietta. France sends to Egypt woollen cloth, red caps, fringes of all kinds, and ornaments of dress, ordinary china ware, arms, &c. England sends muslins, and cloths of different kinds, alum, iron, lead, vitriol, gums, &c. From Florence silks are imported.

Sierra Leone, and the Pepper, Ivory, Gold, and Slave Coasts, where the Dutch, French, English, and Danes, have settlements, export gold dust, ivory, gums, hides, &c., and formerly slaves, in exchange for woollen and cotton goods, linen, arms, gunpowder, &c. The coasts of Lower Guinea (Congo, Angola, &c.), and the Guinea Islands, mostly occupied by the Portuguese, export grain, provisions, cotton, indigo, sugar, and *slaves*.

Among the other African islands, the Azores raise, for exportation, wine and fruits. About 20,000 pipes of the former are annually exported by the English and Americans, chiefly to the East and West Indies. The island of St Michael sends every year to England and the United States, 60,000 to 80,000 boxes of oranges. The oranges of the island of Pico are remarkable for their superior quality. This island also produces a beautiful kind of wood, which is almost equal to mahogany. The staple productions of the Canaries are archil in its raw state, rosewood, brandy, and Canary wine. The last goes chiefly to the West Indies and England; in the latter country it is always sold for Madeira wine.

The Cape Verd Islands export archil in a raw state, and coarse cotton cloth for the use of the Africans. The staple produce of Madeira is valuable wine, which is divided into five kinds, according to the market for which it is designed. The most excellent is called *London particular.* The next in quality is also sent to the London market. Of inferior quality is that destined for the India market. The kind that goes to America holds the fourth rank, and the fifth is designated by the name of *cargo*. Of this wine the English annually receive more than 7000 pipes; the United States about 3000. The Isle of Bourbon produces coffee, cloves, white pepper, cotton, gums, benzoin, and aloes. Its trade is confined almost wholly to Madagascar, Isle de France, the Comoro Islands, and the settlements of the Arabs on the eastern coasts of Africa. The Isle de France, or Mauritius, exports coffee, indigo, cotton, sugar, nutmegs, cloves, ambergris, &c. The exports of Madagascar are cowries, betel-nuts, ambergris, wax, cocoa-nuts, and corn.

NORTH AMERICA.

United States.

The people of the United States, as already noticed, are equally remarkable with the British for their eager spirit of industry and pursuit of commerce. In this respect they far surpass the South Americans, who, though enjoying an equally productive region, and one as valuable in many respects for manufactures and trade as that of North America, have made no advances worth mentioning in the arts of civilised life. The large space of unsettled fertile territory fit for cultivation which the North Americans possess, has led them very judiciously to devote their labour and capital to the business of the farmer in preference to the arts of the tradesman. For this reason they form a nation which buys largely of British and foreign manufactured goods, which they are well able to pay for by the great abundance of their native produce. Strangely enough, although it is clearly demonstrable that this is the best course for the North Americans to pursue, their legislature has followed the blundering policy of European states, in imposing restrictions and duties on imports, with the view of forcing the people to leave the agricultural pursuits which they have naturally discovered to be most advantageous, in order that they may sink their capital in unprofitable processes of manufacture. The consequence of this folly has been most disastrous, not only to American foreign commerce, but to those for whose advantage the scheme was contrived. "Instead of the goods manufactured in the States (says Mr M'Culloch)* being as cheap as similar ones manufactured in Europe, they are admitted to be, at an average, from 30 to 100 per cent. dearer! The extent of the pecuniary sacrifice that is thus imposed on the Union has been variously estimated by American writers; but we have been assured by those who have the best means of knowing, that it may be moderately estimated at from 50,000,000 to 60,000,000 dollars, or from about L.11,000,000 to L.13,000,000! And this immense burden—a burden nearly *three* times as great as the whole public expenditure of the republic—is incurred for no purpose of public utility, and is productive of nothing but mischief. The whole effect of the scheme is to divert a certain amount of the national capital from the production of cotton, wheat, rice, tobacco, &c. (the equivalents sent to foreigners in payment of manufactured goods), to the direct production of these goods themselves! And as the latter species of industry is nowise suitable for America, a tax of L.13,000,000 a-year is imposed on the Union, that the manufacturers may be enabled to continue a losing business.

"We entertain too favourable an opinion of the Americans (continues this studious and intelligent writer) to suppose that such a system can be permanent. It has been established in opposition to the wishes of all but a majority of Congress; is exceedingly unpopular in the Southern States, and generally throughout the Union; and has been repeatedly condemned by committees of the legislature. In an able report by a committee of the house of representatives, dated 8th of February 1830, it is said, 'We had before us the prospect of a long and general peace, and our policy should have been regulated accordingly. Our revenue laws should have been restored gradually, but decisively, to their condition previously to the war. Our policy unfortunately took another direction. The tariff of 1816 laid the foundation of all our subsequent errors; and we have now been engaged for fifteen years in an unprofitable experiment to effect what embargo, non-importation, non-intercourse, and war, failed to accomplish. We have attempted, by the mere force of congressional decrees, to resist the natural and salutary tendency of our industry to commercial and agricultural pursuits. We have been steadily sacrificing the commerce, navigation, and capital, of New England, merely to bring forward new competitors in manufacturing, to embarrass our old and skilful artizans, and to ruin themselves. We have, from session to session, kept trade in such agitation and uncertainty, that the value of property could never be ascertained till the adjournment of Congress; and this we have called encouraging and protecting our industry! We have wasted millions of our ancient profits of commerce in a visionary experiment to increase our national wealth. In a legislative attempt to make ourselves more completely independent of foreign nations, we have effectually undermined the foundation of that naval power which can alone protect our country from foreign aggression.'"

With these observations on the present condition of the United States, as regards the principles which regulate their manufacturing and commercial economy, we proceed to notice the state of trade generally. The exports of domestic products for 1828, according to the custom-house estimates, were 50,669,669 dollars. (The dollar is worth about 4s. 6d. sterling.) Those of cotton, the great staple of the country, were 22,487,229 dollars, and, accordingly, nearly half of the entire amount. The next greatest export is that of tobacco, which amounted to 5,269,960 dollars. Of rice, the export amounted to 2,620,696 dollars. The value of these three articles, being over 30,000,000 dollars, thus constituted three-fifths of the whole. In the annual returns made to Congress, the exports of domestic products are divided into those of the *sea*, the *forest*, *agriculture*, and *manufactures*. The three species of agricultural articles above mentioned are mostly the productions of the Southern States, including Virginia and Kentucky. The other exports, coming under the same head, are mostly furnished by the Middle and Western States: namely, beef, tallow, hides and cattle, butter, cheese, pork, bacon and hogs, horses, mules, sheep, flour, buscuits, corn-meal, rye-meal, oats, potatoes and apples, flax-seed, and hops. Of these articles, the principal are flour and biscuit, the value of which was 4,464,774 dollars, being the third article in value among the exports. The fifth article in value is that of swine and their products—viz., bacon, pork, and lard, the value of which was 1,495,830 dollars, mak-

* Commercial Dictionary; article New York.

ing about one thirty-third part in value of the whole export. The articles of corn-meal and rye-meal amounted to 881,894 dollars, constituting a little more than one-sixtieth part of the whole exports. Cattle and their products, including butter and cheese, exceeded the last amount, being 896,316 dollars. This species of export is of far less comparative importance in the trade than formerly, being limited to its present amount, not by the capacity for production, but by the extent of demand in the foreign markets; for an increase of the foreign demand would very soon double and treble the quantity. Some of the articles comprehended in the above list, though agricultural products, yet involve some process of manufacture; such, for example, as butter, cheese, bacon, flour, biscuit, meal, and part of the tobacco. A great many, however, of the exports coming under the head of *manufactures*, include in them the value of materials supplied by agriculture, such as the cotton fabrics, those of leather, and spirits distilled from grain; so that, on the whole, the strictly agricultural products of the country constitute a larger proportion of the whole exports than the tables represent; and yet the proportion represented by the tables is very large, being 38,500,000 out of the 50,000,000; and if we add the value of the materials supplied by agriculture for the manufactured exports, we shall have at least six-sevenths of the whole domestic exportation consisting of the raw products of agriculture.

The products of the whale, cod, mackerel, and herring fisheries, exported mostly from the Northern States, amount to 1,603,980 dollars, being nearly a thirtieth part of the whole domestic export. Nearly one-half of this value consists of codfish, and more than one-third of the products of the whale-fisheries.

The value of skins, furs, ginseng, lumber, staves, bark, tar, pitch, rosin, and turpentine, and pot and pearl ashes, partly from the Northern and partly from the Southern States, which were formerly of much greater comparative importance in the trade of the country, now constitutes about one-thirteenth part of the whole value of the domestic exports, and amounts to 3,889,611 dollars. A large proportion of the trade in these articles, as well as in those of codfish and bread-stuffs, is carried on with the West Indies, Mexico, and South America. The skins and the furs go to Europe and Canton; the ginseng to Canton, but in less quantity than formerly, being, in 1828, but 91,164 dollars; and the pot and pearl ashes are sent to England and France.

The manufactures are as yet of the coarser sort, consisting partly of articles made of the products of the country, and partly of those fabricated from foreign materials. The articles in which the foreign materials from a considerable part of the value, are spirits manufactured from molasses, refined sugar, articles of iron, cordage, chocolate, gunpowder, umbrellas, and parasols, gold and silver coin, and jewellery.

The whole estimated value of exports of home manufactures is about 6,500,000 dollars, being about thirteen per cent. of the whole domestic exports of the country. The value of raw materials imported, and then wrought up in manufactured articles, and exported, and included in the list of domestic manufactures, may be estimated at about 200,000 or 250,000 dollars; leaving the net exports of manufactures from the raw products supplied by the country about 5,750,000 dollars. As cotton fabrics form a large item in this list of exported manufactures, and those fabrics are mostly of the coarser kind, the raw material will constitute a very considerable part of their value, and the proportional value of the direct wages of manufacturing labour incorporated in these exports will be proportionally less. Taking the whole list of domestic manufactured articles together, and making allowances for the cost of the raw materials, in their rudest state, after they are taken from the ground or from animals, and assume the character of merchandise, by deducting their value from the gross amount of that of the exported manufactures, the remainder, which is the result of the manufacturing labour, interest of capital, and profits incorporated into these materials, to bring them into the state in which they are exported, may be estimated at about 4,000,000 dollars.

We will now glance hastily at the descriptions of articles on which the arts of the United States are employed for the supply of foreign markets; and the most considerable of them is cotton twist, thread and fabrics, the exported value of which, for the year 1828, was 1,000,000 dollars and a fraction over, being one-fiftieth part of the whole domestic exports, the principal markets of which are South America, Mexico, and the Mediterranean. The value of leather, and its various manufactures, exported, is a little over 500,000 dollars, making one per cent. of the entire exports of the description of which we are speaking. The value of hats exported during the same year was about 333,300 dollars—a very large amount, considering the short period since this article has been sent to foreign markets. Soap and candles have long been supplied for the foreign markets, the amount for the year in question being about 900,000 dollars. The various articles manufactured, for the most part, of wood, such as furniture, or of wood, leather, and iron, such as coaches and carriages, besides various agricultural implements supplied to the West Indies and South America, constitute a very important branch of trade, which amounted to between 600,000 and 700,000 dollars. The American glass begins to appear in the foreign markets. The value sent abroad in 1828 was 51,452 dollars, and it bids fair to be increased. The other exports consist of a variety of articles in small quantities, among which are wearing-apparel, combs and buttons, brushes, fire-engines and apparatus, printing-presses and types, musical instruments, books, maps, paper and stationery, and trunks. It is apparent, from the above enumerat and estimates, that the manufactured articles, of which the export is most considerable and the most flourishing, are those of which the raw materials consist mostly of cotton, wood, and leather.

The foreign articles imported and again exported from the country, during the same year, amounted to 21,595,017 dollars. This transit trade thus appears to form a very important part of the American commerce. But one-third of this whole amount consists of an article which affords very little freight, namely, specie, the export of which during the same year was about 7,500,000 dollars. Another large item in value of this transit trade, consists of cotton fabrics, the exports of which were 2,000,000 dollars. The foreign silks exported amounted to about a quarter as much. The value of wines exported was about 333,300 dollars; that of teas about twice as much; that of coffee and cocoa, 1,500,000 dollars; and of sugar nearly 1,000,000 dollars. These are the most important articles of foreign export. The other exports of foreign articles, previously imported, amounted, during the same year, to about 8,000,000 dollars in the whole; but it is not necessary to enumerate them.

The imports for the same period, according to the custom-house estimates, amounted to 88,509,824 dollars, and exceeded the estimated value of the exports by about 16,250,000 dollars. In regard to the various kinds of goods imported, without pretending to great exactness, which is the less important as the proportions vary considerably from year to year, it appears that some of the principal articles have constituted nearly the following proportion of the whole imports, previously to 1828; viz. wool and woollen fabrics, 11 per cent.; cotton stuffs, 12; silk, 10; hemp and flax, and manufactures of them, 5; iron and steel, and manufactures of them, 5; spirits, $1\frac{1}{2}$; molasses, $2\frac{1}{2}$; teas, 4; coffee, $3\frac{1}{2}$; sugar, $5\frac{1}{2}$; and indigo, $1\frac{1}{2}$ per cent. The principal trade, both import and export, is with Great Britain and its dependencies, whence, in 1826, the imports were forty-two ninety-sixths of the whole importation.

From the official report of the treasury department, it appears that the imports into the United States, during the year ending September 30, 1829, amounted to 74,492,527 dollars, of which amount 69,325,552 dollars were imported in American vessels, and 5,166,975 dollars in foreign vessels; that the exports, during the same year, amounted to 72,358,671 dollars, of which 55,700,183 dollars were of domestic produce, and 16,658,478 dollars of foreign produce; that of domestic articles, 46,074,554 dollars were exported in American vessels, and 8,725,639 dollars in foreign vessels; and of the foreign articles, 15,114,807 dollars were exported in American vessels, and 1,543,591 dollars in foreign vessels; that 872,948 tons of American shipping entered, and 944,799 cleared from, the ports of the United States; and that 130,743 tons of foreign shipping entered, and 133,006 cleared, during the same period.

It appears from official statements that since 1829 the trade of the States has undergone an increase. For the year ending September 30, 1832, the total exports amounted to 87,176,943 dollars in value, and of imports 101,029,266 dollars. In the valuation of exports, the produce of the sea and land amounted to 49,416,183 dollars, while the total of manufactured commodities was only 5,044,014.

Mexico.

The commerce of Mexico is at present checked by natural and political causes. The want of river communication is a great impediment to its internal commerce. Roads lead from the *plateaux* to the seaports, but they are very imperfect, and beasts of burden, therefore, are preferred to carriages, which would not be able to make their way. The principal objects of export are gold and silver, either in bullion, coined, or worked up in various ways; cochineal, sugar, flour, indigo, salt meat, dried vegetables, tanned hides, sarsaparilla, vanilla, jalap, soap, Campeachy wood, and pimento of Tabasco. Among the articles imported are woollen cloths, silks of Lyons, linen from Germany, white and printed calicoes from France, England, and the United States, paper, china, spirits, cacao, quicksilver, iron, steel, wine, wax, jewellery, watches and clocks, and all kinds of ornaments. In 1826, 1267 vessels entered the ports of the republic. The chief port of Mexico is Vera Cruz.

British North American Possessions.

These consist of Upper and Lower Canada, New Brunswick, Nova Scotia, Cape Breton, Prince Edward's Island, Newfoundland, and Hudson's Bay. The manufactures of these countries are of that nature which might be supposed to subsist in a newly settled country. Their interest consists in the export of raw or partially prepared commodities, in exchange for manufactured goods, both for use and ornament. Thus, they export timber, oil, fish, seal-skins, grain, &c.; and by the British colonial regulations, they enjoy the benefit of importing goods in return from the United Kingdom duty free. Their corn is admitted into British ports on paying a small duty; and also their wood, which, though inferior to Baltic timber, is admitted in preference, with a view to benefiting the colonies and our own commerce. Halifax and Pictou, in Nova Scotia; St John's, in Newfoundland; Montreal and Quebec, in the Canadas; are the chief ports for export and import. The fisheries of Nova Scotia and Newfoundland are exceedingly valuable, and are much encroached upon by the citizens of the United States. In 1829, these colonies imported goods from the United Kingdom to the value of L.2,118,450, and exported thence to the value of L.1,141,288. The estimated value of the productions raised annually, including the fisheries, was L.17,620,020. A considerable trade is carried on with the West Indies, as well as with the mother country; some business is also done with the United States. The wealth and population of these colonies are increasing with the most gratifying rapidity.

SOUTH AMERICA.

This extensive and naturally fine country, both as respects its climate and its mineral riches and products of the ground, was originally peopled by Spaniards, Portuguese, and other ignorant and bigoted nations; and although in modern times its inhabitants, from nearly the one end of the Continent to the other, have assumed a species of political independence, they are still, generally speaking, the same slothful, impure, and ignorant race of beings they formerly were. The various nations into which they have been divided by political events, are little else than confederacies of robbers, with all the various classes of turbulent and troublesome individuals who have joined them from other countries. Brazil, Colombia, Buenos Ayres, Chili, Peru, Guatimala, are the names of the principal states; and having fully described their character in our article on South America, we do not require to extend our notices of their trade and character here. It may suffice to state, that the chief exports are gold and silver—the produce of the mines, cochineal, indigo, cacao, ox horns, hides, and tallow; also horse hides, wax, cotton, wool, flax, hemp, tobacco, sugar, coffee, ginger, pimento, Peruvian bark, and most kinds of medicinal stuffs and balsams, mahogany and other fine woods. The imports include every description of manufactured goods from Europe, and corn from North America. The people can make almost nothing themselves, and this quarter of the globe has long formed a good market for all kinds of British goods, although these have frequently been exported at a loss. The chief commercial cities of South America are Rio Janeiro, Buenos Ayres, Lima, Carthagena, Caraccas, Potosi, and Bahia.

The English, Dutch, and French possessions in South America, are Demerara, Berbice, Essequibo, Surinam, and Cayenne. From Cayenne are exported, cloves, Cayenne pepper, annotta, sugar, cotton, coffee, and cacao; from Berbice, rum, sugar, cotton, cacao, &c.; from Demerara, Surinam, and Essequibo, sugar, rum, cotton, coffee, and molasses. From Honduras, mahogany and logwood are exported to Great Britain; this trade at present engages 20,000 tons of shipping.

WEST INDIES.

The chief islands which constitute the West Indies are Cuba, St Domingo or Hayti, Jamaica, Barbadoes, Dominica, St Christopher or St Kitt's, Curaçao, and Guadaloupe. They have all very nearly the same productions, viz. sugar, coffee, wax, ginger, and other spices, mastich, aloes, vanilla, quassia, manioc, maize, cacao, tobacco, indigo, cotton, molasses, mahogany, long peppers, lignum-vitæ, Campeachy wood, yellow wood, gums, tortoise-shell, rum, pimento, &c. Before St Domingo or Hayti became an independent government of blacks, it was the depôt of the goods brought from Havannah, Vera Cruz, Guatimala, Carthagena, and Venezuela; but since that event, Jamaica has been the magazine of all goods from the Gulf of Mexico. Trinidad is the great seat of the contraband trade with Cumana, Barcelona, Margarita, and Guiana. The imports are manufactures of all kinds, wine, flour, and formerly slaves, who are still smuggled into many of the islands. These form one great source of the commerce of the world; and we must refer the reader, for more particular information, to our article on the West Indies, and to the Tables in this sheet.

AUSTRALIA.

This fifth great division of the globe, comprehending New South Wales, Van Diemen's Land, and adjacent islands, and belonging to Great Britain, is rapidly advancing in the arts of civilised life, and annually increasing in its amount of imports and exports, as well as in domestic trade and production. In 1833, the estimated value of land was L.1,500,000; of houses, stores, and merchandise, L.1,025,000; with a circulation of L.20,000. The imports, in 1829, amounted to L.96,123, and the exports to L.33,101. The exports are of raw produce, chiefly to Great Britain, from whence imports are made of manufactured goods. The most valuable article exported is Merino wool, for which there is now a large demand in this country. The native manufactures are wool, potteries, breweries, distilleries, &c., and these have attained a comparative degree of prosperity.

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ELECTRICITY AND GALVANISM.

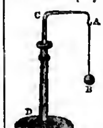
ELECTRICITY, from the Greek word *electron*, amber, is the name given to an important branch of Natural Philosophy, which treats of the phenomena and effects produced by the friction or rubbing of amber and other bodies which possess analogous properties. This science, which embraces so many subjects of inquiry, not only remarkable in themselves, but highly important from their relations with every department of nature, is wholly of modern creation. Although the ancients (as, for instance, Thales of Miletus, who founded a celebrated school of philosophy, called the Ionic) were acquainted with the mysterious power of attracting and then repelling light bodies which amber possessed after being rubbed, and the benumbing shocks which are experienced on touching the *torpedo*, or electrical eel, yet the scattered facts were never generalised into a scientific theory. Indeed, the philosopher above named ascribed these results to the presence of a soul or essence, which, roused by the friction, went forth to bring back the small particles floating around. It was only in modern times, when induction from facts began to be practised by philosophers, that the phenomena connected with electricity began to assume the dignity of a science. Dr Gilbert, an English physician, made the first step towards generalisation, in the year 1600. He published a valuable treatise, in which he observed, that not only amber, but various other substances, can by friction be made to draw light bodies to them. Boyle, Guericke, Newton, and some other philosophers of that period, contributed to extend human knowledge upon this interesting subject, but the real science of electricity took its rise in a latter age. About the middle of the eighteenth century, several very remarkable facts were ascertained, particularly that of Benjamin Franklin, which identified lightning with electricity; but the extensive relations which connect it with so many other departments of physical science were not discovered until the present century, nor was their importance until then appreciated. In this short era a new science has arisen, founded on that modification of electricity, which is known by the name of GALVANISM. The galvanic battery (which will be afterwards described), as an instrument for analysing or decomposing chemical substances, has connected it with chemistry in the most intimate manner. Hence has sprung ELECTRO-CHEMISTRY, one of the connecting branches between remote divisions of the philosophy of nature. ELECTRO-MAGNETISM is a still more recently discovered province of science, and which identifies as one, two powers which were previously regarded as distinct.

As the best method of conveying a clear and at the same time philosophical view of this interesting science, we shall in the first place, independently of all theory, state the most general and remarkable facts connected with it. After these have been enumerated, the reader will then be prepared for a review of the theories which have been advanced for the purpose of explaining phenomena, and for connecting the various facts in the mind. The general facts relating to this subject we think may be classed under two heads—1, The *Excitation* of Electricity; and, 2, the *Distribution* of Electricity. Connected with each of these heads are various phenomena which we shall notice as they occur, during the gradual developement of the subject.

EXCITATION OF ELECTRICITY, AND RESULTING PHENOMENA.

If a piece of sealing-wax, amber, the glass of a watch, or any other smooth piece of glass, be rubbed upon a piece of dry flannel or woollen cloth, or even the sleeve of a cloth coat, it will be found to have acquired a new and very singular physical property. This property is exhibited by holding the body which has been subjected to friction, over small and light substances, such as shreds of paper, gold leaf, feathers, straw, cork, &c. These will be first instantly *attracted* to it, some of them adhering to its surface, others falling back to the place whence they were withdrawn, whilst others are thrown off from the body as if they were *repelled* from it. The property which has thus been conferred upon the body by undergoing the process of rubbing, as above described, is called *electricity;* the body which has acquired the property is called an *electric;* and the attraction which is exhibited is called *electric attraction.* In this state it is said to be *excited*, and the body by which it is excited is denominated the *rubber.* Those substances which are not excited by similar treatment, are termed *non-electrics.*

In order to render the above phenomena perfectly clear, and also to illustrate certain remarkable facts, we shall employ the following figure:—



B is supposed to be a small piece of cork or the pith of wood, which is suspended from a stand A C D, by a dry silk thread A B. Having rubbed an electric, for instance a dry rod of glass, and presented it to B, the ball will be instantaneously attracted to the glass, and will adhere to it. After they remain in contact for a few seconds, if the glass be withdrawn without being touched by the fingers, and again presented to the ball, the latter will be *repelled* instead of being attracted, as in the first instance. By being touched with the finger, the ball can be deprived of its electricity; and if, after this has been done, we present a piece of sealing-wax in place of the glass formerly employed, the very same phenomena will take place. On the first application, the ball will be attracted; and, on the second, repelled. It is clear, then, in the first place, that both these electrics have the power of attracting another body before they have communicated to it any of their own electricity: and, secondly, that they repel the body after they have communicated to it a portion of their own electricity.

But a very remarkable circumstance takes place, if we, after having conveyed electricity to the ball B, by means of excited glass, which was for a moment or two in contact with it, should present to it, after the former was withdrawn, excited sealing-wax: the ball, instead of being repelled, as it would have been were the glass again applied, is attracted by the wax. If the experiment be reversed, and the excited wax first presented to the ball, and then the excited glass, the latter will be found to *repel* the ball. "Hence it follows," says Sir David Brewster,* "that excited glass *repels* a ball electrified by excited glass. Excited wax *repels* a ball electrified by excited wax. Excited glass *attracts* a ball electrified by excited wax. Excited wax *attracts* a ball electrified by excited glass. From which we conclude, that there are two opposite electricities; namely, that produced by excited glass, to which the name of *vitreous* or *positive* electricity has been given; and that produced by excited wax, to which the name of *resinous* or *negative* electricity has been given.

"If, when the pith ball B is electrified either with excited glass or wax, we touch it with a rod of glass, its property of being subsequently attracted or repelled by the excited glass or wax will suffer no change; but if we touch it with a rod of metal, it will lose the electricity which it had received, and will be attracted either by the excited glass or wax, as it was when they were first applied to it. Hence, the rod of glass and the rod of metal possess different properties, the former being incapable, and the latter capable, of carrying off the electricity of the pith ball. The metal is therefore said to be a *conductor*, and the glass a *non-conductor*, of electricity."

In these experiments, electricity has been produced by *friction;* but there are other methods of obtaining it, which, however, will be afterwards explained.

* Article Electricity in the Encyclopædia Britannica, the most comprehensive, philosophical, complete, and intelligible treatise upon this interesting science which we have ever yet met with.

With regard to attraction and repulsion, a few facts remain to be stated. Some substances remain longer in contact with the electric than others, and two bodies which have both been in contact with the same electric, mutually repel each other. If electrics of considerable size are employed, the phenomena of course are best observed; and if the experiment be performed in a darkened chamber, flashes of bluish light will be seen to extend over the surface of the electric submitted to friction, and which we shall suppose is a cylinder of sealing-wax, sulphur, or glass. Sparks, accompanied also with a sharp snapping sound, will be seen to dart round it in various directions. If a round body, as a metallic ball, be presented to it, and moved from one end to the other, a succession of sparks will be obtained as the ball passes along the surface; and if the knuckle be presented instead of the metallic ball, each spark will be accompanied by a prickling sensation. If the cylinder be brought near to the face, an unpleasant sensation of tickling is felt in the skin, as if it were covered with a cobweb. If a metallic globe be suspended in the air by silk threads, and in that situation rubbed by an electric, it will also become electrical, and exhibit the same properties as an electric. It is essential to the success of this experiment, that it be insulated; that is, cut off from all communication with any substance, except the air and the electric which sustains it. The instruments employed in experiments similar to those above described, are termed *Electroscopes.* Besides that one of which a representation has been given, there are various others, all of which are formed upon the same principles.

It is now proper to mention the principal electrical substances in nature. They are, amber, gum-lac, resin, sulphur, glass, talc, the precious stones, silk, the fur of most quadrupeds, and almost all vegetable substances (excepting charcoal) which have been thoroughly deprived of moisture, as, for instance, baked wood, and very dry paper.

DISTRIBUTION AND TRANSFERENCE.

We have noticed that when the excited electric was brought near the pith ball B, the latter was first attracted and then repelled. If we now remove the electric, and present to the ball which has thus touched it, a second ball, which has had no previous communication with an electric, we find that these two balls attract one another, and come into contact. The same actions are repeated between this second ball, and a third which may be presented to it; and so on in succession, but with a continued diminution of intensity. This diminution plainly indicates a diminished power, in consequence, as it would seem, of its being distributed amongst a number of bodies. It is clear, therefore, that the unknown power which we have called electricity, can, like heat, be transferred or communicated from one body to another, and that its intensity, like that of heat, is weakened by being diffused amongst a number of bodies. An electrified ball can be deprived of its electricity by being touched with a rod of metal of any kind; but if we touch it with glass or wax, it will not be carried off. Hence, metals are said to be *conductors*, and glass and wax *non-conductors*, of electricity. Bodies greatly vary in their power of conduction, and many of them owe it to the water which they contain. The conducting power of any substance depends on the state of the atmosphere at the time with regard to humidity, and on the intensity of the electricity employed. The following tables of conductors and non-conductors are by Sir David Brewster, and have been collected by him from various authors with great care. The bodies are placed in the order of their conducting or non-conducting power; "but it is probable," says Sir David, "that this order would be greatly changed, if the bodies were all submitted to a new and uniform examination."

List of Conductors.

All metals	River water.
Silver	Ice above 13° Fahr.
Copper	Snow
Lead	Living vegetables
Gold	Living animals
Brass	Flame
Zinc	Smoke
Tin	Steam
Platina	Soluble salts
Palladium	Rarefied air
Iron heated	Vapour of alcohol
Iron cold	Vapour of ether
Charcoal well burned	Moist earths
Plumbago	Anthracite
Concentrated acids	All the substances and minerals in the third class of Haüy's list, as given in Sect. II.*
Powdered charcoal	
Diluted acids	
Saline solutions	
Metallic ores	Powdered glass
Animal fluids	Flowers of sulphur
Hot water	Resins rendered fluid by heat
Sea water	
Spring water	Glass heated to redness

List of Non-Conductors.

Shell-lac	Leather
Amber	Air and all dry gases
Resins	Baked wood
Sulphur	Dry vegetable bodies
Wax	Porcelain
Jet	Dry marble, and
Glass	Siliceous and argillaceous stones in Class I. of Haüy's list
Vitrifications	
Mica	
Diamond	Camphor
Transparent gems	Caoutchouc
And all the minerals in	Lycopodium
Class I. of Haüy's list	Dry chalk
Raw silk	Lime
Bleached silk	Phosphorus
Dyed silk	Ice below 13° Fahr.
Wool	Ashes of animal bodies
Hair	Ashes of vegetable bodies
Feathers	Oils, the heaviest being the best conductors
Dry paper	
Parchment	Dry metallic oxides.

The two qualities of a capability of excitation, and a power of conducting electricity, appear to be incompatible with each other, for the one always diminishes in proportion as the other increases. Hence, it follows, as an invariable law, that *electrics* are *non-conductors*, and, on the other hand, that conductors are *non-electrics*. The most perfect *non-conductors* of electricity are also called *insulators*, from their power of insulating an electrified body, or preventing any of its electricity from escaping along its support. The insulating power of atmospheric air depends upon two circumstances, its density and its dryness. Air of the ordinary density of the atmosphere, if perfectly dry, is a remarkably good insulator, and no change of temperature appears to affect its insulating power; but rarefaction diminishes its power of confining electricity, and, when greatly rarefied, it may be classed amongst conductors. The conducting power of air of the ordinary density depends upon the quantity of moisture which it contains, water being a very good conductor of electricity. Changes of temperature and also of form affect the conducting powers of most bodies. Thus, though water, in its ordinary liquid state, is an excellent conductor, yet, when it appears in the solid form of ice, its conducting power is much impaired, and at a very low temperature it ceases entirely. Glass, when cold, is a non-conductor, but when heated to redness, it conducts tolerably well. Hence, although some bodies are said to be perfect non-conductors, yet this is not strictly true. In Dr Faraday's interesting researches on this subject, he gives the following summary of conditions of conduction in bodies, which, although they apply chiefly to voltaic electricity, are yet true within certain limits of ordinary electricity:—

1. All bodies conduct electricity in the same manner from metals to lac and gases, but in different degrees.

2. Conducting power is in some bodies powerfully increased by heat, and in others diminished, yet without our perceiving any accompanying essential electrical difference, either in the bodies or in the changes occasioned by the electricity conducted.

3. A number of bodies insulating electricity of low intensity when solid, conduct it very freely when fluid, and are then decomposed by it.

4. There are many fluid bodies which do not sensibly conduct electricity of this low intensity; there are some which conduct it and are not decomposed, nor is fluidity essential to decomposition.

5. There is but one body yet discovered (periodide of mercury), which, insulating a voltaic current when solid, and conducting it when fluid, is not decomposed in the latter case.

6. There is no strict electrical distinction of conductors which can as yet be drawn between bodies supposed to be elementary, and those known to be compounds.

It is to Coulomb that we owe the useful discovery, that *shell-lac* is the most perfect of all insulators; and hence its value in electrical inquiries. He found that the electricity of a pith ball five or six lines in diameter, could be completely insulated by a cylinder of sealing-wax or gum-lac about half a line in diameter, and about twenty inches long; that a fine silk thread, penetrated and covered with melted wax, so as to form a cylinder one-fourth of a line in diameter, had the same insulating power when it was five or six inches long; and that an equal degree of insulation could not be obtained by a fine thread of glass, of five or six inches in length, or by a hair or a fibre of silk, unless the electricity insulated was very weak, or the air extremely dry. Coulomb found that the insulating power of a fibre of gum-lac was ten times greater than that of a silk fibre of the same diameter and length; and he established the following general law, that the densities of electricity insulated by different lengths of fine cylindrical fibres, such as those of gum-lac, hair, silk, &c., vary as the square root of the lengths of the fibre.

There are various other circumstances upon which the conducting power of bodies depends. That of silk, for instance, is affected by the colour of the thread, or rather by the nature of the dye-stuff by which it has been tinged. When of a brilliant white, or a black, its conducting power is the greatest; and a high golden yellow or a nut-brown renders it the best insulator. Mr Coulomb, who has investigated the subject with great ability, assigns three causes as chiefly operating in depriving a body in a state of imperfect insulation of its electricity; first, the imperfection of the insulating property in the solids by which it is supported; secondly, the contact of successive portions of atmospheric air, every particle of which deprives the body of a portion of its electricity; thirdly, the deposition of moisture upon the surface of the insulating body, which establishes communications with its remote ends, thus virtually increasing its conducting power. There is another very remarkable circumstance relating to the dissipation of electricity, namely, the shape of the body which holds the electricity. Its retaining power is materially affected by the form which it possesses. The spherical shape is that most favourable to its retention; whilst, from bodies of a pointed figure, especially if the point projects to a distance from the surface, electricity escapes most readily. On the other hand, these bodies receive electricity more readily than those of any other form.

With regard to the distance to which electricity can be conveyed, an experiment of a very interesting nature was made by Mr F. Ronalds. He erected at Hammersmith an electrical telegraph, on which the inflections of the wire composed one continuous length of more than *eight miles*. "When a Canton's pith ball electrometer was connected with each extremity of this wire, and it was charged by a Leyden jar, both electrometers appeared to diverge suddenly at the same moment; and when the wire was discharged by being touched with the hand, both electrometers appeared to collapse as suddenly. When any person took a shock through the whole length of the wire, and the shock was compelled to pass also through two insulated inflammable air pistols, one connected with each extremity of the wire, the shock and the explosion seemed to occur quite simultaneously; but when the shock was compelled to pass through the gas pistols, and any one closed his eyes, it was impossible to distinguish more than one explosion, although both pistols were discharged. When people did not look at the pistols, and when I sometimes charged only one highly, and sometimes both lowly, they could never guess, except by mere chance, whether one or both were fired. Thus, then, three of the senses—namely, sight, feeling, and hearing—seemed to receive absolute conviction of the instantaneous transmission of electrical signs through my pistols, my eight miles of wire, and my own proper person."*

OF THE TWO KINDS OF ELECTRICITY.

We have already noticed the origin of the names *vitreous* or *positive*, and *resinous* or *negative*, electricity, and also described the phenomena connected with each. Although, taken separately, the one acts in a manner precisely similar to the other, yet in all their relations to each other they display a marked contrariety. Indeed, they may be viewed as agents having opposite qualities, which completely neutralise one another by combination, just like an acid and an alkali. It is remarkable that the excitation of one species of electricity is always accompanied by the presence of the other, and both are produced to an equal extent. Thus, when a piece of glass is rubbed by silk, just as much resinous electricity is produced in the silk as there is vitreous electricity produced in the glass; and whatever electrified bodies are repelled by the one, are attracted by the other. Of course, these two surfaces, having acquired opposite electricities, invariably attract each other. A white and a black ribbon rubbed against each other between the finger and thumb, exhibit electrical phenomena in a very marked manner. The black is resinously and the white vitreously electrified; of course they attract each other; and if separated, the one attracts the light bodies which the other repels. When two pieces of the same ribbon of the same length are rubbed, the one being drawn lengthways and at right angles over a part of the other, the one which has been subjected to friction in its whole length, acquires vitreous and the other resinous electricity. In like manner, when the whole length of the bow of a violin is drawn over a limited part of the string, the hairs of the former exhibit a vitreous, and the latter a resinous, electricity. It is to be observed, that the body whose excited portion is of the least extent, is generally found to be resinously electrified.

To know the species of electricity evolved, it is merely necessary to communicate beforehand, to the slips of gold leaf, a known electricity, either from excited glass or sealing-wax. If they be divergent with the former, then the approach of a body similarly electrified will augment the divergence, but that of one oppositely electrified will cause their collapse.

The following is a table of several substances which acquire the vitreous electricity, when we rub them with those which follow them in the list; and the resinous electricity, when rubbed with those that precede them:—

The skin of a cat	Paper
Polished or smooth glass	Silk
Woollen stuff or worsted	Lac
Feathers	Roughened glass.
Dry wood	

No visible relation can be pointed out between the nature or constitution of the substances, and the species of electricity developed by their mutual friction. The only general law among the phenomena is, that the rubbing and the rubbed body always acquire opposite electricities. Sulphur is vitreously electrified when rubbed with every metal except lead, and resinously with lead and every other kind of rubber. Resinous bodies rubbed against each other acquire alternately the vitreous and resinous electricity; but, rubbed against all other bodies, they become resinously electrical. White silk acquires vitreous electricity with black silk, metals, and black cloth; and resinous with paper, the human hand, hair, and weasel's skin. Black silk becomes vitreously electrical with sealing-wax, but resinously with hares', weasels', and ferrets' skins; with brass, silver, iron, the human hand, and white silk. Woollen cloth is strongly vitreous with zinc and bismuth; moderately so with silver, copper, lead, and specular iron. It is resinous with platina, gold, tin, antimony, grey copper, sulphuret of copper, bisulphuret of copper, sulphurets of silver, antimony, and iron. Dry air impelled on glass becomes resinously electrical, and leaves the glass in the opposite state. Silk stuffs agitated in the atmosphere with a rapid motion, always take the resinous electricity, while the air becomes vitreously electrified.

Numerous experiments have been made with the view of ascertaining the conditions that determine the species of electricity exerted in the respective bodies of which the surfaces are made to rub against each other, but they have led to no satisfactory conclusions. The mechanical configuration of the surface appears to have a greater influence in the result than the peculiar nature of the substance itself. If a plate of glass with a polished surface be rubbed against one which is roughened, the former always acquires the vitreous and the latter the resinous electricity. Various substances, if rubbed when polished, exhibit a different kind of electricity than that with which they are excited, if rubbed when roughened or scratched. No purely scientific explanation has ever yet been given of these remarkable phenomena.

INDUCTION.

If a body is charged with electricity, and insulated so perfectly as to prevent the escape of the electricity which it contains, it nevertheless tends to produce an electrical state of the opposite kind in all the bodies around it. Thus the vitreous induces the resinous, and the resinous the vitreous, electricity in a body that is situated in the vicinity of either of them, and this to a degree proportioned to the smallness of the distance which separates the bodies. The electricity is in this case said to be induced, and the phenomenon is called *electrical induction*. The operation of this law is a key to the principal phenomena of electricity. In illustration of it, we shall quote an able writer upon the subject. "If an electrified body, charged with either species of electricity, be presented to an unelectrified or neutral body, its tendency, in consequence of the law of induction, is to disturb the electrical condition of the different parts of the neutral body. The electrified body induces a state of electricity contrary to its own in that part of the neutral body which is nearest to it; and, consequently, a state of electricity similar to its own in the remote part. Hence, the neutrality of the second body is destroyed by the action of the first; and the adjacent parts of the two bodies, having now opposite electricities, will attract each other. It thus appears that the attraction which is observed to take place between electrified bodies, and those that are unelectrified, is merely a consequence of the altered state of those bodies, resulting directly from the law of induction; and that it is by no means itself an original law or primary fact in the science.

"The effect of induction will be in proportion to the facility with which changes in the distribution of electricity among the different parts of a body can be effected, a facility which corresponds with the conducting power of the body. Hence, the attraction exerted by an electrified body upon another body previously neutral, will be much more energetic if the latter be a conductor than if it be an electric, in which these changes can take place only to a very small extent. This is confirmed by the following experiment:—Suspend by fine silk threads of equal length, two small balls of equal dimensions, both made of gum-

* Of course, we can only refer the reader to Haüy's work, where these minerals are all enumerated. It would be impossible to give them in this place.

* Description of an Electrical Telegraph, &c. London. 1823.

lac, but one having its surface covered with gold leaf. Place these two pendulums, as they may be called, at a little distance from one another, so as to admit of a comparison of their motions; and then present to them an excited electric, which may be either a tube of glass, or a cylinder of sealing-wax. It will at once be seen that the ball, with a metallic covering, which readily admits of the transfer of electricity from one side to the other, will be much more readily and powerfully attracted than the other ball, which allows of no motion in its electricity. The latter ball will, by slow degrees however, assume electrical states of the same kind as the gilt ball, and will be fully attracted. As this change is very slowly effected, so it is more permanent when once produced; and the plain ball adheres for a considerable time to the electric which has attracted it. The gilt ball, on the contrary, is sooner repelled, by its readily receiving the charge of electricity imparted to it by the electric. A degree of permanent electricity, however, is also induced on this ball, in consequence of its gradual penetration into the substance of the gum-lac."

THEORIES OF ELECTRICITY.

Electrical phenomena are generally accounted for by supposing that there is an extremely subtile and highly elastic fluid which pervades all material substances, but is itself devoid of any sensible gravity. It is supposed to move with various degrees of facility through the pores or actual substance of various kinds of matter. Hence, in proportion as they admit of the fluid passing through them with ease or difficulty, bodies have been divided into conductors and non-conductors. According to the doctrine of there being but one species of fluid, it is supposed that the electrical equilibrium which constitutes the natural state of matter is disturbed by friction, and that one of the two bodies brought near to each other, attracts to itself a surcharge of the fluid, and is *over-saturated*, whilst the other is left in a deficient state, and is *under-saturated*. For this view of the subject we are indebted to the immortal Franklin; and hence the terms of positive or plus, and negative or minus, have arisen. But as some of the appearances cannot easily be reconciled to the hypothesis of a mere excess or deficiency of one fluid, there is another theory which supposes the fluid to be a *compound*, susceptible of decomposition by friction and other means; and hence the origin of the terms vitreous and resinous electricities. Without entering into the subtleties of the question, which of the two theories is the more correct one, we shall attend to the facts of the case. The facts, both as presented to us by nature, and developed by experiments, are those of excitation, attraction, and repulsion; and distribution, induction, and transference.

Excitation.—The two electricities are supposed to exist in bodies naturally in a state of union, which, from various causes, such as friction, can be destroyed; the vitreous electricity is impelled in one direction, whilst the resinous is transferred to the opposite side; and the peculiar energies or powers, formerly latent, now display themselves. When accumulated in any part of a body, each fluid acts in proportion to its relative quantity; that is, to the quantity which is in excess above that which is still retained in a state of neutrality by its union with electricity of an opposite kind. Hence, when two bodies are rubbed together, say glass and a metallic amalgam, only the electricity at the surfaces subjected to friction is decomposed, the resinous adhering to the amalgam, whilst the vitreous attaches itself to the glass. All the rest of the electricity remaining on each surface undecomposed, is in a state of perfect quiescence or inertness.

Distribution and Transference.—The particles of the same kind of each of these highly elastic bodies mutually repel each other with a force which increases as the distance is less. Indeed, it has been proved that the intensity of this force, like that of gravitation, is inversely as the square of the distance. Like gravitation, also, it acts at all distances, and it is not impeded by any intervening body, provided it be not in an active electrical state. We will recur to this subject again. But whilst the particles of each fluid repel those of the same kind, they exert, as we have seen, a high attractive power over those of an opposite kind. The intensity of this attraction, also, like that of gravitation, increases with a diminution of distance. It is evident, therefore, that from the powerful attraction which they have for each other, they would always flow towards each other and coalesce, were it not that the non-conducting properties of electrics offer an impediment to their motion. When these obstacles are removed, they immediately rush into union, and give rise to the remarkable phenomena already noticed.

Attraction and Repulsion.—The repulsive power evinced by bodies charged with the same electricity, has been already mentioned. To explain the circumstance more minutely, let us suppose a body charged with electricity to be suspended in the air, or otherwise surrounded by a non-conducting medium, which allows it to move freely. As long as this body remains alone, the outward pressure which the electric fluid exerts against the insulating medium that confines it, will, by the laws of hydrostatics, be equal on all sides; and the body, thus balanced by equal and opposite pressures, will have no tendency to move. But if another body, similarly circumstanced, be brought near to it, the repulsive action between the similar electricities contained in these bodies, will diminish the outward pressure of each fluid against the sides of the bodies, which are adjacent to each other; and it will, at the same time, increase the outward pressure on the opposite or remoter sides. Both these causes conspire to destroy the equilibrium; each body is impelled in the direction of the preponderating force, that is, in a direction from the other body; and an effect, which may be called *repulsion*, takes place. The very same explanation, it is evident, applies to both kinds of electricity, their properties being in this respect exactly alike.

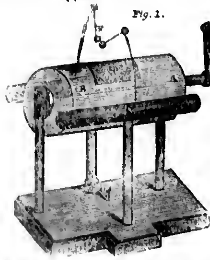
If, on the other hand, a body charged with vitreous electricity be presented to one charged with resinous electricity, the attraction of these two fluids will diminish the outward pressure on the remote sides of the bodies, and increase it on the adjacent sides; hence, the bodies will be urged towards each other, and motions indicative of attraction will result. Thus, in all cases do the movements of the bodies represent the forces themselves which attract the particles of the developed electricities contained in them.

Induction.—The law of induction naturally results from the hypothesis which we have been considering. Either of the two electricities existing in an active state repels the particles of the same electricities in all surrounding bodies, and attract those of the opposite species. On the hypothesis of two fluids, it may be said to decompose their united electricities, and render the body thus acted upon no longer neutral. Although Franklin's theory of there being only one fluid, and the incessant struggle, as it were, of that fluid to establish an equilibrium, one body sending off its overplus electricity to another which has less, accounts for most of the phenomena, yet a difficulty occurs when we attempt to apply it to the case of two bodies which are both in a state of negative electricity; that is, in which there exist in both certain quantities of matter unsaturated with electrical fluid. It is plain that from this theory no action can take place; for both being minus or deficient in the electric fluid, the one has none to spare for the other, and there is no communication or relationship established between the two bodies, and yet we know for certain that they repel each other. In order to reconcile this hypothesis with fact, it has been supposed that the particles of simple matter, or matter uncombined with the electric fluid, naturally exert a repulsive action on one another. We cannot help thinking, however, that this condition is far-fetched, and it is scarcely reconcilable with our ideas of the primary laws of matter, particularly that of gravitation. Nevertheless, it is convenient to employ the Franklinian hypothesis of a single fluid, as being the simplest and most convenient; and it is to be observed, that the one is as well calculated as the other to facilitate our comprehension of the phenomena and of their connections. The further developement of the theories will appear as we proceed.

ELECTRICAL MACHINES.

For the purpose of carrying on electrical investigations, and producing powerful electrical results, the aid of mechanism has been found essential, and these instruments have been called electrical machines. There are various kinds of them, but all constructed upon the same principles. Below is a representation of that which is most commonly used, in our description of which, the essential parts constituting such instruments will appear

Fig. 1.



A B, fig. 1, is a hollow cylinder of polished glass, which revolves upon a horizontal axis, and is from eight to sixteen inches diameter, and from one to two feet long. For the purpose of insulation, it is supported on two upright pillars of glass, which are fixed in a wooden stand. Two hollow metallic conductors, equal in length to the cylinder, and about one-fourth of its diameter, are placed parallel to it, one on each side, upon two insulating pillars of glass, which are cemented into two separate pieces of wood, that slide across the base, so as to allow of their being brought within different distances of the cylinder. To one of these conductors the cushion is attached, which is of the same length with the conductor C. The cushion is usually made of soft leather, generally basil skin, stuffed with hair or wool, so as to be as hard as the bottom of a chair, but yet sufficiently yielding to accommodate itself, without much pressure, to the surface of the glass to which it is applied. The prime conductor is a cylindrical tube, each end terminating in a hemisphere. As the electricity is only contained at the surfaces, it is made hollow, generally of thin sheet brass, copper, tin, or pasteboard covered with gold leaf or tin-foil. It must be carefully freed from all points and asperities; and if perforations are made in it for the purpose of attaching wires and other kinds of fixtures for the purposes of experiment, they should be made about the size of a quill, and should have their edges well rounded and smoothed off. The pressure of the cushion against the cylinder is regulated by an adjusting screw, adapted to the wooden base at E, on which the glass pillar that supports the conductor is fixed. From the upper edge of the cushion there proceeds a flap of thin oiled silk D, which is sewed on the cushion about a quarter of an inch from its upper edge. It extends over the upper surface of the glass cylinder to within an inch of a row of metallic points, proceeding, like the teeth of a rake, from a horizontal rod, which is fixed to the adjacent side of the opposite conductor. The motion of the cylinder, which is given by a single handle, or by a multiplying wheel, must always be given in the direction of the silk flap. That part of the cushion which comes in contact with the glass cylinder should be coated with an amalgam of tin, zinc, and mercury, applied by means of hogs' lard. The amalgam should be placed uniformly over the cushion, until level with the line formed by the seam which joins the silk flap to the face of the cushion. No amalgam should be placed over this line, nor on the silk flap; and it is even requisite to wipe the silk flap clean whenever the continued motion of the machine shall have soiled it, by depositing dust or amalgam on its surface. The best amalgam is that formed by melting together one ounce of tin and two ounces of zinc, which are to be mixed, while fluid, with six ounces of mercury, and agitated till cold in an iron or thick wooden box. After being reduced to powder, a sufficient quantity of hogs' lard is mixed with it, so as to form it into a paste.

This machine acts in the following manner:—When the cylinder is driven round by the handle, the friction of the cushion upon it produces a transfer of the electric fluid from the latter to the former; that is, the cushion becomes negatively, and the glass positively, electrified. By the revolution of the cylinder, the fluid adhering to the glass is carried round, and its escape is at first prevented by the silk flap which covers the cylinder, until it arrives near to the metallic points, which absorb most of the electricity, and convey it to the prime conductor. This being positively electrified, the conductor connected with the cushion being deprived of this electricity, is negatively electrified; so that light balls suspended by threads at F, being oppositely electrified, will attract each other. After the action has gone on for some time, the cushion and its conductor become exhausted of their electricity; so that a new supply must be brought from the earth, the great reservoir of the fluid. This is easily done, by establishing a communication between the cushion and the ground by means of a metallic chain or wire. In this manner, a constant stream of positive electricity flows to the prime conductor. Negative electricity is obtained by insulating the conductor to which the cushion is attached, and connecting the prime conductor with the ground, so as to carry off the fluid collected from the cylinder. If the person who works the machine be supported upon a stool having glass legs, and connected with the conductor by means of a metallic rod, or if he touch it with his hand, he is found to be in the same state of electricity; and another person standing upon the ground can draw sparks from him by presenting his knuckles to his body.

EFFECTS OF ELECTRICAL ATTRACTION AND REPULSION.

By using the electrical machine in the above manner, we are enabled to collect a considerable quantity of electricity, and thus perform experiments upon an ample scale. A pith ball, or a fragment of gold leaf, is very strongly and immediately attracted by the electrified conductor; and, the instant after it has come into contact with it, it is repelled; but it is now attracted by the other bodies in its neighbourhood, to which it communicates its own electricity, and then is again in a state to be influenced by the conductor, and to be again attracted; and this alternation of effects will continue as long as the conductor remains charged. This alternation of attractions and repulsions accompanying the transferring electricity by moveable conductors, is also illustrated by the motions of a ball suspended by a silk thread, and placed between two bells, of which the one is electrified, and the other communicates with the ground. The alternate motion of the ball between the two bells will keep up a continual ringing. This amusing experiment has been applied to give notice of changes taking place in the electrical state of the atmosphere.

The mutual repulsion of bodies that are similarly electrified gives rise to many interesting experiments. A small figure in the shape of a human head, covered with hair, when placed upon the conductor, and electrified, will exhibit the appearance of terror from the bristling up and divergence of the hair.

The intensity of the electricity which bodies may contain, is measured by a delicate instrument, called an *Electrometer*, of which there are several invented by various distinguished individuals. Our limits, however, will not admit of our giving a minute account of them. They all depend upon the repulsive property of electrified bodies, and the distance to which the one is repelled by the other, is indicated by an index of one kind or another.

DISTRIBUTION OF ELECTRICITY.

We have already observed, that, upon the extent of the surface of a body, its capacity for receiving electricity principally depends. Electricity is therefore supposed not to spread throughout the whole mass of a body, at least equally, but to remain principally, if not altogether, at the surface. For the purpose of measuring the proportional quantities of electricity with which different parts of the same or of different bodies are charged, Coulomb invented an instrument, which he called the *Torsion-balance*. It is a glass jar closed at both ends. From the top descends a single fibre of the web of the silk worm, which suspends by the middle a needle made of gum-lac, or other similar substance. This is provided at one end with a pith ball, and at the other with a counterbalance of varnished paper. On one side of the jar there is inserted a small bar, having at each extremity a metallic sphere, the one on the outside, and the other within. The upper end of the silk fibre is affixed to a kind of button having a small index, and made to turn easily round upon a circular plate, divided into degrees. Now the method of operation is plain: when the metallic and pith balls are both similarly electrified, the distance to which the latter is repelled is shown by the index, and thus the power of the electricity employed is indicated. It is incompatible with our limits to enter minutely into the details connected with the experiments performed by means of this extremely delicate instrument. They all go to prove the superficial distribution of electricity, and, of course, the influence of shape in lessening or augmenting its intensity. By an expansion of surface, the intensity of electricity is lessened, although the actual quantity present in the body remains the same; and if the conducting substance be drawn to a point, nearly the whole of the electricity is concentrated there, so that its power is exceedingly great. This is found to take place in all points that project beyond the general surface.

TRANSFERENCE OF ELECTRICITY.

Several remarkable phenomena occur when electricity is drawn off by means of a conductor from those bodies in which the electrical equilibrium has been destroyed. A sharp snapping sound is heard, accompanied by a vivid spark, whilst intense heat is evolved in the path which the electric fluid takes. A perfect conductor, offering no impediment to its course, it is unattended with light during its passage through such a body, light only appearing when there are obstacles in its path, such as imperfect conductors. Of the velocity with which it is transmitted, we have already spoken. It is so great, that in experiments performed with a chain of considerable length, each link became instantaneously luminous. There are various methods of showing the intensity and colour of electrical light. Conductors having a rounded form give the longest and most vivid sparks, which are sometimes seen to take a zig-zag course, similar to that of a flash of lightning. This deviation in its course is supposed to be occasioned by the fluid darting to minute conducting particles, such as those of moisture floating in the air. Electrical light is similar to light obtained from other sources, and its brilliancy depends upon its intensity. Sir David Brewster found that it was capable of polarisation. It displays every shade of colour, that quality being dependent upon the nature of the substance through which the fluid passes.

An interesting question arises—Whence comes the light; is it the electric fluid which thus renders itself visible? This was really supposed to be the case by the early electricians, but later philosophers have substituted other theories to account for the phenomena. That of M. Biot, a celebrated French philosopher, is, that electric light has the same origin as the light disengaged from air by mechanical pressure; "and that it is purely the effect of the compression produced on the air by the explosion of electricity." This hypothesis has been objected to, however, on the ground that electrical light is produced in the best vacuum that can be formed; and although he has replied to the objection, that no perfect vacuum can exist, yet his arguments, though they carry weight, do not bring conviction. An eminent foreigner, Dr Fusinieri, has lately placed the subject in a clear and remarkable point of view. He has proved that the spark which issues from a metallic body contains a portion of the metal in a state of fusion, and also incandescent molecules of the same substance. Hence it has been concluded, that the electric spark is *a flame*, and consists, like other flames, of incandescent molecules in a state of minute subdivision.

We have already observed, that various sounds accompany the various modes of transference of the electric fluid; a peculiar odour has also sometimes been felt near a machine which has been sharply wrought; but whence its origin, is unknown. All sharp pointed bodies, we have said, concentrate the electric fluid at their apex, from whence it has a powerful disposition to escape; and every discharge is accompanied by currents of air. Upon this principle, many ingenious experiments are founded. An apparatus, consisting of wires terminating in points, and having balls annexed to them to represent the planets, may be constructed so as to revolve when electrified, and thus to imitate the planetary motions. We cannot enter further into this subject, but may state in general terms, that the appearances of the electric spark depend upon the nature of the surface from whence it issues, and towards which it is directed. When it escapes *from* a pointed body, the luminous appearance is that of diverging streams, resembling the filaments of a brush, and forming what is termed a *pencil of light*; but when the fluid goes *to* a point, the light concentrates at the point itself, and assumes the appearance of a star.

OF INDUCTION AND ACCUMULATION OF ELECTRICITY.

The principle of induction we have already explained. All the phenomena connected with it may be accounted for by either of the laws already laid down. In addition to the facts which we have enumerated as resulting from the general operation of this law, little can be added, although a number of particular cases might be adduced.

The most convenient mode of obtaining an accumulation of electricity arising from induction, is by the employment of coated glass; that is, of a plate of glass on each side of which is pasted a sheet or coating of tin-foil. Care must be taken to leave a sufficient margin of glass uncovered with the metal, for preventing the transfer of electricity from one coating to the other, round the edge of the glass; and all sharp angles or ragged edges in the coatings should be avoided, as they have a great tendency to dissipate the charge.

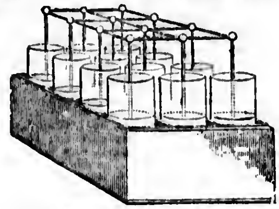
The form of coated glass best adapted to experiments is that of a cylindric jar; this is coated, within and without, nearly to the top. The cover consists of baked wood, and is inserted with sealing-wax, to exclude moisture and dust. A metallic rod, rising two or three inches above the jar, and terminating at the top in a brass knob, is made to descend through the cover till it touches the interior coating. The name of the *Leyden phial*, or *jar*, is applied to this instrument. It is used in the following manner:—The outer coating being made to communicate with the ground, by holding it in the hand, the knob of the jar is presented to the prime conductor when the machine is in motion; a succession of sparks will pass between them, while, at the same time, nearly an equal quantity of electricity will be passing out from the exterior coating, through the body of the person who holds it, to the ground. The jar, on being removed, is said to be charged; and if a communication is made between the two coatings, by a metallic wire extending from the external one to the knob, the electric fluid which was accumulated in the positive coating rushes, with a sudden and violent impetus, along the conductor, and passes into the negative coating; thus at once restoring an almost complete equilibrium. This sudden transfer of a large quantity of accumulated electricity is a real explosion; and it gives rise to a vivid flash of light, corresponding in intensity to the magnitude of the charge. The effect of its transmission is much greater than that of the simple charge of the prime conductor of the machine; and it imparts a sensation, w[illegible] passing through any part of the body, of a peculiar k[illegible]d, which is called the *electric shock*.

The arrangement of the parts in a Leyden jar is shown in the following figure:—

Fig 2

Here the simple bent *discharging* rod, for establishing a direct communication between the inner and outer coating of a jar or battery, and restoring the electrical equilibrium without the operator receiving the charge of the jar, is exhibited. E represents the insulating handle, and A the ring of brass reaching from the ball to the external coating. When opened to a proper degree, one of the balls is made to touch the exterior coating, and the other ball is then quickly brought into contact with the knob of the jar, and thus a discharge is effected.

By uniting together a sufficient number of jars, we are able to accumulate an enormous quantity of electricity. For this purpose, all the interior coatings of the jars must be made to communicate by metallic rods, and a similar union must be established among the exterior coatings. When thus arranged, the whole series may be charged, as if they formed but one jar; and the whole of the accumulated electricity may be transferred from one system of coatings to the other, by a general and simultaneous discharge. Such a combination of jars is called an *electrical battery*.



An arrangement of this description is represented above, in which twelve jars are united in one box, and the whole series connected together by wires and balls.

If we wish to send the whole charge of electricity through any particular substance which may be the subject of experiment, we must so arrange the connecting conductors as that the substance shall form a necessary part of the *circuit of the electricity*, as it is termed. With this view, we must place it between two good conductors, one of which is in communication with the outer coating; and the circuit may then be completed by connecting the other conductor with the inner coating, by means of a discharging rod, to one branch of which, if necessary, a flexible chain may be added.

MOTION OF ACCUMULATED ELECTRICITY.

In forming arrangements for directing the passage of accumulated electricity, it should be borne in mind that the electric fluid will, on these occasions, always pass through the best conductors, although they may be more circuitous, in preference to those which are more direct, but have inferior conducting power; and it must also be recollected, that, when different paths are open for its transmission along conductors of equal power, the electricity will always take that which is the shortest. Thus, if a person holding a wire between his hands discharges a jar by means of it, the whole of the fluid will pass through the wire, without affecting him; but if a piece of dry wood be substituted for the wire, he will feel a shock; for, the wood being a worse conductor than his own body, the charge will pass through the latter, as being easier, although the longer circuit. During its transit through the human body, in like manner, the shock is felt only in the parts situated in the direct line of communication; and if the charge be made to pass through a number of persons, who take one another by the hand, and form part of the circuit between the inner and outer coatings of the jar, each will feel the electric shock in the same manner and at the same instant; the sensation reaching from hand to hand, directly across the breast. By varying the points of contact, however, the shock may be made to pass in other directions, and may either be confined to a small part of a limb, or be made to traverse the whole length of the body from head to foot.

By accurate experiments, it appears that the force of the electric shock is weakened, or its effects are diminished, by employing a conductor of great length for making the discharge. A retardation in the passage of electricity also takes place if the conductor is not of a sufficient size; and when this is the case, as well as in those instances where the conductor is not a good one, the discharge will not be effected so instantaneously or so completely. It has also a tendency to diverge from the direct line of its course, being drawn towards conducting bodies which may attract it. The motion of electricity through perfect conductors is attended with no perceptible alteration in the mechanical properties of the conducting bodies, provided they be of sufficient size for the charge of the electric fluid transmitted. On the contrary, very considerable effects are produced when a powerful charge is sent through a wire which is too small to allow the whole quantity to pass with perfect freedom, or through an imperfect conductor, though of large size, as is proved when a tree is struck by lightning.

CHANGES PRODUCED BY ELECTRICITY ON INORGANIC BODIES.

The effects of electricity passing through various substances are both of a mechanical and chemical nature. The former resemble those which would be produced by a material agent driven with great velocity through the substance of the body. But there are many changes induced by electricity, such as cannot be attributed to mechanical agency, and are undoubtedly of a chemical nature. Some of the mechanical effects have already been noticed. Dr Priestly discovered that it expanded bodies. This is proved by passing a stream of the fluid through a capillary or thermometer tube filled with mercury; the latter will be so much expanded as to break the glass to shivers. The tendency to expand will of course be greater as the conducting power of the body which transmits it is less. Although we know nothing of the nature of electricity, yet it has been found convenient to speak of it as a fluid. Its action upon bodies which either obstruct its motion, or afford it a ready passage, renders its analogy with a fluid very striking. Solid bodies are capable of being diffused into metallic vapour, by passing electricity through them, as is shown by the following experiment:—Take three strips of window glass, each about three inches long and one wide, and having placed two narrow strips of gold leaf or leaf brass between them, so that the ends of the gold leaf project a little beyond the glass, transmit the charge of a large Leyden jar through the gold leaf. The gold leaf will be found to be melted by the shock, and driven into the surface of the glass. The outer plates of glass are generally broken in this experiment, and the middle one, which frequently remains entire, has an indelible metallic stain upon each of its surfaces. This stain is obviously the metallic vapour of the gold driven into the pores of the glass.

The metallic colours thus obtained have been employed for impressing ornamental figures upon paper or silk. In order to do this, trace the outline of the figures on thick drawing paper, and having cut it out as in stencil plates, place it on the silk or paper intended to be ornamented. When a gold leaf is laid upon it, and a card above the gold leaf, the whole is placed in a press or beneath a weight, and an electrical charge sent through it; the metallic stain is limited to the portion of the drawing paper that is cut away, and, consequently, any outline figure may be readily impressed upon the ground employed to receive it.

Chemical Changes.—The effects of electricity as a chemical agent are strikingly displayed in its power of evolving heat, and, consequently, of inflaming and fusing bodies, and its power of promoting chemical composition and decomposition. Combustible bodies, such as a common candle, can be lighted in various ways, by passing the electric fluid through them. The heat evolved by electricity, like most other of its effects, is in proportion to the resistances opposed to its passage. Nor is its heating power in the smallest degree diminished by its being conducted through any number of freezing mixtures which are rapidly absorbing heat from surrounding bodies. Sparks taken from a piece of ice are as capable of inflaming bodies as those from a piece of red-hot iron. Amongst the more striking chemical effects of electricity, are the decomposition of water, the oxidation of metals, and the restoration of the oxides to their metallic state. But the agency of electricity in producing chemical composition and decomposition, one of the most interesting parts of chemical and electrical science, will be fully treated of under GALVANISM.

Many experiments have been made for the purpose of ascertaining the changes affected in *phosphorescent* bodies by electricity, and the results are not without importance. It has been discovered, for instance, that substances not naturally phosphorescent, such as statuary marble in its natural or calcined state, were not only rendered phosphorescent by heat after being strongly electrified, but acquired this property with a beauty, a variety, and an intensity of colour, superior to those which occur in specimens that possess natural phosphorescence. It has also very recently been discovered, that electricity exercises a curious influence upon odoriferous bodies. When a current of the fluid is made to traverse camphor, the odour gradually disappears. After being withdrawn from electrical influence, it remains odourless for some time, and then slowly resumes its former properties.

EFFECTS OF ELECTRICITY UPON ANIMALS.

The influence of electricity upon the human frame, whether it is administered in small quantities so as to excite and surprise us, or in the more powerful and awful form of a stroke of lightning, must be well known to every one. When the human frame forms part of the electric circuit, or when the charge of a Leyden phial is made to enter the body at one hand, and pass out of it at the other, a violent concussion or shock is felt along the line of its passage across the breast and through the arms. This shock, and the motion which accompanies it, no doubt result from the body being composed of various substances of different degrees of conducting power, thus presenting various obstacles to the free passage of the fluid. If the charge is increased, the patient falls down paralysed, suffering a temporary cessation of vital action; and if it be increased to a still greater extent, it produces instantaneous death. This is frequently exemplified in the cases of individuals who are killed by the lightning stroke. It is upon the nervous system that electricity produces the most powerful influence. A strong charge passed through the head, gives the sensation of a violent but universal blow, and is followed by a transient loss of memory and indistinctness of vision. If a charge be passed through the spine, the person who receives it loses his power over the muscles to such a degree, that he either drops on his knees, or falls prostrate on the ground. Small animals, such as mice and sparrows, are instantly killed by a shock from thirty inches of square glass. If a shock be sent through the whole body of an eel, it is irrecoverably deprived of life; but if only through a part of the body, the destruction of irritability is confined to that particular part, whilst the rest retains the powers of motion. Different persons are affected in very different degrees by electricity, according to their peculiar constitutional susceptibility.

The powerful influence of electricity on the human frame led the more sober part of the medical profession to view it as a valuable auxiliary in the healing art, while those who were more sanguine regarded it as an universal medicine, which might be resorted to in every form of disease. Charlatans of every degree found the electrical machine a lucrative article of trade; and there were not wanting well-meaning enthusiasts who contributed to prolong the reign of medical electricity. But though electricity has not yet taken up a position in the healing art, there can be no doubt that in various disorders its application has been found advantageous, and that patients have, in a particular class of diseases, experienced instantaneous relief.

We think some ingenious individual should make a catalogue of the diseases in which electricity gives relief, and, generalising the facts, give us a new science with the title of *Electro-Medicine*. Why not, since we have electro-magnetism and electro-chemistry, from the identity of electricity with the former fluid, and its relations to the latter science.

Although many ingenious electrical experiments have been made upon *vegetables*, some of which seem to indicate that the fluid exercises considerable influence over vegetable life, yet the subject is still involved in too great obscurity to admit of our treating the subject as a branch of electricity. Plants, of course, are destroyed, like animals, when a powerful charge is sent through them; but feeble electricity exerts no influence on either animal or vegetable life, as far as can be perceived, whilst, when transmitted in powerful shocks, it destroys them like lightning.

CHANGES IN THE ELECTRICAL STATE OF BODIES, RESULTING FROM CHANGES OF TEMPERATURE AND FORM, FROM CONTACT, COMPRESSION, &c.

There are certain mineral bodies, which, from being in a neutral state at ordinary temperatures, acquire electricity simply by being heated or cooled. This property is possessed only by regularly crystallised minerals; and of these the most remarkable is the tourmalin. It is a stone of considerable hardness, and the form of its crystals is generally that of a nine-sided prism, terminated by a three-sided pyramid at one end, and by a six-sided pyramid at the other. When heated to between 100° and 212°, the latter extremity becomes charged with positive electricity, whilst the former remains negative. On cooling, the electric states are generally reversed, that end becoming positive which was formerly negative. Other gems possess similar properties, such as the topaz, some species of diamonds, &c. There are a great many substances which become electrified by passing from the liquid to the solid form, such as sulphur, gum-lac, and in general all resinous bodies. The conversion of a body into the aëriform state, is also generally attended by some change in its electrical state.

There are some bodies which are rendered electrical by pressure. The substance which possesses this property in the most remarkable degree, is that variety of the carbonate of lime, known by the name of *Iceland spar*. Cork, bark, hairs, paper, and wood, also possess the property of producing electricity by compression. A number of substances, when reduced to powder, exhibit electricity, if they are made to fall upon an insulated metallic plate. The relation subsisting between electricity, and the chemical properties of matter, is the most important branch of this inquiry. It is observed by Sir H. Davy, that most of the substances that act distinctly upon each other electrically, are also such as act chemically when their particles have freedom of motion; this is the case with the different metals, with sulphur and the metals, with acid and alkaline substances. Of two metals in contact, the one which has the greatest chemical attraction for oxygen acquires positive electricity, and the other the negative. There is little doubt, indeed, that electricity is not only elicited, but is intimately connected with all chemical action; and there is every reason to believe that electricity is essentially concerned in the processes that are carried on in the living system, both of animals and vegetables. For an account of the electricity evolved during the contact of metals, as well as the other relations of the electric fluid with chemical science, see GALVANISM.

THE ELECTRICITY OF THE ATMOSPHERE.

We have now arrived at that part of our subject which is perhaps the most generally interesting of all. Every ear has heard, and every bosom acknowledged by its terror or its awe, the grandeur of the rolling thunder, as it pealed in the dusky sky, like the trump of doom, "convulsing earth and heaven."

The resemblance between the electric spark, and more especially the explosive discharge of the Leyden jar, and atmospheric lightning and thunder, struck the mind of Dr Franklin with so much force, that he was determined, if possible, to verify their identity by experiment.

Having constructed a kite, by stretching a large silk handkerchief over two sticks in the form of a cross, on the appearance of an approaching storm he went into a field in the vicinity of Philadelphia, and raised it, taking care to insulate it by a silken cord attached to a key, with which the hempen string terminated. No sooner had a dense cloud, apparently charged with lightning, passed over the spot on which he stood, than his attention was arrested by the bristling up of some loose fibres on the hempen string: he immediately presented his knuckle to the key, and received an electric spark. Overcome with the emotions which his discovery evinced, he heaved a deep sigh, as if he felt conscious of having achieved immortal fame. The rain now fell in torrents, and, wetting the string, rendered it conducting in its whole length; so that electric sparks were now collected from it in great abundance. The discovery of Franklin soon engaged the attention of all the philosophers of Europe, and the truth of the theory, that lightning and electricity are the same fluid, was put beyond all question.

The atmosphere is very generally in an electrical state. This is ascertained by employing a metallic rod, insulated at its lower end, elevated at some height above the ground, and communicating with an electroscope. In order to collect the electricity of the higher regions of the air, a kite may be raised, in the string of which a slender metallic wire should be interwoven. The atmosphere is almost invariably found to be positively electrified; and its electricity is stronger in the winter than in the summer, and during the day than in the night. From the time of sunrise, it increases for two or three hours, and then decreases towards the middle of the day, being generally the weakest between noon and four o'clock. As the sun declines, its intensity is again augmented, till about the time of sunset, after which it diminishes, and continues feeble during the night.

In cloudy weather, the electrical state of the atmosphere is much more uncertain; and when there are several strata of clouds, moving in different directions, it is subject to great and rapid variations, changing backwards and forwards in the course of a very few minutes. On the first appearance of fog, rain, snow, hail, or sleet, the electricity of the air is generally negative, and often highly so; but it afterwards undergoes frequent transitions to opposite states. On the approach of a thunder-storm, these alternations of the electric condition of the air succeed one another with remarkable rapidity. Strong sparks are sent out in great abundance from the conductor; and it becomes dangerous to prosecute experiments with it in its insulated state.

The protection of buildings from the destructive effects of lightning is the most important practical application of the theory of electricity. The conductors, for this purpose, should be formed of metallic rods, pointed at the upper extremity, and placed so as to project a few feet above the highest part of the building they are intended to secure; they should be continued without interruption till they descend into the ground below the foundation of the house. Copper is preferable to iron as the material for their construction, being less liable to destruction by rust, or by fusion, and possessing also a greater conducting power. The size of the rods should be from half an inch to an inch in diameter, and the point should be gilt, or made of platina, that it may be more effectually preserved from corrosion.

An important condition in the protecting conductor is, that no interruption should exist in its continuity from top to bottom; and advantage will result from connecting together by strips of metal all the leaden water-pipes, or other considerable masses of metal in or about the building, so as to form one continuous system of conductors, for carrying the electricity by different channels to the ground. The lower end of the conductors should be carried down into the earth, till it reaches either water, or at least a moist stratum.

For the protection of ships, chains, made of a series of iron rods linked together, are most convenient, on account of their flexibility. They should extend from the highest point of the mast some way into the sea, and the lower part should be removed to some distance from the side of the ship, by a wooden spar or outrigger.

THUNDER AND LIGHTNING.

We have already mentioned, in general terms, that these terrible visitations are to be classed with electrical phenomena. The lightning is to be identified with the electric spark, and the thunder with the sound which we have seen accompanies it, but augmented by being prolonged by the successive echoes of the clouds, which, it has been proved, are capable of reflecting sound. Sir John Herschell has lately thrown considerable light upon the rolling sound of thunder; and his observations seem in some measure to supersede the theory above stated. "To understand this cause," says he, "we must premise, that, *cæteris paribus*, the estimated intensity of a sound will be proportional to the quantity of it (if we may so express ourselves) which reaches the ear in a given time. Two blows, equally loud, at precisely the same distance from the ear, will sound as one of double the intensity; a hundred struck in an instant of time will sound as one blow a hundred times more intense than if they followed in such slow succession that the ear could appreciate them singly." Now, let us suppose two flashes of lightning of equal intensity and length, both to begin at, say one mile's distance from the auditor, but one of them to run out in a direct line from him, and the other to describe one of a circle of which he is the centre. The sounds arising from each of the two streams of electricity may be regarded as originating at one and the same instant, since the speed of lightning is incomparably greater than that of sound. Now, it is perfectly clear that the sound will reach the ear under very different circumstances in the two cases. That of the circular flash will arrive all at once, and affect the ear as a single explosion, whilst the other will reach the ear in successive peals, each arriving after the other as the distance between the auditor and the lightning-vein is increased. Such is a general view of Sir John's theory, and it is scarcely possible to doubt its correctness for a moment.

Distance of Thunder.—The distance of the point in the atmosphere where the lightning is generated, may be readily computed by multiplying 1090 by the number of seconds which elapse between the flash and the first stroke of thunder. The product will give in feet the distance required.

The ordinary cases of thunder and lightning occur when the electricity passes between two clouds oppositely electrified, or one of which has an inferior charge of the same kind of fluid. When, however, the accumulated electricity of the clouds descends to the earth, it then assumes its most appalling form, and spreads destruction around its path, like the sword of the destroying angel. The strongest fabrics reared by human hands, and the most firmly rooted oaks, cannot withstand its desolating fury. Down it comes, setting the forest in flames, shivering walls of Babylonian thickness and adamantine strength, and laying man, his works, and whatever obstructs its path, in one common ruin. The thunderbolt, which the terror of the vulgar mind, as well in ancient as in modern times, has aggravated into a really solid substance, darting sheer down from "the crystal wall of heaven," as Milton hath it, is to be identified with the passage of the electric fluid from the clouds to the earth. Sometimes, however, the earth, as it were, retaliates, and the fluid shoots upwards to the clouds; this is called the *ascending thunderbolt*, of which there are some striking cases on record. It has been seen to rise in the form of a flame six feet high, and followed by a loud noise.

There are various interesting electrical phenomena, but they belong more immediately to the subject of Meteorology. A few of them, however, may be noticed, and of these the transport of ponderable substances by lightning is none of the least remarkable. To Fusinieri, whose name has already been mentioned, we are indebted for our knowledge of this interesting subject. The general facts at which he arrived, are:—"That lightning contains, like the common electric spark, matter in a state of extreme division, and in a state of ignition and combustion. In the matter deposited by lightning on houses and on trees which have been struck by it, he has found *iron*, *sulphur*, and *carbon*. Lightning divides and subdivides itself indefinitely into sparks, which end in being not much larger than those of ordinary machines; and each of these sparks contains ponderable substances in the state of extreme division already mentioned. The lightning deposits the substances with which it is charged while it passes through them, and while it breaks hard bodies; and it deposits them on the surface by which it enters the body, as well as on that by which it escapes, and also on the surfaces of fracture."

The connection between the formation of hail, and a highly electrical state of the atmosphere, is certain; but how the production of hail under such circumstances is to be accounted for, we cannot tell. To electricity is, also, to be attributed the phenomena of waterspouts, sheet or summer lightning, the aurora borealis, fireballs, columns of light, and other luminous appearances of the atmosphere. The fire of St Elmo, or Castor and Pollux, is a brilliant light which frequently appears on the summits of ships' masts, on the points of bayonets, on the tops of spears, and on the tips of the ears of horses, and also on their manes. It is nothing more than the electricity discharging itself into or from pointed bodies, and is intimately connected with a peculiar electrical state of the air.

ELECTRICITY OF LIVING ANIMALS.

During the chemical processes and changes which are incessantly taking place in living bodies, electricity is developed in greater or less quantities. The friction which takes place between the clothing and the skin of the human body, also tends to generate this power. Cardan relates, that sparks were emitted from the hair of a Carmelite monk whenever it was stroked backwards; other cases are also on record, of the fluid having been developed by the body being rubbed. But independent of these electrical phenomena, we find in certain fishes a regular system of electrical organs, by which they either defend themselves from the attacks of their enemies, or seize the prey nature has provided for their use. Amongst the most remarkable of these is the *Raia Torpedo*, which is capable of giving a great many shocks to a number of individuals connected together, in the same manner as in the experiment with the Leyden jar. Another is the electrical eel, which, when provoked, discharges its electricity, and the shock is experienced if the hand be dipped in the water containing the fish.

GALVANISM.

This science has been named after the celebrated Galvani, an Italian philosopher, on account of the following circumstance:—A recently killed frog having been accidentally touched in the limb with the blade of a knife which was held by a person who was experimenting with an electrical machine, was immediately thrown into violent convulsions. Galvani was not present when this occurred, but being informed of the circumstance, he lost no time in repeating the experiment, and extending his observations upon the phenomenon. He found that other metals besides that composing a knife answered the purpose, and very justly inferred that they owed this property of exciting muscular contractions to their being good conductors of electricity. Such was the origin of that science which has opened up to mankind a rich and boundless field of investigation.

Galvani proceeded with his experiments upon animals by means of metallic substances, and arrived at the conclusion, that the different parts of an animal are in opposite states of electricity, and that the effect of the metal is merely to restore the equilibrium. But this theory was proved to be erroneous by Volta, a celebrated philosopher of Pavia, who, about the year 1801, discovered the *Galvanic* or *Voltaic pile*. He was led to it by meditating on the developement of electricity at the surface of contact of two different metals. He tried the effect of his compound plates of metal upon animals, and was led to infer that the electricity is derived, not from the living system, but from the action excited between the metal and the humid animal fibre, that the animal matter acts merely as a medium conducting this electricity, and that the effects produced are to be ascribed to the stimulus of the electric fluid passing along the nerves and fibres, as in a shock from a Leyden jar.

Volta further discovered, that the metallic plates which he used, such as silver and zinc, are excited, the former negatively, and the latter positively; and also that the galvanic energy could be greatly augmented by employing several pairs of plates, connecting them in such a manner that the electricity excited by each pair should be diffused through the whole, and this constituted the voltaic pile. It consisted of any number of pairs of zinc and copper or zinc and silver plates, each pair being separated from the adjoining ones by pieces of cloth, nearly of the same size as the plates, and moistened in a saturated solution of salt. The relative position of the metals in each pair was the same in the whole series, so that if the copper was placed below the zinc in the first combination, the same order was preserved in all the others. The pile was contained in a frame, fixed into a piece of thick wood, which afforded the apparatus both support and insulation.

Volta invented another apparatus, and several improvements were made upon the voltaic pile by other philosophers, but we pass from these to the

CONSTRUCTION OF THE GALVANIC APPARATUS.

The simple contact of different conducting bodies is all that is necessary for the excitement of galvanic electricity. Conductors of electricity have been divided into perfect and imperfect; the former comprehending the metals, plumbago and charcoal, the mineral acids, and saline solutions; the latter including water, alcohol and ether, sulphur, oils, resins, metallic oxides, and compounds of chlorine. The least complicated galvanic arrangement is termed a *simple galvanic circle*. It consists of three conductors; of which one at least must be solid, the second fluid, the third may be either solid or fluid. In the following tables, some different simple circles are arranged in the order of their powers, the most energetic occupying the highest place:—

Table of electrical arrangements, which, by combination, form voltaic batteries, composed of two perfect conductors, and one imperfect conductor.

Zinc Iron Tin Lead Copper Silver Gold Platina Charcoal	Each of these is the positive pole to all the substances below it, and negative with respect to those above it in the column.	Solution of nitric acid ——— muriatic acid ——— sulphuric acid ——— sal ammoniac ——— nitre ——— other neutral salts.

Table of electrical arrangements, consisting of one perfect conductor and two imperfect conductors.

Solution of sulphuret of potash ——— potash ——— soda	Copper Silver Lead Tin Zinc Other metals Charcoal	Nitric acid Sulphuric acid Muriatic acid Any solutions containing acids

In explanation of these tables, it may be observed, that in all those cases where the fluid menstrua afford oxygen, those metals which have the strongest attraction for oxygen are those which form the positive pole. But when the fluid menstrua afford sulphur to the metals, the metal, which, under the existing circumstances, has the strongest attraction for sulphur, determines the positive pole. Thus, in a series of copper and iron plates, introduced into a porcelain trough, the cells of which are filled with water or with acid solutions, the iron is positive, and the copper negative; but when the cells are filled with a solution of sulphuret of potash, the copper is positive, and the iron negative. When one metal only is concerned, the surface opposite the acid is negative, and that in contact with the solution, or the alkali and sulphur, or of its alkali, is positive.

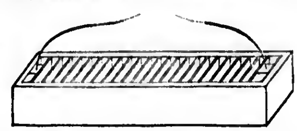
Simple galvanic circles are possessed of but feeble powers; yet these are often sufficiently obvious, as in the instance above alluded to, of a slip of zinc laid upon the tongue, and a piece of silver under it. In this case, we have an example of the arrangement of two perfect conductors (the metals) with one imperfect one (the tongue, or rather the fluids which it contains). A piece of zinc immersed in water which is freely exposed to the atmosphere, oxidises very slowly; but when placed in the same situation, in contact with a piece of silver, its oxidation is much more rapid. By immersing iron and silver (also in contact with each other) in dilute muriatic acid, the action of the acid upon the iron is considerably increased; and hydrogen gas is evolved from the water, not only where it is in contact with the iron, but where it touches the silver. These facts explain why, in the sheathing of ships, it is necessary to use bolts of the same metal which forms the plates; for if two different metals be employed, they both oxidate very speedily, in consequence of their forming, with the water of the ocean, a simple galvanic circle.

Compound galvanic circles, or galvanic batteries, are formed by multiplying those arrangements which compose simple circles. Thus, if plates of zinc and of silver, and pieces of woollen cloth of the same size as the plates, and moistened with water, be piled upon each other in the order of zinc, silver, cloth; zinc, silver, cloth; and so on, for twenty or more repetitions, we have the voltaic pile. The power of such a combination is sufficient to give a smart shock, as may be felt by grasping in the hands previously moistened, the wires connecting the upper and lower extremities of the pile. The shock may be renewed at pleasure, until, after a few hours, the activity of the pile begins to abate, and finally ceases altogether.

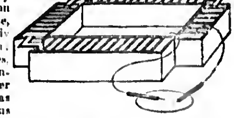
But the galvanic apparatus, by far the most convenient and generally used, was invented by Mr Cruickshank.

GALVANIC TROUGH.

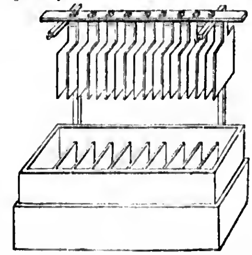
The galvanic trough, as it is named, and which consists of a long and narrow trough, made of baked wood, is shown beneath.



Grooves are cut in the trough, opposite to and at the distance of one-half and three-fourths of an inch from each other, and into these are let down, and secured by a cement, square plates of zinc and copper, previously united together by soldering. The space, therefore, between each pair of plates forms a cell for the purpose of containing the liquid by which the combination is to be made active. The plates may be from three to six or eight inches square, and care is to be taken, in their arrangement in the trough, that the order in which they are inserted be not in any instance reversed, but that the copper side of each double plate be always towards one hand, and the zinc side towards the other. The galvanic trough thus constructed, is more easily put in action than the pile, & more easily kept clean, and, besides, it can be continued longer in action, as it contains more liquid.



The voltaic battery has been improved by keeping the plates detached, instead of soldering them together. They are connected at the upper edge by a metallic arc, and are introduced into a trough divided into cells by partitions of glass (or sometimes into troughs wholly made of earthenware), in such a manner that one plate is on one side of the partition, the other on the other. This arrangement has the advantage, that, both surfaces of each plate being acted on, a greater power is obtained.

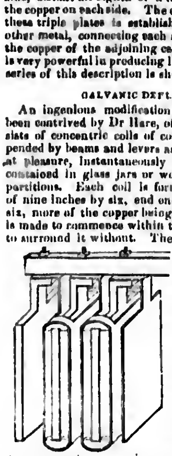


In the above engraving the plates are shown suspended over a porcelain trough, which is the best form in which they can be constructed. The only practical objection to the arrangement is, that in some cases the acid acts on the glazed surface of the porcelain, and the troughs leak.

Dr Wollaston has heightened the improvement, by placing in each cell one plate of the one metal, as the zinc, and two of the other, the copper, so that each surface of the zinc may be opposed to a surface of copper. The plates of copper are connected by metallic arcs, both at the top and bottom; and between them, supported by pieces of wood, is the plate of zinc, distant an eighth or a fourth of an inch from the copper on each side. The communication between these triple plates is established by arcs of lead or other metal, connecting each central zinc plate with the copper of the adjoining cell. This arrangement is very powerful in producing light and heat. A single series of this description is shown in the engraving.

GALVANIC DEFLAGRATOR.

An ingenious modification of this apparatus has been contrived by Dr Hare, of Philadelphia. It consists of concentric coils of copper and zinc, so suspended by beams and levers as to be made to descend, at pleasure, instantaneously into the exciting fluid contained in glass jars or wooden troughs, without partitions. Each coil is formed from a zinc sheet of nine inches by six, and one of copper fourteen by six, more of the copper being required, as this metal is made to commence within the zinc, and completely to surround it without. The sheets are so coiled as to leave between them interstices of a quarter of an inch. In the original apparatus, they were arranged in two rows, 40 coils in each; on their immersion in the appropriate fluid, the immediate evolution of heat and light was found to be most intense, and far exceeding that of voltaic piles or troughs of an equal number of series and extent of surface; and



on account of its superior power of causing the combustion of metallic wires and leaves, the instrument was named by its inventor the *galvanic deflagrator*.

The size of the plates composing the galvanic series has been varied from one or two inches square, to that of a great number of feet. The battery of Mr Children consisted of twenty pairs of copper and zinc plates, each plate being six feet long by two feet eight inches broad. Each pair was connected by leaden straps at the top, and had a separate wooden cell. These cells were capable of containing 945 gallons of liquid. The plates were suspended from a wooden beam, by means of which they could at once be lowered into the cells, and again raised at pleasure.*

Different liquids are employed to fill the cavities of the trough; and it is essential to employ those which exert a chemical action upon one of the metals, the effect with pure water being very inconsiderable. In general, the galvanic effect is proportional to the rapidity with which the more oxidable metal is acted upon by the intervening fluid. Thus, where the liquid employed is pure water, the electric excitement is very feeble, for the action on the metals is feeble; still the zinc is, even in this arrangement, observed to be oxidised more rapidly than it would be, were it not in contact with the copper. A saline solution, as of muriate of soda, or muriate of ammonia, is found to cause a more rapid oxidation of the zinc; and, accordingly, the electric power is greater; and, lastly, an acid fluid, which oxygenates and dissolves the metals much more rapidly, produces the highest activity of which the battery is capable. The fluid generally used is nitric acid, diluted with twenty or thirty times its weight of water.

With regard to the electrical effects produced by the galvanic battery, it is unnecessary to speak, as they are, of course, similar to those already described as resulting from an excited electric. We shall now proceed to the most important part of the subject, that which relates to the chemical changes effected by galvanism, and which has been called

ELECTRO-CHEMISTRY.

Some of the chemical changes effected by electricity were noticed under that head, but those resulting from the operation of galvanism, whose power is infinitely greater than that of ordinary electricity, are of incalculably more importance. Its application, indeed, to chemical analysis, has led to a series of discoveries which constitute a new era in the history of chemistry, and rank amongst the most brilliant recorded in the annals of physical science. In order to acquire clear ideas of chemistry as relating to galvanism, we will trace them from their origin, and attend to what takes place in the simplest galvanic circle, composed of two dissimilar metals, and an interposed fluid.

If a plate of zinc, and another of copper, be immersed in very dilute sulphuric acid, without touching or communicating with each other, the zinc will be acted upon by the acid; part of the water will be decomposed, its oxygen combining with the zinc, and forming oxide of zinc, and its hydrogen will be disengaged in the form of gas from the surface of the zinc plate. The copper is not acted upon. If the metals be brought into contact, the oxidation goes on with greater rapidity and energy, although without the evolution of the same quantity of hydrogen gas from the oxidating surface. But, from the whole fluid, hydrogen is disengaged in quantity exactly corresponding to that of the oxygen derived from the water, and the greater portion of it rises in a copious stream of bubbles from the surface of the copper plate, which remains unacted upon as before.

If, however, an acid, such as the nitric acid, capable of acting upon the copper, as well as upon the zinc, be employed instead of the sulphuric acid, similar phenomena will take place, with this additional circumstance, that the action of the acid upon the copper will cease the instant the galvanic circuit is completed; and instead of nitrous gas being formed on the surface of the copper, which happens before the circuit is formed, only bubbles of pure hydrogen will make their appearance; and the copper is protected from all further action, the zinc being, as in the former case, oxidated and dissolved with additional energy. It is on this principle that Sir H. Davy has effected the protection of the copper sheathing of ships from the corrosion of sea-water, by placing in contact with it pieces of zinc, or iron, on which sea-water exerts a greater chemical action than on copper. Among the simplest effects of galvanism upon fluid-conductors, is the resolution of water into its two gaseous elements, oxygen and hydrogen. If the water employed be not perfectly pure, other substances besides the two components of water make their appearance at the two wires employed in the experiment. The apparent formation of these substances greatly puzzled the early experimentalists, but Sir H. Davy proved, in a most masterly manner, that, when the water is perfectly free from any foreign ingredient, only the two simple gases of which it is composed are obtained. He also discovered, that, under the influence of voltaic electricity, neutral salts existing in any solution were decomposed, the acid portion being accumulated around the positive wire on the same points where oxygen was disengaged; while the bases, whether earthy, alkaline, or metallic, were at the same moment transferred along with the hydrogen to the negative wire.

Phenomena of a still more extraordinary nature presented themselves to Sir Humphry Davy in the further prosecution of these inquiries. It was discovered that the elements of compound bodies were actually conveyed by the influence of the electric current through solutions of substances, on which, under other circumstances, they would have exerted an immediate and powerful chemical action, without any such effect being produced. Acids, for example, may be transmitted from one cup, connected with the negative pole, to another on the opposite or positive side, through a portion of fluid in an intermediate cup, tinged with any of the vegetable-coloured infusions, which are instantly reddened by the presence of an acid, without occasioning the slightest change of colour. The same happens also with alkalis. If three cups be arranged, and connected with each other in a series by moistened cotton, the middle cup, and also the one next to the positive side of the battery, being filled with blue infusion of cabbage or of litmus, and the cup next to the negative side containing a solution of sulphate of soda, on the series being placed in the voltaic circuit, a red tinge will soon be perceived in the water of the positive cup, which will become strongly acid. It is evident that the sulphuric acid so transferred must have passed through the fluid in the middle vessel, but without affecting the coloured solution in its passage. By reversing the connections with the poles of the battery, a similar transfer of the alkali will be made: it will be collected in the tinged water of the negative cup, which it will render green; but the intermediate portion of fluid will not, either in this or in the former case, exhibit any trace of the substance which is carried through it by the influence of electricity. Cohesion, however, where powerful, as might have been expected, intercepts the transmission of the substance. Sulphuric acid cannot be transmitted through a solution of barytes or strontites, nor these earths through sulphuric acid; for when the attempt was made, they fell down as insoluble precipitates. Solids are also decomposed, and their elements transferred to the opposite wires, by means of the galvanic energy. So powerful is this mysterious agent, that the minutest portions of a substance, acted upon by either of the wires, is collected around it.

The reader has now obtained a general view of the principles and discoveries developed in Sir H. Davy's great Bakerian Lecture on the Chemical Agencies of Electricity, which was crowned by the National Institute of France with the Napoleon prize, to the glory of the country of the chemist, no less than to his own. The grand law of electro-chemical decomposition may be again stated in full. Metals, inflammable bodies, alkalis, earths, and oxides, are determined to the negative surface or pole; and oxygen, chlorine, iodine, and acids (may we add bromine and fluorine?) to the positive pole. The decomposition into their constituent elements of the alkalis and earths, which crowned the brilliant career of the great philosopher above named, is, in point of theory, only a particular instance of the general fact above stated.

Various other applications have been made of the voltaic battery to the purposes of chemical decomposition. Sulphuric acid is resolved into oxygen and sulphur; phosphoric acid into oxygen; and phosphorus and ammonia into hydrogen and azote, and a minute proportion of oxygen. Oils, alcohol, and ether, when acted on by a powerful battery, deposit charcoal, and give off hydrogen or carburetted hydrogen. But it is unnecessary to enumerate all the instances of decomposition effected by this the most powerful instrument of analysis in the hands of man.

We have now arrived at a general law, namely, that when compounds are placed in the galvanic circuit, they are decomposed, and their elements collect, some around the negative, some around the positive pole of the battery. How this arises, what is the cause of this remarkable effect, it is difficult to say. Various theories have been brought forward to explain these singular results.

CHEMICAL THEORY OF GALVANISM.

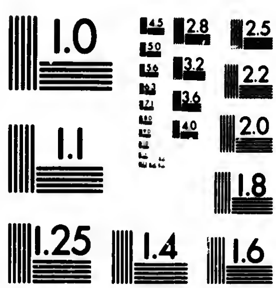
The general fact which forms the basis of this theory is, that chemical action occurring between a fluid and a solid body is always accompanied by the disturbance of electric equilibrium, and thus a quantity of electricity passes from a latent into an active state. For instance, during the oxidation of metallic bodies by means of an acid, a large quantity of electricity is developed, or, in other words, the metal becomes negatively electrified, whilst the liquid becomes positively electrified to the same extent. Now, this can be accounted for in a certain degree, by supposing the existence of either one or two fluids. According to the first theory, we have only to suppose that the fluid is abstracted from the metal and transferred to the zinc; or, according to the second hypothesis, that the two electricities are separated by chemical action, and the determination of the resinous or negative electricity in the direction of the zinc, and of the vitreous or positive fluid in the direction of the oxidating liquid. Why the electrical equilibrium should be disturbed during chemical composition, and what is the obstacle which prevents its restoration, is yet a mystery to us, but the fact is beyond all doubt. It may be asked, is chemical action the *cause* or the *effect* of electricity being transferred from a latent to an active state? That chemical attraction itself is a modification of electricity, and that the same power which communicates attractive and repulsive properties to masses of matter, may, when acting upon the ultimate particles of different bodies, induce them either to separate or unite, as their natural electrical states are the same or different, is extremely probable. Sir H. Davy, who advanced the above theory, conceived that all bodies possess natural electrical energies, which are inherent in them, whether they are in a state of combination or not. Oxygen, chlorine, iodine, and acids, according to the theory, are naturally negative; while inflammables, as hydrogen, sulphur, &c., and metals, are naturally positive. Hence, when the combinations of these substances are subverted by the galvanic influence, the substances are evolved in the electric state natural to them; and, as it is a law of electricity that bodies in opposite states attract each other, the oxygen, being negative, is immediately attracted by the positive wire, while the inflammable or metallic base, being naturally positive, is attracted by the negative wire. In this way, the uniform appearances of these bodies at their particular poles are accounted for. Thus, if hydrogen is naturally positive, and oxygen naturally negative, according to the laws of electricity, they must attract each other; and if these opposite states are sufficiently elevated to give them an attractive force, superior to the power of aggregation, they may be expected to combine; and, in like manner, other bodies, whose particles are in different states, may from this cause be united together. If a body, also, whose electrical energy exceeds that of one of the substances combined, be brought to act upon these, it may expel that ingredient, and take its place; and this may be the cause of what is called decomposition from elective affinity.

The effect of heat, likewise, in promoting combination or decomposition, may often depend on its exciting electrical energy; and the elevation of temperature and production of light, so frequently attending chemical action, may depend on the changes attending the electrical states, since such changes are accompanied with the evolution of heat and light. The agency of the galvanic apparatus, then, in producing decomposition, it is conceived on this hypothesis, is, that the two wires placed in contact with the compound are, in states of electricity, more intensely elevated than the natural states of the two ingredients; hence the attraction of these two highly electrified points overcomes that subsisting between these ingredients: they are separated, and immediately drawn to the respective poles—the positive constituent to the negative wire, and the ingredient, which is naturally negative, to the positive wire. A number of facts might be brought forward in support of these views.

The transfer of material ponderable substances, such as those which constitute water to the respective poles of the battery, has been thus explained by Dr Roget, in a paper which was read to the Philosophical Society of Manchester, in 1807:—"We may conceive the agency of electricity to extend throughout the whole of the fluid line connecting the two wires. The hydrogen existing in every particle of water in this line will, if it possess a positive electrical polarity, according to the hypothesis of Mr Davy, be repelled by the positive and attracted by the negative wire. We may consider the row of particles of hydrogen abstractedly from those of oxygen. While the former are moving together, by the agency of electricity, in a direction towards the negative wire, all those particles which have not yet reached that wire will merely have to pass over in succession from one particle of oxygen to the next, among those of the other row. They will not appear in the form of gas, because the instant each has quitted the particle of

* British Cyclopædia, article Galvanism.

IMAGE EVALUATION TEST TARGET (MT-3)



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oxygen with which it was associated, it meets with another to combine with; and this process will be continually repeated until it has arrived at the end of the line, when, finding no oxygen to unite itself with, it will make its appearance in the form of gas. In like manner, the first particle of hydrogen in the series, by its abandoning the first particle of oxygen, which finds no other particle of hydrogen to replace it, causes the oxygen to appear at that point in the form of gas. We have thus the two gases formed at each end, not from the same individual particle of water, but from the two which happen to be at that moment in contact with the wires. The production of the two gases will take place at the same instant in both places, each particle having only to move one step, that is, from one particle to the adjoining one, instead of having to traverse the whole extent of the line, and no current will be perceptible in the fluid. If this theory be correct, the operation of gravity in favouring the descending current of the heavier element, namely, oxygen, might be rendered sensible; and that this is actually the case, appears by an observation of Mr Sylvester, that when the wire giving out oxygen is placed at a much lower level than that which gives out hydrogen, the effect is sensibly greater than when the positions are reversed."

Similar explanations of the mode of transfer have been given by Dr Henry, and by Grotthus; and from the following passage in Sir H. Davy's last paper on the subject, it would seem that he entertained views somewhat similar:—"If it be supposed that the fluid is divided into two zones, directly opposite in their powers to the poles of the battery, the virtual change may be regarded as taking place in the two extremities of these zones nearest the neutral point; so that, by a series of decompositions and recompositions, the alkaline matters and hydrogen separate at one side, and oxygen, pure, or in union, at the other. In this way, the electricity may be regarded as the transporter of ponderable matters, which assume their own peculiar characters at the moment when they arrive at the point of rest." That visible motions are sometimes produced in fluid-conductors when transmitting the electric current, has been shown by Sir H. Davy, who noticed the very singular convulsive agitations into which mercury is thrown, when placed within the circuit of a powerful voltaic battery discharged through water. These motions, which are frequently of a violent and capricious kind, have also attracted the attention of Sir John Herschel, who, in 1824, made them a subject of very interesting research.

Before concluding this part of the subject, it should be remarked, that, in the production of the different effects arising from the operation of galvanism, a different law is observed with regard to each of these effects, according as the structure of the galvanic arrangement varies. Thus, a few metallic plates, of a surface containing two or three square feet, will be powerful in producing heat and light, and will therefore deflagrate metallic leaves placed in the circuit, and illuminate charcoal points vividly; but the battery which they form will display little power of electrical attraction and repulsion, will have comparatively little effect on sentient organs, scarcely producing any shock, and will act feebly in producing chemical decomposition. Thus the great battery of Mr Children, and the deflagrator of Dr Hare, which melted many feet of platina with ease, had no very remarkable power in effecting decomposition, or in giving shocks. If the same amount of surface, however, as existed in either of these arrangements, had been disposed in a battery, so as to have formed four times the number of plates, the result would have been a diminution of the burning effect, while it would have exhibited more evidently the different electrical states, and been more powerful in exciting sensations in animal organs, and in giving rise to chemical decompositions.

PHYSIOLOGICAL EFFECTS OF GALVANISM.

In treating of electricity, we observed that the energy of that fluid was chiefly exerted on the functions of the nervous system in living animals. It is shown in the production of sensation, in the excitation of muscular contraction, and in altering the products of secretion. The shock received by the human body from the voltaic pile is similar to that resulting from a large electrical battery very weakly charged. Twenty pair of plates are generally sufficient to give a shock which is sometimes felt in the arms. With a hundred pair, it extends to the shoulders. A continued flow of the current through the body is accompanied by a continued aching pain. The impression made upon some of the nerves of the face when they form part of the circuit, is accompanied by the sensation of a vivid flash of light. When a piece of zinc and a piece of copper are placed, the one above and the other below the tongue, which must be in a moist state, a peculiar taste is experienced. This is supposed to arise from the saliva of the mouth having been decomposed by the galvanic action, and not merely the effect of a direct impression of the electric current on the nerves of the tongue. When the current of voltaic electricity is made to pass along a nerve distributed to any of the muscles of voluntary motion, they are thrown into violent convulsive contractions. The susceptibility of some animals is very great, and numerous curious experiments may be performed with them. If an earthworm be placed upon a crown piece which lies upon a plate of zinc of larger size, it will suffer no inconvenience as long as it remains in contact with the silver only; but the moment it has stretched out its head, and touched the zinc, so as to complete the galvanic circle, it suddenly recoils, as if it had felt a severe shock. If the battery be powerful, small animals may be easily killed. Striking effects are produced by galvanism, in the muscles of an animal, after death, as long as they retain their contractility. The convulsions are so general as often to impress the spectator with a belief that the animal has been restored to the power of sensation, and that it is suffering the most cruel torture. The eyes open and shut in their sockets spontaneously, as if re-endued with vision; the nostrils vibrate, as in the act of smelling; and the movements of mastication are imitated by the jaws.

But the experiments which are calculated to produce the greatest terror and astonishment, are those made upon the bodies of recently executed criminals. The following is an account of one performed by Dr Ure, upon the body of a murderer named Clydesdale, and it is perhaps the most striking on record:—

GALVANISATION OF A DEAD BODY.

In the first experiment, one rod was connected with the spinal marrow, and the other with the sciatic nerve. Every muscle of the body was thrown into convulsive movements, resembling a violent shuddering from cold. One rod having been removed from the hip to the heel, the knee being previously bent, the leg was thrown out with such force as nearly to overset one of the scientific operators who attempted to prevent its extension. In the second experiment, the nerves and muscles connected with the respiratory organs were acted upon, and the effect was truly wonderful. Full and laborious breathing instantly commenced. The chest heaved and fell; the belly protruded and collapsed with the relaxing and retiring diaphragm; and this continued as long as the galvanic discharges were given. In the third experiment, one rod was connected with the eyebrow, and the other with the heel. Every muscle of the countenance was thrown into convulsive emotion, and every terrible passion became then fearfully embodied. In rage, horror, despair, anguish, and ghastly smiles, the expression of the murderer's face far surpassed the most fearful representations of a Fuseli or a Kean. One gentleman who was present at this awful exhibition fainted, and others were compelled to leave the room through terror or faintness. In the fourth and last experiment, one of the arms was electrified, and the fingers were set nimbly into motion like those of a violin player. The fist being closed, and the rod applied to the tip of the forefinger, it instantly extended, and from the convulsive agitation of the arm, the criminal seemed to point to the spectators, some of whom thought that he had come to life. It remains to be stated that the positive pole or wire connected with the zinc end of the battery was that which was applied to the *nerve*; and the negative, or that connected with the copper end, was that which was applied to the *muscles*. The battery consisted of 270 pairs of four-inch plates. Dr Ure, who deserves the highest praise for the admirable manner in which he conducted the above experiments, was of opinion, that, had the respiratory organs been acted upon before the body had lost a large quantity of blood from incisions having been made in it in various places, there is a probability that the malefactor would have been brought to life. But this event, he justly remarks, was scarcely desirable in the case of a murderer, however important in a philosophical point of view.

The effects of galvanism upon the functions of secretion are the most remarkable as well as the most inexplicable. That it acts especially, and in a peculiar manner, upon the gastric juice, a fluid essentially subservient to the process of digestion, there can be no doubt. Perhaps the various functional parts of the body form a sort of galvanic battery, by which a regular circulation of this subtile and mysterious fluid is kept up.

ELECTRO-MAGNETISM, OR MAGNETO-ELECTRICITY.

The strong resemblances between the phenomena exhibited by magnetism and electricity, were long ago pointed out by philosophers. The analogy was strongly corroborated by the fact often observed, that magnetism was communicated to bodies by a stroke of lightning, and that the compass needles of ships have lost their virtue, and had their polarity changed by a similar cause. Dr Franklin, in enumerating the points of analogy between lightning and electricity, remarks, that they both have the power, not merely of reversing the poles of magnets, but of completely destroying their magnetism. Other analogies were discovered; but it was not until 1819, when Professor Oersted of Copenhagen, led by theoretical views, established a most interesting relation between these two powers, and laid the foundation of the new science, called Electro-Magnetism. The facts which this philosopher discovered may be thus expressed:—

When a wire conducting electricity is placed parallel to a magnetic needle properly suspended, the needle will deviate from its original or natural direction. This deviation follows a regular law.

1. If the needle is *above* the conducting wire, and the positive electricity goes from right to left, the *north* end of the needle will be moved *from* the observer.

2. If the needle is *below* the wire, and the positive electricity passes as before, the *north* end of the needle will be moved *towards* the observer.

3. If the needle is in the same horizontal plane with the wire, and is between the observer and the wire, the *north* end of it will be *elevated*.

4. If the needle is similarly placed on the opposite side, the *north* end of it will be *depressed*. In these two experiments the needle must be very near the wire.

From these simple facts, Mr Oersted concludes that the magnetical action of the electrical current has a circular motion round the wire which conducts it.

The metallic wire to be made use of in this experiment, should be two or three feet in length, to allow of its being bent in various directions. It is called the *conjunctive wire*. Ampère and Davy discovered two very important facts soon after Oersted had made his experiments public—namely, that the conjunctive wire itself becomes a magnet, and that magnetic properties might be communicated to a steel needle, not previously possessing them, by placing it in the electric current; and the degree of magnetic power thus communicated, Davy showed was always proportional to the quantity of electricity transmitted through it. When the conjunctive wires of two distinct galvanic batteries are made to approach each other, they exhibit magnetic attractions and repulsions. Two wires of copper, silver, or any other metal, connecting the extremities of two galvanic troughs, being placed parallel to each other, and suspended so as to move freely, immediately attract and repel each other, according as the directions of the currents of electricity flowing through them are the same or different.

Upon this experiment is founded the most plausible theory of magnetism, viz., that it arises from the attractions and repulsions of currents of electricity, constantly circulating round every magnet. This is conceived to explain the reason why the magnetic needle places itself at right angles to a wire conducting electricity, namely, that the current passing along the wire may coincide with that circulating round the magnet. Dr Faraday has considerably extended our knowledge upon this interesting subject; and, by some beautiful experiments, he has clearly proved the tendency which one of the poles invariably has to move always to the right and the other to the left.

Reviewing the various experiments which have been made upon this subject, it seems clearly proved that electricity and magnetism are identically the same. A permanent magnet is supposed to be thus constituted:—It is a mass of iron or steel, round the axis of which electric currents are constantly circulating, and these currents attract all other electric currents flowing in the same direction, and repel all others which are moving in an opposite direction. The electric currents flow round every magnet in the same direction in reference to its poles. For instance, if we place a magnet with its north pole pointing to the north, in the usual position of the magnetic needle, the current of electricity flows round it from west to east (that is, the direction in which the earth and other planets revolve round the sun), or, on the eastern side of the magnet, it is moving downwards, and on the western side upwards, on the upper side from west to east, and on the lower side from east to west. This is found to be a uniform law. To complete the view of this doctrine, it remains only to explain the influence of the earth on the magnet, by which the needle is kept always in one position, nearly coinciding with the meridian. It is conjectured that currents of electricity, analogous to those which circulate round every magnet, are constantly flowing round the globe, as the current of electricity in a galvanic apparatus moves in an unbroken circuit from the negative to the positive pole, and from it, by the connecting wire, round again to the negative pole. The direction of these currents is inferred to be the same as has been stated with regard to artificial magnets; and it is simply by the attractions and repulsions of these terrestrial currents, bringing the currents round the needle to coincide with them, that the latter always points to the north.

To detect these currents, and to prove the truth of the whole theory, many ingenious experiments have been made; but as an account of them is incompatible with our limits, we refer the reader to the best work upon the subject—that of Mr Watkins of London.

To conclude: With regard to the abstract nature of this singular agent whose properties we have described, the first question that presents itself is, whether it be a material substance or not. Although many of the phenomena seem at first sight to indicate that such is the case, yet, after due consideration, they will be found resolvable into the sudden action of a repulsive power exerted amongst the particles of matter situated in a continuous line. The materiality of electricity, indeed, still rests upon a similar foundation with that of heat and light, which, as we observed in the number of this work devoted to Chemistry, is still a disputed point. We have already spoken at sufficient length upon the subject of there being one or two fluids. We may remark, that as all the facts can be explained by either of the two hypotheses, and as we are still in ignorance whether or not it be a *fluid* at all, speculation upon it, however amusing, is utterly useless.

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THE EAST INDIES.

GEOGRAPHICAL BOUNDARIES.

INDIA, or Hindostan, or the East Indies, as it is called, to distinguish it from the West India Islands, is a large country in Asia, forming, as may be seen by the adjoining map, an extensive triangular-shaped territory, pointing with its narrow peninsular extremity southward to the Indian Ocean. India is nearly comprehended between the latitudes of 8° and 35° north; its extreme length from north to south is about 1900 miles, and from east to west about 1500; its superficial area measures 1,280,000 miles. The northern boundary of this extensive region is formed by a range of mountains running from east to west, which are higher than any other on the surface of the globe, some of them reaching 15,000 feet above the level of the sea: they are called the Himalaya Mountains, from an Indian word, "heem," signifying snow—some of their peaks being perpetually clothed with ice and snows. From the extremities of this mountain-chain flow two large rivers, which form on either side the boundary of India; that on the east is called the Brahmaputra, and that on the west, the Indus—a river from whose name the whole country has derived its present designation. Each of these streams with their tributaries waters an immense tract of fertile country, and affords excellent means of internal trade to the people situated on its banks. From the mouths of these rivers the coast stretches both ways to the southward, the eastern and western side inclining to the same point, so as to meet at Cape Comorin. Beyond this, the adjoining Island of Ceylon extends a little farther outward, and reaches to within about six degrees of the equator.

MAP OF THE EAST INDIES.

This large country presents a great variety of surface, being diversified in some places with wide sandy deserts; in others with fine undulating hill countries, well watered and fertile; a third portion consists of flat high-lying regions, called table-lands, which, from their height above the sea, are cool and temperate; and a fourth division consists of immense fertile plains, watered by the large rivers of the country, and their numerous tributaries. A considerable portion of the low-lying country is of a marshy shrubby character, called jungle, and unfitted for cultivation. Each of these divisions of India presents an aspect peculiar to itself, and all of them are distinguished by natural productions, both plants and animals. Besides the Indus on the west, and the Brahmaputra on the east, there are other large and important rivers descending from the outskirts of the Himalaya Mountains, or from ranges of hills called Ghauts, and descending to the sea both on the east and west coasts. The principal of these streams is the Ganges, which, with its tributaries, drains a large portion of the north-east division of the country, and enters the sea in the province of Bengal, along with the conjoined waters of the Brahmaputra. The valley of the Ganges, and the vallies of its tributaries, form the fairest and richest portion of India. This district, in its largest extent, may be described as a semicircle with its base extended along the line of the Himalaya Mountains, and its curve running along from Boodiana on the Indus, to Delhi, Gualior, Punnah, Sumbhulpoor, and Balasore, where it meets the sea and the mouths of the Ganges, thence along the coast to Chittagong, and north by Silhet and Rungpore, to include the country of the Brahmaputra.

The first sight of India to European voyagers has little which can please or interest. The coasts are remarkably flat, and frequently dangerous to approach through the raging surf; the shore is only discernible by the tall cocoa-trees which surround the villages or temples. This extreme flatness of the shores of India is one of the peculiar distinguishing traits of the country, and is exceedingly disadvantageous in a maritime commercial point of view.

The southern district of this magnificent valley is called Bengal, and extends along the sea from Chittagong to Balasore, about four hundred miles, and reaches about the same distance northward. The sea-coast is not the most fertile or useful part of this territory; great part of it towards the centre being composed of marshy ground, or of mud islands, among which the branches of the river are spread like network. These islands are covered with a rank vegetation of reeds, which are sometimes twenty or thirty feet high; or with trees and underwood so tall and dense, that it is impossible to penetrate them. They afford shelter to tigers and other wild animals, but the air of the whole of them is pernicious to health. About 150 miles upwards, the soil becomes higher and less marshy, so as to afford good ground for cultivation; and the country is here fertile and thickly peopled. It is in this district, immediately above the mouths of the Ganges, that Calcutta, the capital of British India, is situated. The inundations of the Ganges cover and fertilise immense tracts of the level country near the river, while others more remote procure the same advantages from an artificial irrigation. Luxuriant fields, divided by groves of tall trees, with villages under their shelter, and swarming with a population beyond any thing that Europe can show, form the general features of the vast alluvial plain of Bengal.

DIVISIONS OF THE COUNTRY.

The modern territorial and political subdivisions of India may thus be specified:—First, NORTHERN HINDOSTAN, an extensive and rugged territory, comprehending—

1. The country between the Sutuleje and Jumna	4. Kemaoon
2. Gurwal or Serinagur	5. Painkhandi
3. Sources of the Ganges	6. Bhutant
	7. Dominions of Nepaul

Second, HINDOSTAN PROPER, which is the most comprehensive division.—It stretches across the centre of India, and obtains the most prominent place in the history of the old Mahommedan empires of India. It reaches south to the Nerbudda river, where the Deccan commences, and includes the following thirteen large provinces:—

1. Bengal	8. Cashmere
2. Bahar	9. Ajmeer
3. Allahabad	10. Moultan
4. Oude	11. Cutch
5. Agra	12. Guzerat
6. Delhi 7. Lahore	13. Malwa

Third, THE DECCAN.—This division lies next in a southerly direction to the above, extending from the Nerbudda river on the north, which flows into the sea on the west coast, to the Krishna, a river flowing into the sea or Bay of Bengal on the east coast. Between these rivers lies the Deccan, a much less fertile division of India than the preceding; Bombay, a small island on the west coast, belongs to the province of Aurungabad in this division. The Deccan comprehends the following provinces, a portion of which once formed the Mahratta empire:—

1. Gundwana	6. Beeder
2. Orissa	7. Hyderabad
3. The Northern Circars	8. Aurungabad
4. Candeish	9. Bejapoor
5. Berar	

Fourth, India South of the Krishna.—This division forms the extreme southerly portion of the Indian peninsula, and comprehends the following provinces:—

1. Canara	6. Mysore
2. Malabar	7. Coimbatoor
3. Cochin	8. Salem, and the Barramahal
4. Travancore	
5. Balaghaut, ceded districts	9. The Carnatic, in which is situated Madras

Besides the foregoing divisions and provinces, the large territories of Ave and the Burmese empire, lying east from the Brahmaputra, are now attached to India, besides other conterminous regions in different quarters.

HISTORY.

What was the original political condition of the vast territory now composing the British Indian empire, it would be needless to detail minutely. Like other portions of Asia, it was early inhabited by a primitive people, more or less barbarous, professing different pagan religions, and speaking many more different languages. The principal religion, however, was Hindooism, which we shall afterwards allude to; and it has been said by some historians that the early Hindoo race of inhabitants manifested many symptoms of civilisation, and even a knowledge of some of the sciences. However this may have been, the inhabitants generally were in some measure an industrious but simple race, and little inclined to war. Reasoning from what has occurred in their history, as well as from the information communicated regarding them, they seem, from the earliest times, to have had little or no care with regard to who ruled over them, provided they were insured in the possession of their ancient religious usages, and their system of living in small communities under a primitive species of local government. They were reckless of what sovereign was placed over them, or to what dynasty they were transferred, so long as the internal economy of their village districts remained the same. This species of political apathy produced the results which might have been expected. From the most remote period of which any record is preserved, the inhabitants of India, including those tribes which possessed more decided warlike propensities, or who had the spirit to resist aggression, were subjected to the government of strangers, who seized upon their territories, and made them the objects of taxation. Among other warlike princes who thus made inroads on the country, Alexander the Great, in the course of his ambitious career, marched with an army to India, the northern part of which he conquered.

Of this remote period of Indian history, little is correctly known: all that may be said of it is, that both the Greeks and Romans were supplied with some of their articles of luxury from Hindostan, and that for many centuries this eastern clime was supposed, by the ill-instructed inhabitants of distant parts of Asia and Europe, to be the richest and most sumptuous country on the globe. The tales related of Indian grandeur appear to have in time excited the avarice and ambition of Mahommedan or Saracen chiefs. The first of this barbarous though intrepid race, who made a successful inroad upon India, was Mahmoud, sultan of Ghizni, or Afghanstan, a kingdom on the north-west of India. Mahmoud commenced his successful expeditions into India about the year 1000, and he continued them till 1024, making the destruction of pagan idolatry more the object of his visits than the acquisition of wealth or power. In this period of twenty-four years he had subdued a considerable number of the native princes, and, notwithstanding his professions, exacted immense tributes in gold and every kind of valuable commodity. A successor of Mahmoud, named Mahommed, after carrying on war with the Indian princes for some time, at length, about the year 1193, entered Hindostan with an exceedingly large force, and bore down all opposition. The king of Delhi was slain in battle, and having advanced to that ancient capital, Mahommed there left a viceroy to maintain his authority. In this manner a Mahommedan dominion was for the first time established in the heart of India, and in one of its greatest cities, and thus commenced the Afghan or Patan sovereigns and their dynasty.

The dynasty so planted continued in existence for rather more than three hundred years, when, in 1525 or 1526, it was subverted by Baber, who was considered one of the most adventurous warriors of his time, and who, like his prototype Mahommed, was of the Moslem faith. Baber was either descended from a Mogul or Tartar chief, or in some way, not clearly explained by historians, connected with a race called Moguls, who assisted him in his attempts upon India; and from causes of this nature, the empire which he founded in Hindostan has ever since been called the Mogul empire. From the year 1526, a series of Mahommedan emperors, whose seat of authority was at Delhi, ruled the largest and finest portions of India. By them the country was in many places newly subdivided into provinces, and put under the government of tributary kings or nabobs, who superseded the Hindoo rajahs or petty princes. One of the greatest of these Mogul emperors was Akbar, who flourished between the years 1556 and 1605. By his daring and judicious management, the central provinces were preserved in complete tranquillity, and Guzerat, Bengal, and part of the Deccan, were added to his already extensive empire.

BEGINNING OF EUROPEAN INTERCOURSE.

While the emperors of India were thus establishing their power, multifarious schemes were formed in Europe for getting possession of some of the wealth, if not some portions of the territory, of Hindostan. The commodities of Indian manufacture or produce were hitherto imported into the European states only by means of tedious overland journeys, or partly by the Red Sea, and were endangered in their passage by the attacks of ferocious Tartar and Turkish tribes. The discovery of a new and safe road to India thus became a matter of very great consequence. A route by sea round the Cape of Good Hope was at last found by the Portuguese, who, under the command of Vasco de Gama, in 1498, landed in Hindostan, on the coast of Malabar, where they at once established themselves. The whole commerce of the East Indies was now in the hands of the Portuguese for nearly a century—and this was the golden age of Portugal. Lisbon became the great depôt of Indian spices and other commodities, greatly to the envy of the Dutch and other nations. Portugal was united to Spain in 1580—the Spaniards oppressed Holland, and caused it to revolt—this revolt was followed by the capture of the Dutch ships trading to Lisbon—and this capture compelled the Dutch to engage in a direct trade to India. The English soon followed their example. The political and spiritual tyranny of the Portuguese in India, as well as the abuses which they permitted in commerce, gradually subverted their power, and divested them of respect. The Dutch and English, therefore, found every thing in that state of division which is favourable to the establishment of a third party. The Dutch established an East India Company in 1602, and a prosperous trade was thereafter carried on. The Dutch adopted quite a different line of policy from that of the Portuguese in their transactions with India. They cared nothing about the religion of the Hindoos, and set up no inquisition to force Christianity on those they dealt with; all they wanted was commercial intercourse, and their excellent management soon secured them in a large share of the Indian traffic. They possessed themselves of Batavia, in the island of Java; in 1641, they acquired Malacca, the capital of the Portuguese East Indies; they subsequently acquired the Cape of Good Hope for a settlement; and these colonies were a great assistance to the intercourse between Europe and India. The Dutch subsequently acquired a number of other possessions in the East; but most of these came afterwards into the possession of the British.

RISE OF THE EAST INDIA COMPANY.

We now enter upon the history of the rise and progress of the British power in India. The English became animated with a desire to open a commercial intercourse with India as early as the reign of Edward VI. (1553); but their expeditions failed in reaching the desired country, from their want of geographical knowledge: and it was not till the shutting of Lisbon against the Dutch, that they were so far excited as to persevere in their maritime attempts till they were successful. They at length learned which was the true course to steer for India; whereupon, in 1600, a company of merchants was formed in London to prosecute the traffic with the East; being empowered to do so by a charter from Queen Elizabeth, which was to last fifteen years. The first expedition of these adventurers cost L.69,091, and consisted of five ships, the largest of which was 600, and the smallest 130 tons burden. The articles which they took were principally bullion, iron, tin, broad-cloths, cutlery, and glass. Their expedition proved remarkably successful, and led immediately to a repetition of annual voyages of the same nature. This early trade was nevertheless considerably hampered by the Portuguese; and it was found necessary to try to secure the favour of the Mogul emperor. In 1607, therefore, Captain William Hawkins was sent out by the Company, to endeavour if possible to open a commercial intercourse with the dominions of the Mogul. Hawkins, after surmounting great difficulties placed in his way by the Portuguese, reached the court of the Mogul emperor Jehangire, son of the famous Akbar, already mentioned. This visit was unfortunately of no avail, from the pernicious interference of the Portuguese Jesuits; and another English mission, on a greater scale, and from the king, was sent forth in 1615. This embassy, which was conducted by Sir Thomas Roe, proved more successful in securing the favour of the Mogul, but did not lead to any important results. The affairs of the Company, nevertheless, continued prosperous, and factories were in many places planted on the coasts of India. These factories were warehouses for the reception of native produce, and the storing of imported goods from England, and were no doubt of considerable use in the objects of their establishment. From the real or pretended dread of being attacked by marauders, the keepers, merchants, and servants, at these places, at length began to strengthen the defences; and so, from being mere mercantile warehouses, the factories partook of the decided character of armed garrisons. It does not appear that the native powers of India took any active measures to prevent this insidious process of planting settlements. The natives were fond of dealing with foreigners, and the princes were so eaten up with jealousy of each other, that the British always contrived to gain the friendship of one by taking part against another, and in the end getting the advantage of both. Besides, it was not for some time that the British disclosed any intention of securing the jurisdiction of provinces, or a property in the soil. A watchful hypocrisy led them to yield, on all occasions, a reverence towards the political sway of the native emperors, rajahs, and nabobs. The original East India Company, with its charters at different times disputed and renewed, continued throughout the seventeenth century to carry on a profitable traffic with the East. Its factories were extended to Java, Sumatra, Borneo, the Banda Islands, Celebes, Malacca, Siam, the coasts of Malabar and Coromandel. In 1640, the native authorities gave permission for the building of Fort St George, at Madras; and in 1645, a factory was established on the banks of the Hooghley, a branch of the Ganges near its mouth, which formed the foundation of Calcutta. The island of Bombay was also procured as a settlement in 1664-5, after a struggle with its Portuguese possessors. The affairs of the Company were not, however, in a prosperous state; and soon after the revolution of 1688, the question of the validity of the old royal charter was started. The consequence followed of the Company not being able to perform its obligations, on account of losses occasioned by wars, infidelity of officers, extravagance, &c.; and Parliament, in 1698, granted a charter to a new East India Company, on condition of a loan of L.2,000,000 sterling to the state, and which was required to carry on King William's wars. But the great contentions between the two Companies soon made it necessary to unite them, and a union was effected in 1702, when an act of Parliament was passed, establishing the conjoined association under the title of the United Company of Merchants trading to the East Indies. Stock was raised by the sale of shares, and the shareholders to a certain amount were entitled to elect the directors of the Company.

The progress of the Company's settlements in India was, on several occasions about this period, caused by the superior skill of the British in medicine. In 1715, an embassy being sent on a commercial commission to Delhi, it happened that a medical gentleman named Hamilton, who accompanied the factory, had the good fortune to cure the emperor Feroksere of a severe illness, which could not be overcome by the ignorant native physicians. In gratitude for this important service, though it is likely some very valuable presents from the Company had an equally liberalising effect, the emperor granted liberty to the Company to purchase in Bengal thirty-seven townships in addition to that of Calcutta; he also conferred upon them some important commercial privileges, which soon rendered Calcutta a flourishing settlement.

The charter of the East India Company was from time to time renewed during the eighteenth century, though, but not without great difficulty, against a powerful opposition. But loans to government carried them always through these embarrassments. In 1744, they advanced L.1,000,000 at three per cent., in consideration of an extension of their privileges till 1780. Hitherto we have seen this company of English merchants acting only for the avowed object of commercial intercourse with India; we now open a new page in their history, and show the origin of their political power.

THE COMPANY'S ASSUMPTION OF POLITICAL POWER.

The East India Company assumed the qualifications of a military and political power in the year 1748. But their advances towards territorial dominion were retarded by a rival, which gave them no small trouble. This competitor was France, which had in the meantime hastened to share in the commerce and spoils of India. In 1746, a French battalion had destroyed the army of the nabob of the Carnatic, and soon after the French officers succeeded in disciplining Indian troops according to the European method. The inferiority of the native Indian troops opposed to European soldiers, and the facility of instructing Indian soldiers, known by the name of *Sepoys*, in the European tactics, was thus proved. Ambition and avarice, political and mercantile cunning, could now act on a larger scale; and the independence of the Indian princes was gone whenever this trading Company, which was already encroaching upon all the rights, both of the rulers and the people of these countries, should establish a permanent military force. Thus far the military organisation of the Company had been merely on the defensive; it now became able to act offensively; and the entire difference of the European and Indian notions of law could never fail to furnish opportunities to put this new means of power into action. The rights of succession, and all the rights of princes, subjects, and families, were so much disputed on the different principles of the Indian, Mahommedan, and British laws, that the Company, which often interfered as arbitrator, easily succeeded in extending their legal jurisdiction. If called to account in England for any of its undertakings, it was easy to uphold the correctness of its conduct, politically, on the ground of self-defence, which, at the distance of several thousand miles, could not be called in question; and, in legal matters, by taking advantage of the impenetrable labyrinth of the law. Edmund Burke, who experienced, in the case of Warren Hastings, the head of the Company's affairs in the east, this impregnability of the association, accused them justly "of having sold every monarch, prince, and state in India, broken every contract, and ruined every state who had trusted them." In 1749, the robberies of the Company began with the protection of the pretender of Tanjore, a fine province of the Carnatic. Under pretence of illegitimacy, the nabob of this district was driven out for the purpose of obtaining some cessions of territory, and then restored on making further concessions. The rapid progress of the Company in the art of extending their possessions, appears from their treaties with the Surrajah-Dowlah, the nabob of Bengal, whom they contrived to depose in 1757, when large and rich provinces were the reward of their faithless policy. The French, who in a similar manner had acquired considerable territorial possessions in the Carnatic, now came into collision with the British merchants, and a hot war was carried on in India between these contending Europeans. The indecency of this conflict as to which party should be the greatest robber, seems to have shamed both France and England, and commissioners were mutually sent to India to reconcile the differences which existed, as well as to check the acquisition of territory either by the English or French companies. As a matter of course, this affectation of justice ended in nothing. After the commissioners had agreed that each should restore its acquired territories, and after a "solemn" treaty to that effect had been arranged, hostilities commenced as before. It would be needless to recount the particulars of this struggle for power; it will suffice to state, that the French ultimately were deprived by the British of their possessions.

OVERTHROW OF THE MOGUL EMPIRE.

By the defeat of the French forces in 1761, the British were left at liberty to pursue their schemes on India, being in no small degree favoured by the unhappy political condition of the Mogul empire. This large empire came under the rule of Aurungzebe, a descendant of Akbar, in 1658, and his reign lasted till his death in 1707. Under this celebrated Mahommedan emperor, the empire of the Moguls came to the height of its glory, and attained its largest extent. After Aurungzebe had added to it the kingdoms of the Deccan, it included nearly the whole peninsula of Hindostan, with the neighbouring regions of Cabul and Assam. The revenues extorted from this populous and wealthy territory amounted to L.32,000,000 sterling. During the reign of Aurungzebe, it was attacked by the Persians under the bold prince Nadir, and also by a growing nation, called Mahrattas, whose kingdom comprehended large portions of the provinces of Malwa, Candeish, Aurungabad, and Bejapore, in the Deccan. By Nadir, and his successor Ahmed Abdalla, the Mogul empire, after the death of Aurungzebe, was almost entirely subverted to the character of a tributary to the Persians. Under these circumstances there was scarcely a native power that did not consider itself entitled to trample on the feeble authority of the throne of the Mogul; and between the Afghans, whose kingdom lay to the north-west, and the Mahrattas, the empire was distracted, and made the object of greedy contest. The Afghans were at length victorious over their enemy; and in 1753 they placed a descendant of the old dynasty on the throne, and in the possession of the empty but still venerated title of Great Mogul, to be the tool or captive of the first daring power which should seize the capital.

HYDER ALI AND TIPPOO.

From this period the dignity of the empire was at an end, and a favourable opportunity was offered to the various dependent princes to throw off their allegiance, as well as to enterprising chiefs to take advantage of the unsettled state of things, and establish new kingdoms for themselves. In this state of general revolution, a bold Mahommedan adventurer arose from an obscure rank, named Hyder Ali, who, by summoning round him bold and predatory bands, and waging war with considerable address, established his power as a sovereign in the Mysore—a territory forming one of the most remarkable of those elevated table-lands that diversify the southern provinces. Hyder was succeeded in 1782 by his son Tippoo, a person equally bold, though less prudent and fortunate. Against both these powerful rulers the British for a number of years waged war with various success. In 1792, Seringapatam, the capital of the Mysore, was besieged by the Marquis Cornwallis, with a strong British army, and after some show of resistance, Tippoo was fain to offer terms of surrender. He agreed to give up half of his dominions, and pay L.3,560,000 in bullion. For the fulfilment of the treaty he was under the necessity of giving up two of his sons as hostages. Having fulfilled his engagement, these young princes were returned in 1794; but after this he again commenced hostilities, and in 1799 the British forces, under General Baird, once more attacked and now captured Seringapatam. In the general slaughter which occurred in entering this strongly-fortified place, Tippoo was shot, and his body was afterwards found among a heap of the slain. Thus terminated a dynasty which, though short, and limited in respect of territorial dominion, was undoubtedly the most vigorous and best organised of any that had sprung out of the wreck of the Mogul empire. The principal war in which the East India Company was engaged after this successful contest, was that with the Pindarees, roving tribes of Mahrattas, who, without any territory, carried on predatory warfare against all whom they could rob with impunity. The war with the Pindarees was one of great difficulty, and it cost the British a number of years before they finally quelled them. The Pindaree war terminated in 1817, and it was followed by a contest betwixt the British and the Birman empire, which was successfully closed in 1826, and by which the Company gained a considerable territory along the Bay of Bengal, east of Brahmaputra river. By the foregoing, and other less conspicuous contests with native princes, among which may be reckoned the war against the Nepaul, in 1814, and also by means of purchases, negociations, and voluntary or involuntary renditions of territory, including the capture or cession by treaty of the French and Dutch settlements, the British power was at length established as supreme over nearly the whole of India.

EXTENT AND POPULATION OF INDIA.

The following has been given by the best authorities as an estimate of the extent and population of the territories now included in British India:—

	Square Miles.	Population.
Presidency of Bengal,	220,312	69,710,071
Districts, the population of which is doubtful,	85,700	...
Madras,	141,923¼	13,508,535
Bombay,	59,438½	6,251,546
Districts, the population of which is doubtful,	5,550	...
	512,923¾	89,470,152

The population of the above doubtful districts is probably not large, so that the whole will not much exceed ninety millions. The territory of the allied or protected, that is, the subject states, is estimated at 614,610 square miles; their population, however, is not supposed nearly equal to that of the territories under the immediate government of the Company. Mr Hamilton, in the second edition of his East India Gazetteer, estimates it as follows:—

The Nizam,	10,000,000
The Nagpoor Rajah,	3,000,000
The King of Oude,	3,000,000
The Guickwar.	2,000,000
The Satara Rajah,	1,500,000
The Mysore Rajah,	3,000,000
Travancore and Cochin,	1,000,000
Kotah, Boondee, and Bopaul,	1,500,000
Rajpoot and other petty states,	15,000,000
	40,000,000

The same author makes the following conjecture as to the states that still remain independent:—

Sindia,	4,000,000
Lahore, Rajah Runjeet Singh,	3,000,000
Sind,	1,000,000
Nepaul,	2,000,000
Cashmere and other districts belonging to the King of Cabul,	1,000,000
	11,000,000

This would give for the whole of India a population of upwards of 140 millions; but in the foregoing estimate, notice is not taken of the portion of India beyond the Ganges, including part of the Burmese territory, having, according to Mr Hamilton, an extent of 77,000 square miles, and a population of 301,000.

GOVERNMENT OF INDIA.

Hitherto the Company have governed their Indian territories by means of the presidencies of Calcutta, Madras, and Bombay, each of these places being the head-quarters of a local military and civil government. In future there will be another presidency, that of Agra, a place of note in the interior. The whole are under the supreme control of a governor-general appointed by the British court; these governors-general seldom retain their situations above a few years, there having been no fewer than nine from the year 1798 till the appointment of Lord Bentinck in 1828. Mr Pitt, in 1784, passed an act establishing a Board of Control, composed of six privy councillors, to superintend the territorial concerns of the Company, which check is still continued, and reappointed under the act of 1833. To retain possession of so large a territory as India, the Company require to keep up a numerous and well-appointed armed force, which is composed chiefly of natives or sepoys, with British officers, and partly of troops raised in Great Britain. The Company further employ a number of king's regiments, who have double pay allowed them. Mr Hamilton gives the following statement of the amount of the forces employed:—

Artillery,	15,782
Native cavalry,	26,094
——— infantry,	234,412
Engineers,	4,575
King's troops,	21,934
Total,	302,797

Of these the irregulars of all descriptions amounted to 82,937 men. This formidable army of native and European soldiers is distributed throughout Hindostan, at appointed stations, forming a chain of military posts, and keeping up a continual communication with the seats of the various presidencies.

The relations which subsist betwixt the Company and the tributary and dependent states may thus be described:—The Company undertake the defence of the dependent prince's territories against all enemies, domestic or foreign. He is bound, on the other hand, to enter into no alliances with other sovereigns or states without the Company's consent; and he pays them a certain annual subsidy out of his revenues for their protection, while he generally keeps up an army at the same time for the maintenance of internal tranquillity. In some cases, instead of paying a subsidy, the prince cedes a portion of his territories, of which the Company draw the entire taxes. The Company keep a resident at the prince's court, who is entitled to demand an audience at any time; and by this agent, the Company do in fact interfere pretty regularly in the internal concerns of the state, particularly in settling the succession to the throne. The princes are in reality mere viceroys, or rather tax-collectors for the Company; and when in any state gross mismanagement or breach of engagement repeatedly occurs, these pageants are dethroned and pensioned off, and the Company take the government of the country into their own hands. The Company's protection is often found to shelter internal misgovernment; for the prince being secured by the British army against the resentment of his own subjects, is tempted to indulge the more freely in extortion and oppression.

REVENUE SYSTEM OF INDIA.

To sustain not only the above military force, but the civil management of India, a revenue of L.22,000,000 requires to be levied. About two-thirds of this large sum is derived from a tax on land; and as the mode of collecting, imposing, and administering it, enters deeply into the system of Indian policy, and has a powerful influence on the social condition of the people, we shall here attempt its explanation.

Under the old Mogul empire, the sovereign was considered the universal proprietor of the soil; but the ryots, or cultivators, or actual owners, were held to have a perpetual right of occupancy, so long as they paid the fixed annual tribute or rent demanded by the sovereign. The rent was fixed at a third, and sometimes at a half, of the value of the produce, and the functionaries appointed to ascertain the amount leviable and to collect it, were called zemindars. In 1793, Lord Cornwallis, governor-general, with a view to establish a better system for all parties, changed the zemindars from the character of hereditary tax-collectors, to that of proprietors of the soil, though still accountable to government for the rent. This created a vast deal of misery at the time; thousands of poor ryots were ejected from their ancient possessions; but ultimately the country at large was benefited. It was arranged that the sum payable by the ryot for several years, should be fixed as the permanent rent; one-tenth of this was allowed as the zemindar's share, and the other nine-tenths the proportion payable to the government or Company. The rent paid to the Company being fixed, great quantities of land which had been "concealed," that is, left out of the rough and partial returns formerly made, and which had lain in a wild state, or in pasture, were now put under crop. The practice is, to allow the ryot to occupy waste lands rent-free, for three years, and to charge only a moderate rent for a few years more. In this way a considerable extension of cultivation has taken place; and some of the zemindars acquired wealth. From their improvident habits, however, such wealth seldom lasts more than one generation; and no progress has been made towards the institution of a rural aristocracy. The Company have begun very recently to retrace their steps. When zemindaries fall into their hands, as they are always doing from time to time, by the inability of the holders to fulfil their engagements, the Company replace the ryots as nearly as they are able in their original situation, allowing them to hold their lands under payment of a rent which remains fixed, either permanently, or for a period of years. The Company in this case come in the room of the zemindar, and collect the rents in detail from the ryots by their agents.

This system of "zemindary settlement" prevails generally in Bengal, Bahar, Orissa, and Benares. It has also been tried on a small scale in the Madras presidency, but with very bad success; but in a modified form it has long existed in some parts of Southern India, where hereditary chiefs, called polygars, occupy a similar situation to that of the zemindars in Bengal.

There are other two modes of collecting the rent or land-tax (for it may receive either name); the *Ryotwar*, and the *Mouzawar*.

The ryotwar was first extensively introduced by the late excellent Sir Thomas Munro, when governor of Madras, in 1802. In this system, the government collects the rent directly from the ryots, without the intervention of zemindars. An actual survey was made with great labour and expense, of the lands of the villages in which it was attempted to fix the extent and value not merely of every occupancy, but of every field. The records showed the whole sum which the village had paid in former years; and from this, with the opinions of practised assessors, checked and guided by the advice of the village potail and curnum (the headman and accountant), an estimate was formed of the gross produce, forty-five per cent. of which was assumed as the rent. The sum thus ascertained was fixed as the maximum which the tenant should be called on to pay. The rent is taken from the ryots in monthly payments, and very summary means are used to extort it. The system was extremely unpopular at its introduction, and occasioned great distress; but this was attributed to the excessive amount of the tax, rather than to defects in its imposition. The reader should be told, that the perquisites of the potail, curnum, brahmin, astrologer, schoolmaster, and a long train of other village functionaries, are supposed to absorb ten per cent. of the ryot's crop, so that the forty-five per cent., which government took in a good year, was, and was meant to be, one-half of the clear produce after this deduction was made. In consequence of the outcry against the tax, considerable abatements were made; and the *ryotwar* system remains in operation in a part of Madras presidency at this time, with, we believe, comparatively few complaints.

Village Settlements.

The third system is the *Mouzawar*, or "village settlement." A village in India does not mean a collection of houses at a particular spot, but corresponds to what is called a township in America. "It is a tract of country (says Mr Hamilton) comprising some thousands of acres of arable and waste land; politically viewed, it resembles a corporation or township. Its proper establishment of officers and servants consists of the following descriptions:—The potail, or head inhabitant, who has the general superintendence of the affairs of the village, settles the disputes of the inhabitants, attends to the police, and performs the important duty of collecting the revenues within his village—a duty which his personal influence, and minute acquaintance with the situation and concerns of the people, renders him best qualified to discharge. The curnum, who keeps the accounts of cultivation, and registers every thing connected with it. The tallier (constable), or totie (watchman); the duty of the former appearing to consist in gaining information of crimes and offences, and in escorting and protecting persons travelling from one village to another; the province of the latter appearing to be more immediately confined to the village, consisting, among other duties, in guarding the crops, and assisting in measuring them. The boundary man, who preserves the limits of the village, or gives evidence concerning them in cases of dispute. The superintendant of the tanks and watercourses, who distributes the water therefrom for the purposes of agriculture. The brahmin, who performs the village worship. The schoolmaster, who is seen teaching the children in the villages to read and write in the sand. The calendar brahmin, or astrologer, who proclaims the lucky or unpropitious periods for sowing and threshing. The smith and carpenter, who manufacture the implements of agriculture, and build the dwelling of the ryot. The potman, or potter. The fisherman. The barber. The cowkeeper, who looks after the cattle. The doctor. The dancing girl, who attends at rejoicings. The musician and the poet. These officers and servants generally constitute the establishment of a village; but in some parts of the country, it is of less extent, some of the duties and functions above described being united in the same person; in others, it exceeds the number of individuals which have been described. Under this simple form of municipal government, the inhabitants of the country have lived from time immemorial. The boundaries of the villages have been but seldom altered; and though the villages themselves have been sometimes injured, and even desolated, by war, famine, or disease, the same name, the same limits, and even the same families, have continued for ages. The inhabitants give themselves no trouble about the breaking up and division of kingdoms; while the village remains entire, they care not to what power it is transferred, or to what sovereign it devolves; its internal economy remains unchanged; the potail is still the head inhabitant, and still acts as the petty judge and magistrate, and collector, or renter, of the village."

It will be understood that under the zemindary settlement, the government transacts with one individual for an extensive district, probably as large as a county; under the mouzawar or village settlement, it transacts with the chief person of the village for the whole community; and, under the ryotwar settlement, it transacts with each individual cultivator. It may be proper to add, that in India a ryot seldom holds more land than he and his family are able to cultivate, and that there are few farm servants in our sense of the word.

Of the three modes of settlement, it may be stated that the zemindary plan has yielded the largest revenue; the method of "village settlement" does not cause much more trouble to the government, and is better liked by the cultivators; the ryotwar is the most expensive and troublesome, and has been the least productive of revenue; but it would be the most equitable and most advantageous to the people, if the ends of justice were not defeated by the frauds of the native officers entrusted with its details, and whose corruption is almost universal.

The revenue derivable from land by these various processes of exaction, amounts, as has been said, to two-thirds of the whole revenue of the Company, or the sum of L.14,000,000. The next greatest head of revenue is the receipt from native princes, or from ceded and conquered countries, and which averages in amount from L.7,000,000 to L.8,000,000.

The Company have hitherto gained a million sterling per annum by the monopoly of opium. They have offered a price annually, which has been fixed at the lowest rate that will remunerate the producer; and ryots, whose lands have been suited to the cultivation, entered into engagements to deliver certain quantities. About two-thirds of the opium is sold in China, into which empire it is regularly smuggled; and one-third is sent to the eastern isles, Java, Sumatra, &c. Salt has also been an article of valuable taxation. It has been manufactured on the coast of the Bay of Bengal exclusively for the Company. Before it reaches the consumer, its price is enhanced five, eight, or ten fold. The Company have realised a gross revenue of two millions per annum from this monopoly.

The customs drawn by the Company consist partly of taxes collected at the seaports on foreign goods brought in, and partly of *transit* duties levied on goods passing through the country. There are provincial duties paid in passing from one presidency to another; town duties on certain articles at the gates of towns; and market duties levied at the market stations where fairs are held. To collect these taxes, and guard against contraband trade, there are customhouses, called *Chokies*, at every considerable village. In the single district of Madura, with a million of souls, in Madras presidency, there are twenty-one customhouses, each of which has four or five subordinate establishments; and at these stations, even when no duties are exigible, fees are charged by the native officers for the trouble of examination, and a good deal of delay is caused in the transmission of merchandise. These taxes are sources of annoyance and occasional extortion to the trading classes. They produce a gross sum of L.1,800 000, which is reduced to L.1,600,000 by the charges of collection, &c. We believe that a considerable portion of the revenue derived from these duties on traffic is laid out by the Company in the construction of roads and bridges, where improvements of this kind are most wanted.

Territorial Revenue of India, for the year 1829-30.

Mints	36,483
Post office	132,565
Stamps	424,692
Judicial (fees)	114,670
Land revenue	14,314 660
Customs	1,837,127
Ceded territory	569,676
Burmese cessions	103,240
Salt	2,421,619
Opium	1,757,400
Marine	61,769
Ava indemnification	92,220
Bhurtpore	34,800
Subsidies	392,355
Bank profits	8,640
	L.22,301,646
Deduct amount calculated to be over-estimated in the receipt from land revenues at Bombay	247,600
Total revenues	L.22,054,416

DEBT AND ASSETS OF THE COMPANY.

The expenditure of the Company, on its military, political, and civil establishments, has ever, on an average, been greater than the revenue. It appears, by the official account made by the auditor-general of the East India Company (Melville), "that the gross territorial revenue, during the fourteen years ending in 1829, amounted to L.284,804,085; but the gross charges during the same period amounted to L.304,188,859, exhibiting a deficit of L.19 384 774. The circumstance of the expenditure being generally greater than the revenue, has produced the natural result of a considerable debt. However, this debt of the Company is small in proportion to their resources, the value of their possessions, and the large subsidies received from the tributary princes. What is termed the territorial debt exceeds L.39,000,000, the floating debt L.7,000,000; both together, in 1828, to L.47,506,558; the commercial debt was exceedingly small, only amounting to L.167,443; the grand total of the debts being L.47,672,001. To meet this amount of debt, the Company at the same time possessed assets to the amount of L.25,955,111; thus leaving L.21,716,890 as the total amount of debt unprovided for. Considering the enormous outlay in the progress of conquering such a vast territory as India, and considering the manner in which the affairs of the Company have been conducted, and other circumstances, it will appear remarkable that the deficiency of funds is so exceedingly small.

ACT OF PARLIAMENT OF 1833.

As may be generally known, an act of Parliament was passed in the year 1813, permitting the free trading of British subjects with India, reserving the commerce of China to the Company; the territorial and commercial branches were separated, as well as all accounts connected with them; and the king was empowered to create a bishop of India, and three archdeacons, to be paid by the Company. This act, which was in force till the 22d day of April 1834, did not afford perfect freedom of trade to India, yet it led towards that desirable result, and greatly increased the commerce with the East. By the act 3. 4. Gul. IV. cap. 85, passed in August 1833, entitled "An act for effecting an arrangement with the East India Company, and for the better government of his majesty's Indian territories, till the 30th day of April 1854," the Company were deprived of the exclusive right of trading with China, and ordained to close the whole of their commercial business, and make sale of their merchandise, stores, and effects, so far as regarded commercial assets. It was further ordained, that the whole debts of the Company should be chargeable upon the revenues of their Indian territories, but leaving a yearly dividend of ten per cent. to be retained by the Company. This dividend to be redeemable by Parliament. The Company to pay into the Bank of England two millions annually, till the sum of twelve millions is accumulated as a security fund to the government. The other principal provisions were—A board of commissioners, to be appointed by the king, to superintend affairs of India; Bengal presidency to be divided into two presidencies—Fort William (Calcutta) and Agra; the whole government, civil and military, of India, to be vested in a governor-general and councillors.

The 81st clause is in these terms:—"And be it enacted, that it shall be lawful for any natural born subjects of his majesty to proceed by sea to any port or place having a customhouse establishment within the said territories, and to reside thereat, or to proceed to, and reside in, or pass through, any part of such of the said territories as were under the government of the said Company on the 1st day of January 1800, and in any part of the countries ceded by the nabob of the Carnatic, of the province of Cattack, and of the settlements of Singapore and Malacca, without any licence whatever; provided that all subjects of his majesty, not natives of the said territories, shall, on their arrival in any port of the said territories, from any port or place not within the said territories, make known in writing their names, places of destination, and objects of pursuit in India, to the chief officer of the customs, or other officer authorised for that purpose, at such port or place as aforesaid." Clause 86 permits his majesty's natural born subjects to purchase lands in India: 87 enacts that no native of India, or natural born subject of his majesty, shall, by reason only of his religion, place of birth, descent, colour, be disabled from holding any place, office, or employment under the Company: 112 enacts that St Helena be placed under his majesty's government.

By this act, it will be perceived that several very important provisions are made for the benefit both of Hindostan and Great Britain. India is henceforth open to the settlement of British emigrants; trade may be carried on freely with either India or China; and Indo-Britons, Hindoos, or other natives, are now placed on a level as to political, military, or civil distinctions, with Englishmen. The multifarious advantages which must arise out of these and other provisions of the statute, need not be commented on. The act seems only a preliminary to the final and complete cession of India to the British government.

HINDOOS.

The bulk of the population of India is composed of Hindoos, the primitive inhabitants of the country, and forming one of the most ancient nations in the world. This race is distinguished for their humanity, gentleness, industry, and polished by letters and arts, at a time when most of their Asiatic neighbours were yet only in the first stages of civilisation. This remarkable people have preserved their national character for thousands of years, even under the dominion of foreigners, and have retained to the present day their language, their written characters, their local government, religion, manners, customs, and habits of life. The Hindoos are in general of a brownish-yellow complexion, but the higher and richer classes are almost as white as Europeans. They are somewhat above the middle height, well proportioned, and very flexible and dexterous. Temperance, frugality, hospitality, and obliging manners, are the favourable traits in their character; but they are now reproached with indolence and avarice. With proper discipline, they form excellent soldiers and faithful servants of the Company. They possess great natural talents, but are at present deprived of opportunities for their developement. They practise agriculture, breeding of cattle, fishing, hunting, and mining, and are largely engaged in manufactures, commerce, and navigation. They manufacture cloths of great variety and value, particularly cotton and silk, among which are the finest muslins and shawls, mats, cordovan leather, &c. and are inimitable in dyeing. In the arts of music and singing they are backward, but in dancing, statuary, and architecture, they are more advanced. They are acquainted with arithmetic, astronomy, and chronology, and are fond of poetry.

The most extraordinary peculiarity in the Hindoos is their divisions into *castes*, or perfectly distinct orders of society, which have existed from the remotest times. There are four castes, and it is strictly enjoined by the Hindoo religion that no transition from one to another shall take place; no connection between them by marriage or any other way is allowed, and no individual of one class can assume the habits or engage in the occupations of another. The distinction is complete in every sense, hereditary and personal; all the privileges or disabilities are inherited; no one is permitted to become what he is destined to be by his natural abilities, but is obliged to become only what his birth permits, or to remain what it condemns him to be. The slightest transgression of these laws is punished with loss of caste, and sometimes, in particular cases, with death. Even the difference of food is precisely marked out. The three higher castes are prohibited entirely the use of flesh; the fourth is allowed all kinds except beef; all others are outcasts, and may eat what they please. Thus, the lower the rank of the Hindoo, the less he is restricted in his meat and drink; but, on the other hand, the burdensome restrictions increase with the inferiority of rank.

The first, or most noble caste of the Hindoos, are denominated Brahmins; they are priests, scholars, teachers, lawyers, and state officers, and are required to be virtuous, learned, peaceable, just, and self-denying. The second order is the Kyetra, who are kings and warriors; and they are required to have a thirst for glory, to die rather than retreat, and to be generous to captives. They preserve the ancient name of rajaputs, by way of distinction, in their old hereditary dominions. The third order, which is called Bhyeya, or Vaisa, are husbandmen and merchants. The fourth caste is that of the Soodras, who are labourers, and they are enjoined to serve with patience and fidelity. A lower caste, if it can be called such, are the Parias—those unhappy beings who have lost their station in the noble orders, and who are obliged to do whatever no one else can do without pollution. They are not only reckoned unclean themselves, but they render unclean every thing they touch. They are deprived of all civil privileges, and stigmatised by particular laws, regulating their mode of life, their houses, and their furniture; they are not allowed to enter the temples of the other orders, but must worship by themselves. Their houses are miserable hovels, distant from cities and villages.

The Brahmins, who are not legitimately entitled to possess property, and who must live upon the bounty of others for their support, cherish in the people the most debasing superstitions, and exact from them the most profound veneration. Instead of being holy, harmless, and undefiled, they are vicious, tyrannical, avaricious, and to the last degree impure. This infamous aristocracy is the curse of India, and presents a barrier to the attempts which have been made to meliorate the condition of the inferior orders. We believe the Kyetra and Bhyeya castes are nearly extinct, and that the Hindoo nation is now composed principally of Brahmins and Soodras, with their subdivisions. These subdivisions are innumerable:—Every trade, every peculiar department of service, has its class, wherefore the retinue of servants to be kept is very large; for the man who carries in your water cannot wait at table, nor the man who cooks a dinner serve it up, nor the servant who waits at table sweep the room, and the same kind of classification goes on through all the pursuits of life. In a number of instances, Brahmins have become soldiers in the service of the East India Company, but without engaging in menial employments; and they still claim precedence even of kings, in point of etiquette. This rigorous classification of the Hindoos undoubtedly presents an obstacle to the advancement of Christianity, which, though hardly thought of by the British at home, is next to insurmountable, and will retard proselytism for an indefinite period. The Hindoo who becomes a Christian loses his caste by partaking of the Lord's Supper, and it therefore requires an extraordinary strength of mind to make a profession of faith in the Gospel; for by losing his caste in this or any other way, no one will speak to him, or touch him, or have any intercourse with him—his own wife and family will disown him—he becomes a Paria, a dog.

From recent investigations, it appears that the foregoing rigorous classification of the Hindoos is much less an obstacle to improvement in manners than was formerly supposed. It would seem that the classification is more theoretic than practical. The altered state of society has obliged members of the aristocratic castes to engage in divers employments or trades not permitted by their religion; but to accomplish this object, various subterfuges and self-deceptions are practised. Besides, there have arisen a prodigious variety of subdivisions by the intermixture of castes; and the employments allowed to these mixed or impure castes may be said to be every description of handicraft and occupation for which the wants of human society have created a demand. In point of fact, we are told by the best authority, that men of all castes may be seen working together in one handicraft employment. A kind of purity of caste is perhaps, nevertheless, kept up by the members of different castes not eating with each other, or not eating forbidden things. It is related that purity of caste is sustained by means of clubs or lodges scattered throughout Hindostan, and existing in considerable force in every large town; yet it seems that excommunication from these fraternities, is, upon the whole, unable to prevent the breaking down of ancient habits, or to subdue the disposition to imitate the English in the arts of civilised life. The Hindoo races are, indeed, described as now exceedingly anxious for improvement; and it is rational to expect, that, through the means of schools for education, and a conciliatory behaviour on the part of their British neighbours, they will attain no small degree of cultivation. On this subject, Bishop Heber—an authority on whom every dependence may be placed—makes the following statements in his work on India:—

"To say that the Hindoos or Mussulmans are deficient in any essential feature of a civilised people, is an assertion which I can scarcely suppose to be made by any who have lived with them; their manners are at least as pleasing and courteous as those in the corresponding stations of life among ourselves; their houses are larger, and, according to their wants and climate, to the full as convenient as ours; their architecture is at least as elegant; nor is it true that in the mechanic art they are inferior to the general run of European nations. Where they fall short of us (which is chiefly in agricultural implements, and the mechanics of common life), they are not, so far as I have understood of Italy and the south of France, surpassed in any degree by the people of those countries. Their goldsmiths and weavers produce as beautiful fabrics as our own; and it is so far from true that they are obstinately wedded to their old patterns, that they show an anxiety to imitate our models, and do imitate them very successfully. The ships built by native artists at Bombay are notoriously as good as any which sail from London or Liverpool.

In the schools which have been lately established in this part of the empire, of which there are at present nine established by the Church Missionary, and eleven by the Christian Knowledge Societies, some very unexpected facts have occurred. As all direct attempts to convert the children are disclaimed, the parents send them without scruple. But it is no less strange than true, that there is no objection made to the use of the Old and New Testament as a class-book; that so long as the teachers do not urge them to eat what will make them lose their caste, or to be baptised, or to curse their country's gods, they readily consent to every thing else: and not only Mussulmans, but Brahmins, stand by with perfect coolness, and listen sometimes with apparent interest and pleasure, while the scholars, by the road-side, are reading the stories of the creation and of Jesus Christ.

The different nations which I have seen in India (for it is a great mistake to suppose that all India is peopled by a single race, or that there is not as great a disparity between the inhabitants of Guzerat, Bengal, the Dooab, and the Deccan, both in language, manners, and physiognomy, as between any four nations in Europe), have of course, in a greater or less degree, the vices which must be expected to attend on arbitrary government, a demoralising and absurd religion, and (in all the independent states, and in some of the districts which are partially subject to the British) a laxity of law, and an almost universal prevalence of intestine feuds and habits of plunder. Their general character, however, has much which is extremely pleasing to me: they are brave, courteous, intelligent, and most eager after knowledge and improvement, with a remarkable talent for the sciences of geometry, astronomy, &c., as well as for the arts of painting and sculpture. In all these points they have had great difficulties to struggle with, both from the want of models, instruments, and elementary instruction; the indisposition, or rather the horror, entertained, till lately, by many among their European masters, for giving them instruction of any kind; and now from the real difficulty which exists of translating works of science into languages which have no corresponding terms."

RELIGION OF THE HINDOOS.

The religious belief of the Hindoos is called Brahminism, and is founded on a most extensive collection of sacred records, of which the Brahmins are allowed to be the sole expounders. "These sacred writings (says Mr Statham, in his 'Indian Recollections') are of two kinds—the Vedas and Shasters. The former may be termed their Scriptures, the latter expositions of them. Beass Muni (that is, Beass the Inspired), a prophet who lived in the reign of Judistheer, on the banks of the Jumna, near the present city of Delhi, collected all the detached pieces which form the Vedas, from all parts of India, and gave them their present form and arrangement. They are divided into four books, all written in the Sanscrit. The first book is called Rug Veda, which signifies the Science of Divination, concerning which it principally treats. The second is distinguished by the title of Sheham, which signifies Piety or Devotion, and this book treats of religious and moral duties. The third is the Judger Veda, which, as the word implies, includes the whole science of Religious Rites and Ceremonies. The fourth is denominated Obater Bah: in the Sanscrit, *obater* signifies the being or essence, and *bah*, good: this, literally interpreted, is the knowledge of the Good Being, and accordingly this book comprehends the whole science of theology and metaphysical philosophy.

The Vedas, as also the Shasters or commentaries, pretend to great antiquity; so much so, that many Europeans have been strangely staggered in their belief of the Mosaic chronology, by reading them. But it only requires a little consideration and research to discover a vein of imposition running through the whole of their details. They reckon the duration of the world by four ages, or jogues, extending altogether to about eight millions of years; but the fallacy of this reckoning has been fully exposed by astronomical observation.

The idea which their Shasters give of God is, that there is one supreme Being, whom they style Bhogabon or Esher, sometimes Khodah: proceeding from him, are three powers or deities, viz. Bruhmha, the Creator of all; Vishnu, the Preserver of all; and Seeb or Sheva, the Destroyer of all. Now, whilst the latter is worshipped by all, the former has scarcely any attention paid to his temples; and even Vishnu, the Preserver, has few votaries compared with the destroyer Seeb. Subordinate to these are 330,000,000 inferior gods and goddesses, each representing some peculiar virtue or vice. The Hindoos suppose that each of the three presiding powers oftentimes seeks to encroach upon the prerogative of his compeer, and thus are often quarrelling and seeking to subvert each other's arrangements."

One of their most superstitious practices consists in their worshipping or deifying the waters of the Ganges. This large and beautiful river extends from west to east across an extensive district in Hindostan Proper, and with its tributaries may be reached by a very large proportion of inhabitants in the most populous and productive part of India. The sacred ceremony of adoring the Ganges consists in the population crowding morning and evening to bathe in it, and quantities of the water are carried to all parts of India, and are sworn by in courts of justice. "At Allahabad (continues the above entertaining writer), where the streams of the Ganges and Jumna unite, the country for many miles round is considered sacred ground; and so great is the number of pilgrims who resort thither for bathing, that the vizier has received in one year half a lac of rupees for permission to enjoy the benefit of immersion in the sacred flood. Many are the lives sacrificed here annually. The persons who thus fall victims to their superstition are generally females, who come from all parts of the country to perform the tragic deed, and who show a firmness of purpose worthy a better cause. Several of them, accompanied by the priests, embark in a boat, and proceed to the spot where the streams unite, when each of the victims in succession descends from the boat to the river, with a large earthen pan fastened to her body, and is supported by a priest till she has filled the pan with water from the stream, when the priest lets go his hold, and she sinks to rise no more, amidst the applauses of the spectators, whilst the Brahmins enjoy the scene, and extol the fortitude of the last victim to her who is about to follow."

The cow is an animal held sacred among the Hindoos, and cow-dung is used in the temples and other places as a species of holy ointment. The lotus, a plant with tall luxuriant leaves, is likewise held in deep veneration. Some of the temples or pagodas of the Hindoos are of high antiquity and gigantic conception, majestic appearance and tasteful architecture. The entrance is always made in a huge pyramid, in a number of stories, which gradually grow narrower as they approach the top. Inside may be seen the cow lying down, a serpent, or some other object of adoration. Here sacrifices take place. One of the most extensive pagodas of India is that of Juggernaut, whose towers are seen at twenty miles' distance. Here, as at other places, there are processions of idol cars, large heavy ornamented structures, which are dragged along by the multitude amid the shouts of assembled thousands. As the wheels pass swiftly on, self-devoted victims rush forward, throw themselves before them, and are crushed to death, exulting in the hope of thus securing a passage to the celestial abodes. The practice of widows sacrificing themselves on the funeral pile of their husbands, is another horrid rite; but it has been suppressed in recent times by the British government.

Besides Brahminism, there are a variety of religious beliefs and sects in India, but all less or more founded on the most gross superstitions. Each possesses its own temples, images, and orders of priesthood. The Boodhists, previous to their violent expulsion by the Hindoos, were second in point of numbers, but their religion is now little practised in India, and is confined chiefly to Thibet, Birmah, Siam, and Ceylon.

INDIAN LANGUAGES.

There are, it is believed, four original languages in India, and of these there are some hundreds of dialects, differing less or more from each other and from the originals, and maintaining also a partial distinction from the introduction of Arabic, Persic, and other foreign words. While, however, each tribe has its own peculiar dialect, all use one language, the Sanscrit, in their sacred writings. The Sanscrit is a dead language, though probably once spoken; it is wonderfully perfect in its construction, and extremely copious. Its alphabet is called *Devanagari*, divine alphabet, because it is said to have had its origin from the gods, whose language it is: it consists of fifty letters, and has three genders. The next language in estimation is the Pracrit, which comprehends the various dialects used in common writing and social intercourse. The dialects of the Pracrit are spoken in Bengal, and include that which is called Hindostanee, the principal spoken tongue in India.

MAHOMMEDANS AND OTHER CLASSES.

According to Mr Hamilton, "the modern Mahommedans may with safety be estimated at one-seventh of the total population; and notwithstanding the subversion of their political predominance by a Christian power, their religion continues to expand. They are no longer, however, the sanguinary zealots who, eight hundred years ago, in the name of God and the prophet, spread desolation and slaughter among the unconverted Pagans. Open violence produced little effect on so patient a people; and although the Mahommedan subsequently lived for centuries intermixed with Hindoos, no radical change was produced in the manners or tenets of the latter; on the contrary, for almost a century past, the Mahommedans have evinced much deference to the prejudices of their Hindoo neighbours, and a strong predilection towards many of their ceremonies." The warlike portion of the Mahommedans having recently been dislodged by the British from the Mahratta courts, where they had found shelter, and they have been obliged to seek employment in inferior stations. The Mahommedans of India are more intelligent, and possess greater strength and courage than the Hindoos; but they are also more proud, jealous, revengeful, and rapacious, and their fidelity is much less relied on by the British government. In some districts the Mahommedan population is nearly as numerous as that of the Hindoos, and both seem to live in a state of mutual amity.

Besides the Hindoos and Mahommedans, there are various scattered tribes in India of a very different character from either, and often inhabiting mountainous tracts of country, and called Garrows, Monguls, Tartars, &c. Among the different races is found that of the Parsees or Persians, the ancient worshippers of fire, long since driven from their native country by the persecuting sword of the Arabs. Many of this people are opulent, and they take the lead in the commercial transactions of Bombay, Surat, and other north-western parts. Their general conduct is quiet, orderly, and respectable.

Notwithstanding what has been related of the strictness of the Hindoos regarding modes of living, they seem liable to fall in with European usages. In Calcutta, and other large towns, many of the wealthy natives imitate the British in their dress, household furniture, equipages, and style of living, and show a strong desire to mix in their social parties, to which, however, they rarely find access. The English take no pains to conciliate the friendship of the native tribes, however well behaved and intelligent they may be. "Of this foolish, surly, national pride (says Bishop Heber), I see but too many instances daily, and I am convinced it does us much harm in this country. We are not guilty of injustice, or wilful oppression, but we shut out the natives from our society, and a bullying, insolent manner is continually assumed in speaking to them." The exclusiveness of this species of hauteur is perhaps fully more remarkable with respect to that class of persons who have drawn their origin from the intercourse betwixt the English and natives. These Indo-British, as they are called, form a part of the population of Calcutta, and are a very interesting and increasing people. "Many of them (says Statham) are very opulent, and others can vie with the more cultivated of their European neighbours in literary attainments; notwithstanding this, there is a marked contempt shown them by Europeans generally. If a European lady should wed with an Indo-Briton, the doors of all the higher circles would be closed against her, however rich the man of her choice might be." This state of things will happily be modified by the provisions of the act of Parliament already narrated.

RURAL CHARACTERISTICS AND PRODUCTS.

In the large and fertile territory of Bengal, as well as in all other parts of India where the cultivation of the soil is pursued, the arts of the husbandman are, as may be expected, still on the rudest plan; and in every quarter there exists great room for improvement, which nothing could so well facilitate as the settlement of intelligent European families. In the inundated districts of Bengal, rice is the main crop which is raised, at least during the wet season; it grows to its greatest height while the lands are overflowed, and is frequently reaped by men in canoes, the ear only being cut off, and the stalk left. When the peasants go to market during the height of the flood, they take their families with them, lest the house should be washed off during their absence with the boats. Rice is the summer crop, requiring much heat and moisture; but during the cool dry season, from November to April, they sow and reap another harvest, consisting of wheat, barley, or different kinds of pulse: this is called the *dry crop*, because it is reared without flooding the lands; the rice being considered as the *wet crop*, for a contrary reason. There are, therefore, two seed-times and two harvests in this rich country. Besides these regular crops, many small grains are sown, which are limited to no particular season of the year, and which reward the industry of the Indian cultivator with a rich vegetation at all times.

INDIGO.

Besides the different kinds of grain, the farmers of Bengal raise a number of other products, of great value. Of these, one of the principal is indigo; this is a small plant, shrubby in its growth, but in its leaves and flowers very much like the common tares of this country; it is sown during the rains, and raised in rows or drills. The leaves only are useful, on which account it is cut repeatedly, without being allowed to flower, which would make it drier and less juicy. The leaves are steeped and beaten in a vat among water; after which, the liquid is strained through cloths, and set to evaporate in shallow troughs placed in the shade. This is soon effected in that warm dry climate; and the indigo is then found deposited in a crust at the bottom. The process requires much preparation and expense; and it has only succeeded well since the country has enjoyed peace, and there has been a prospect of employing large capitals with security. It now produces, however, a large return to the cultivators; and gives a new source of wealth to the country. It is cultivated along the whole course of the Ganges up to Delhi, and is an annual in the lower, but a triennial in the upper provinces. It succeeds best on overflowed grounds, and in dry seasons is apt to fail. The number of factories of indigo in the Bengal presidency is estimated at 300 or 400. A few of them belong to natives; but they are chiefly in the hands of Englishmen, who take leases of ten or twenty thousand acres of land in the name of native servants (not being allowed to hold it in their own) from a zemindar, for the purpose. They encourage the ryots (native cultivators) to raise crops of the plant, by making advances to them in money. They purchase the produce at a price agreed on, and erect works for extracting the dye from the plant; the whole of the operations being generally conducted by native labourers, under native superintendants. It is observed that the establishment of such factories raises the value of land, extends cultivation, and spreads a certain degree of improvement in the villages. The importation of Bengal indigo into Britain began about forty years ago, and has since increased to an amazing extent. Mr Crawfurd calculates that about 9,000,000 lbs. are annually exported from Calcutta, of which 7,000,000 lbs. come to Britain, and the rest goes to America, France, Germany, Sweden, &c. About L.1,680,000, he thinks, are expended for rent and labour in its production, and it realises in Europe a sum of L.3,000,000. In the countries named, Bengal indigo is silently obtaining a preference over every other.

SILK.

Silk is raised in great quantities in Bengal and Orissa, between the latitudes of 22° and 26°, and it has hitherto been very nearly a monopoly in the hands of the Company. It is chiefly produced by the native Indian worm, which affords four crops, or sometimes six in the year: the Italian worm, which was introduced half a century ago, yields only one crop a-year, but of a finer quality. The Indian silk, compared with the best European varieties, is "foul, uneven, and wants staple;" but its cheapness has brought it into extensive consumption. The Company have eleven factories, or "filatures," which form the centres of "circles," within which the cultivation of silk is carried on, each having a certain number of subordinate stations. The silk, in the raw state, is purchased from the ryots at the factories or subfactories, wound off the cocoons, and prepared for transmission to Europe. About 1,800,000 lbs. are annually brought to England, of which a very small quantity (one per cent.) is equal to the finest silk; the mass of it is decidedly inferior. There is strong ground to conclude that, under the new act, the production of silk in India will be greatly increased, and its price in Great Britain lowered.

COTTON.

Cotton has long been cultivated by the natives in all the three presidencies. It is universally of the kind called "short staple," and being coarse in quality, and badly cleaned, it fetches only two-thirds of the price of American short staple in the British market. The best quality comes from Bombay (the Guzerat); the next from Madras; and the worst from Bengal. The cultivation being entirely in the hands of the natives, is rudely conducted; and, in particular, pains are not taken to renew the plant constantly from the seed, as the Americans do with the most advantageous results. Experiments have been made under the sanction of the Company, and by private individuals, to introduce and cultivate finer species than those in use, but they have generally been failures. There is no doubt, however, that by the introduction of European capital and skill, the quality of Indian cotton may be much improved, and what is raised, sent to the market in a much cleaner and better condition. The exports of cotton from India to all countries amounted in 1827 to 68,000,000 lbs., of which only a third part came to Great Britain.

SUGAR.

The cultivation of the sugar-cane is pursued with great success in Bengal and other parts of India, but chiefly by the natives for domestic use. The process of bruising the canes is on a rude plan, and the sugar which is produced is from this or some other cause very inferior to the sugar of the West Indies. In no article of produce is there greater room for improvement than in this. The cultivation of the cane requires great care and skill, and the mechanism for extracting and preparing the sugar can only be erected at a great outlay of capital. It is anticipated that when Europeans are permitted to hold lands freely, and to embark capital on sugar plantations, sugar of good quality may be manufactured much cheaper than in the West Indies, where the price of labour is much higher.

THE BAMBOO AND OTHER PRODUCTS.

The bamboo, a species of cane or reed, is much cultivated in Bengal. It grows to the amazing height of forty feet; and though it arrives at perfection in two years, it has all the firmness of the hardest timber. It has joints like a reed, or like grass, and is, like them, quite hollow; yet it is so strong that the porters of the country use it for suspending the heaviest burden between the shoulders of two men while they are carrying it from place to place. It is used for beams and uprights in building houses; and being protected from damp by a kind of natural varnish, it will last in such situations for a hundred years. It serves also for making bridges, for the masts of small boats, and for innumerable other purposes; yet of this useful material, one acre of land will yield ten times as much as the same space will produce of other wood. There is none of the productions of India which puts so many conveniences, in regard to furniture, houses, boats, &c., within reach of the poorer classes, as the bamboo.

It would require a large space to mention even the names of the plants useful to man, which flourish in the luxuriant soil of Bengal. Cotton, tobacco, the opium poppy, rape (which is cultivated for the sake of its oil), cucumbers, vegetable marrow (as one of the gourd tribe is called), and innumerable other plants, always afford a plentiful harvest. Of fruit-trees, there are the mango, which is something like our peach, the date-tree, the vassia, the guava, the pomegranate, and others which it would be idle to enumerate.

Another production, which is peculiar to warm climates, and which grows in high perfection along the sea-coasts, is the cocoa-palm. This tree would of itself be almost sufficient for the subsistence of mankind in the countries where it grows, so various and useful are its products; indeed, there are some populous islands—the Maldives and Laccadives—on the coast of India, where little else is cultivated. This exceedingly valuable product being already described at length in our Journal, it requires no farther notice in this place.

MODE OF LIVING.

Animal food being rejected by many classes of Hindoos, the breeding of cattle is therefore not a source of much profit to the farmer, neither are sheep reared in any numbers, their flesh not being in request, while the wool is coarse and low-priced. To those of the natives who eat animal food, the fish of their numerous rivers afford a plentiful resource, many of the kinds being of excellent quality, and in such abundance that the poorest of the people can have them in as large quantities as they wish.

This natural abundance of food makes subsistence cheap, but does not much elevate the situation of the common people, because their wages are lowered in the same proportion. The usual hire of a plough with its yoke of oxen is not more than fourpence per day, and a farm labourer may be had to work regularly for five shillings a-month. The facility of finding natural substitutes for things which in other countries require skill and labour, gives many of the conveniencies of life an appearance of rudeness and imperfection which to us appears altogether savage. Much of the food of the people, for instance, requires no cooking; plantains, cocoa-nuts, dates, pumpkins, &c. being more palatable raw than dressed. Houses are made of bamboo or cajann stakes, without splitting, planing, or dressing of any kind; they are then woven together with small twigs equally unprepared; the whole is plastered over with mud from the nearest clay-hole, and then thatched with cocoa-nut leaves fresh from the tree. Oars for their boats are only bamboos, with a round board tied to the end; the masts are two or three of the same bamboos lashed together with strings. Drinking cups are made of a large nutshell, with one end rubbed off on a stone; a most palatable and wholesome drink is found in the juice of the cocoa-nut palm, which is received into an earthen jar as it drops from the point of a broken branch; and its only preparation is straining through a kind of natural sieve, which is found at the roots of every leaf on the tree. The common people wear little or no clothing; and when it comes to rain, their only umbrella is formed of a number of palm-tree leaves sewed together by the edges into a shape resembling a cradle cut across, which covers their head and back. This rude fashion of trying to find every thing ready made to their hands having once got admission among their ideas, infects their whole proceedings; every thing, both in farming and manufacture, is done on the principle of exerting as little skill and labour as may be, and letting nature do the rest; they only scratch the ground instead of ploughing it; they never apply any manure; their corn is thrashed by setting bullocks to tread upon it; the smith's anvil is the nearest stone, his bellows a rough goat-skin; a shoemaker tans the raw hide one day, and makes shoes of it the next, sitting the whole time at the door of his customer; the weaver's apparatus needs but the shadow of a tree for shelter—and it can be removed at an hour's notice to any other tree which is more convenient. Even their distillery needs only an earthen kettle, some cold water, and a few bamboo reeds for a worm; and with these they produce liquors as intoxicating and pernicious as any manufactured by the science of Europe.

This absence of skill in all the processes of industry, renders the labour of the working man of very slight value: hence, he never receives more than what is barely necessary for subsistence; and the whole mass of the people are consequently at the lowest ebb in regard to domestic accommodations or mental acquirements. Their celebrated countryman, Rammohun Roy, who died lately in this country, believed that many of them did not know whether the British or the Mahommedans be now masters of India. As to their houses, however, though they are only miserable huts, we must recollect that the people in warm climates are very little within doors. In cold countries, a man's house is every thing to him; he sleeps, eats, works, and spends many of his happiest hours there with his family; in India this is all reversed; the climate is here so warm and steady, that no one remains under a roof except by necessity, in time of night or in time of rain. Hence, except to people of rank, or in easy circumstances, the appearance and accommodations of the interior of the house are a matter of secondary consideration; and would scarcely be cared for, were it not for the women and children.

In the accounts of all travellers in India, it is mentioned that there is no possibility of travelling in almost any part of the country in safety without a guard and retinue of servants. The roads, if they can be called such, are hardly-discernible tracks, quite unfitted for wheel-carriages, and travellers must therefore ride on horseback, or on the backs of elephants, or be carried in palanquins—a species of litter supported on men's shoulders. There being also no inns in India, each traveller is obliged to carry tents and provisions for daily use. Throughout the whole regions of Upper and Southern India, and in some parts of Central India, robbery and theft prevail to a great extent, and armed attendants are necessary for protection.

Slavery prevails in Bengal and some other parts of India, but neither to a great extent nor on a severe principle. The slaves are mostly used in domestic labour, and are generally treated with kindness, both by Hindoos and Mahommedans. Although the British government does not countenance slavery, it would be found almost impossible to extirpate it, either by law or admonition, for it originates in the sale of children by parents during famines, or under circumstances of peculiar calamity. Such is sometimes the distress of the parents that they will dispose of their offspring for the merest trifle, not from want of affection, but most likely with a view to the saving of their lives. Selling children into slavery, therefore, prevents infanticide, or, what is as bad, death by starvation; and so long as no fund exists to relieve the famishing natives during times of exigency, it does not seem possible to prevent the disposal of children by their parents, especially since the laws of the Hindoos permit the practice. We may, however, naturally expect that, with the advance of civilisation and habits of providence, slavery will here, as elsewhere, cease. At present, slaves in India are frequently liberated by their owners from motives of piety.

ANIMALS.

India possesses a variety of animals, both in the brute and bird creation, found in no other region. Among the brute tribes the most conspicuous is the elephant, which affords amusement in the hunting, and which is of great service, when tamed, in carrying persons on its back in an ornamental and commodious seat fitted up for the purpose. The tiger is found in the low marshy regions or jungles, and is also made the object of hunting; but this ferocious animal is now becoming of rare appearance, except in the remote parts of the country. India abounds in monkies, and has some peculiar races of dogs. When English-bred dogs are taken to the country, they speedily degenerate. In the forests, deer of different kinds, and a race of antelopes, prevail. There are also various descriptions of oxen, among which is the white or sacred bull and cow. There are many splendid specimens of birds, as shining creepers, the ring-necked paroquet, lories, cockatoos, parrots, and other highly-coloured feathered animals. There are likewise vultures, bustards, peacocks, and nearly all the game birds and poultry of Britain. India and its islands possess many dangerous reptiles, as crocodiles, lizards, and poisonous serpents or snakes, all of which are more or less found about rivers and marshes, and render bathing in the waters by no means safe. India has also many remarkable insect tribes, one of which, the kermes, produces a fine scarlet dye. Fish, of an immense number of varieties, abound in all the streams and waters, and are frequently of exceeding brilliancy in colour.

CLIMATE.

The climate of India, though in some high districts salubrious and pleasant, is, on the whole, ill suited to the constitutions of Europeans. There are three seasons—the rainy, cold, and hot: the rainy in general extends from June till October; the cold from November till February; the hot from March till May. During the rains the climate is unhealthy. The temperature of the atmosphere ranges during the hot months from 72° to 105°. At Calcutta, the temperature varies throughout the year from 69° to 89°, but is more commonly about 82°. At Bombay, the temperature is generally somewhat higher; and at Madras it is higher still, the Carnatic being a dry and hot region. This general hotness of India, and the insalubrious character of the rainy season, produces not only discomfort, but renders Europeans liable to fevers, diseases of the liver, and other complaints not common in this country. To accommodate invalids, the East India Company have fitted up sanitory stations at certain parts of the country on the higher grounds, where the air is cool and agreeable; but these places cannot always be depended on by the enfeebled functionaries of the Company, and visits to England are often necessary for the preservation of life. In consequence of the heat of the climate, Europeans amply provide themselves with light cotton garments, which are universally worn as undress.

EAST INDIA MONEY.

The circulating medium of India consists of gold and silver coins, paper money, and cowries. The most common silver currency is the new coinage of Calcutta. Potdars, or money-changers, are a common class in every town, and sit generally in the open air with heaps of cowries placed before them. Cowries are small shells, which, not being depreciable by imitation, form a good medium for buying and selling among the lower classes. Their value varies in different places. The following is their value in Calcutta:—4 cowries 1 gunda; 20 gundas 1 pon; 32 pons 1 current rupee, or two shillings sterling (2560 cowries); 10 current rupees 1 pound sterling. The sicca rupee is 16 per cent. less in value than the current rupee, which is an imaginary coin. The Bombay rupee is valued at 2s. 3d.; a pagoda is 8s.

CALCUTTA.

Calcutta, the British capital of India, is situated about 100 miles from the sea, on the east bank of the Hooghley, a branch of the Ganges, in latitude 22° 23′ N., longitude 88° 28′ E. The length of the town is about six miles along the bank of the river. When seen from the south, on which side it is built round two sides of a great open plain, with the Ganges on the west, it presents the view of a very noble city, with tall and stately houses ornamented with Grecian pillars and spacious verandas. The esplanade between the town and Fort William leaves a grand opening, along the border of which is placed the new and splendid government house, erected by the Marquis Wellesley. Fort William, which was commenced by Lord Clive, is the largest and strongest fortress in India, but is considered too extensive to be easily defended; its garrison usually consists of two European regiments, with artillery, besides a supply of native troops. The public buildings of Calcutta, besides the government house, are a town hall, a court of justice, two churches of the established religion, and one for the Scotch Presbyterian worship, which is a very handsome edifice. There are also several chapels for other religious bodies, mosques, and pagodas—the latter generally decayed and ruinous, the religion of the people being chiefly conspicuous in their worship of the Ganges. Behind the elegant front lines of houses is ranged the native town, deep, black, and dingy, with various crooked streets, huts of earth baked in the sun, or of twisted bamboos, interspersed here and there with ruinous brick bazaars, pools of dirty water, cocoa-trees, and little gardens, with some fine large dirty houses, the residences of wealthy natives. "Fill up this outline," says Bishop Heber, in his valuable Correspondence, "with a crowd of people in the street, beyond any thing to be seen even in London, some dressed in tawdry silks and brocades, more in white cotton garments, and most of all black and naked, except a scanty covering round the waist, besides figures of religious mendicants with no clothing but their long hair and beards in elf locks, their faces painted white or yellow, their beads in one ghastly lean hand, and the other stretched out like a bird's claw to receive donations; marriage processions, with the bride in a covered chair, and the bridegroom on horseback, so swathed round with garlands as hardly to be seen; tradesmen sitting on the ground in the midst of their different commodities, and old men, lookers on, perched naked as monkeys on the flat roofs of the houses; carts drawn by oxen, and driven by wild-looking men with thick sticks, so unmercifully used as to undeceive perfectly all our notion of Brahminical humanity; attendants with silver maces, pressing through the crowd before the carriage of some great man or other; no women seen except of the lowest class, and even these with heavy silver ornaments on their dusky arms and ancles; while coaches, covered up close with red cloth, are seen conveying the inmates of the neighbouring seraglios to take what is called 'the air;' a constant creaking of cart wheels, which are never greased in India, a constant clamour of voices, and an almost constant thumping and jingling of drums, cymbals, &c., in honour of their deities; and add to all this a villanous smell of garlic, rancid cocoa-nut oil, sour butter, and stagnant ditches, and you will understand the sounds, sights, and smells of what is called the 'Black Town' of Calcutta. The singularity of this spectacle is best and least offensively enjoyed on a noble quay which Lord Hastings built along the shore of the river, where the vessels of all forms and sizes, Arab, Indian, Malay, American, English, the crowds of Brahmins and other Hindoos washing and saying their prayers; the lighted tapers, which, towards sunset, they throw in, and the broad bright stream which sweeps them by, guiltless of their impiety and unconscious of their homage, afford a scene such as no European and few Asiatic cities can at all parallel in interest and singularity."

In recent times, considerable improvements have been made in and about Calcutta, jungles being cleared away, streets drained, and stagnant water removed. Though the situation of Calcutta has not been well chosen, it is excellently adapted for commerce. At high water the river is here a full mile in breadth. The advantages possessed for inland navigation are considerable; foreign imports may be transported with great facility, on the Ganges and its tributaries, to the north-western quarters of Hindostan, while the valuable productions of the interior are received by the same channels. There is at all times a vast quantity of merchandise deposited at Calcutta, and the trade carried on is now very extensive. Besides a government bank, there are three private banks, which circulate to a considerable amount. There are several daily, twice-a-week, and weekly newspapers published. The religious, and charitable, and educational institutions, are numerous and of great service. Society in Calcutta is gay and splendid, and the British inhabitants among their own class are described as hospitable, though zealous of etiquette, and of an overbearing disposition. There are no hotels, or inns, or lodging-houses of any description—a want which appears perfectly amazing—and all strangers, male or female, must be provided with introductions to the houses of residents. The expenses of living are very considerable; and as there are now no more opportunities of acquiring wealth by the spoliation of native principalities, fortunes are much seldomer realised than formerly. There being also now fewer deaths, there are fewer chances of promotion. According to Mr Hamilton, "Without being attached to some department of service, or trained up to some mechanical trade, there is little hope of prosperity to a young man migrating on chance from Europe. Here all the inferior situations of clerks, overseers, &c. are necessarily occupied by the natives, and it is by these gradations in Europe that young men rise to opulence in the commercial world." The population of Calcutta is composed of about 14,000 Christians, 45,000 Mahommedans, and 120,000 Hindoos; but this is the amount only within the city proper. If the environs or suburbs be included, the population will amount to perhaps 600,000; and so densely peopled is the surrounding district, that within the circuit of twenty miles there is a population of nearly two and a half millions.

Serampoor, a Danish settlement, about twelve miles above Calcutta, is the head-quarters of the missionaries sent from Europe, and here a printing-press has been established, from which bibles in a great variety of languages have been issued. The missionaries also here conduct a college for the education of native Christians, Hindoos, or Mahommedans. The enterprise and judicious exertions of the missionary body at this place cannot be sufficiently commended.

MADRAS.

Madras, the seat of government of Southern India, is situated in the Carnatic, on the shore of the Bay of Bengal, in lat. 13° 5 N., long. 80° 21′ E. The shore is here low and dangerous to approach by vessels. On the beach stands Fort St George, a place of considerable strength, and which may be easily defended by a small garrison. A noble range of public edifices, including a custom-house and court-house, also adorn what is called the north beach. Madras differs in appearance from Calcutta. It has properly no European town, the settlers residing in their houses in the midst of gardens, and transacting business in the district appropriated to the residence of the natives. The principal church in Madras, St George's, is a beautiful edifice. There are many excellent charities here; and the school for male and female orphans, into which the philanthropic Dr Bell introduced the Lancastrian system of education, is superior to any thing of the kind in Calcutta. The society of Madras is more limited than that of Calcutta, but the style of living is similar. The roads in the vicinity are excellent, and afford most agreeable drives to the European residents. According to Heber, "the native Christians are numerous and increasing, but are, unfortunately, a good deal divided about castes." The Armenians are here numerous, and some of them wealthy. A Scotch Presbyterian church is now erected. The population of Madras and its suburbs has been stated at upwards of 400,000.

BOMBAY.

Bombay, the seat of government for the western parts of India, is a small rocky island, lying on the west coast of Hindostan, in lat. 18° 56′ N., long. 72° 57′ E. Bombay was originally some hilly rocky islets, but these, by the influence of the high tides, have been joined to each other; and now the island is composed principally of two unequal ranges of whinstone rocks, extending from five to eight miles in length, and at the distance of about three miles from each other. All the ground that can be cultivated is now laid out in agriculture, and the remainder is either barren or covered with the residences of Europeans and natives. These residences are on wet, low, and unhealthy grounds, even below high-water mark; and from this and other circumstances, Bombay is described as being the most insalubrious of the presidencies. The fort of Bombay is situated at the south-eastern extremity of the island, on a narrow neck of land. The chief advantage of Bombay is its deep tide water, which permits the most extensive system of maritime trade; excellent docks are erected for the accommodation of the shipping. Bombay is the seat of very extensive trade with the Persian Gulf on the north, as well as with the south of India. Cotton is the principal article of export. The population is stated at about 160,000, composed of Christians, Jews, Mahommedans, Hindoos, and Parsees.

DELHI,

once the capital of the Mogul empire, and still the residence of the tributary and fictitious sovereign of India, is situated in 28° 41′ N. in the province to which it gives its name, and at the distance of 976 miles from Calcutta. This once magnificent city is said to have, in former times, covered a space of twenty square miles; in the present day an immense number of its ancient streets, houses, temples, and other edifices, are in ruins, and the modern town, removed at some distance from the old, occupies a space of seven miles in circumference. It is seated on a rocky range of hills, and is surrounded by walls, recently improved and strengthened by the British. The city contains many large and good houses, mostly built of brick. There are a great number of mosques, with high minarets and gilded domes, and above all are seen the palace of the emperors, a very high and extensive cluster of Gothic towers and battlements, and the Jumna Musjeed, the largest and handsomest place of Mahommedan worship in Hindostan. The chief material of these public buildings is red granite, of an agreeable colour, inlaid in some of the ornamental parts with white marble. One of the principal characteristics of Delhi is thus described by Bishop Heber:—"We passed in our way to the Agra gate, along a very broad but irregular street, with a channel of water, cased with stone, conducted along its middle. This is part of the celebrated aqueduct constructed, in the first instance, by Ali Merdan Khân, a Persian nobleman in the service of the Emperor Shahjehan, then long neglected during the troubles of India, and the decay of the Mogul power, and within these few years repaired by the English government. It is conducted from the Jumna, immediately on leaving its mountains, and while its stream is yet pure and wholesome, for a distance of about 120 miles, and is a noble work, giving fertility to a very large extent of country near its banks, and absolutely the sole source of vegetation to the gardens of Delhi, besides furnishing its inhabitants with almost the only drinkable water within their reach. When it was first re-opened by Sir Charles Metcalfe in 1820, the whole population of the city went out in jubilee to meet its stream, throwing flowers, ghee, &c. into the water, and calling down all manner of blessings on the British government, who have indeed gone far, by this measure, to redeem themselves from the weight of, I fear, a good deal of impolicy."

The British Resident at Delhi exercises a most extensive authority, from his having the exclusive charge of the emperor and his family, his taking cognisance of all political events in the north-west of India, and his superintendence of many ex-kings and chiefs. The office is therefore always filled by one of the ablest and most experienced of the public functionaries of the Company. The population of Delhi is now computed not to exceed 200,000.

AGRA,

the capital of the province of the same name, is commodiously situated on the south-west side of the river Jumna, in lat. 27° 11′ N. The greater part of this once flourishing city is now in ruins. In the habitable part, the houses are several stories in height, and the streets remarkably narrow. There is a large and ancient fort, surrounded with high walls and towers of red stone, which command some noble views of the city and its environs. The principal sights, according to Heber, are the Motee Musjeed, a beautiful mosque of white marble, carved with exquisite simplicity and elegance; and the palace built by Akbar, in a great degree of the same material, and containing some noble rooms, now sadly disfigured and destroyed by neglect. Agra has been in some measure renovated by the British; and when made the seat of a presidency, will most likely be still further improved.

BENARES

is an ancient and highly venerated city in Hindostan, situated in lat. 25° 30′ N., on an elevated piece of ground on the banks of the Ganges, about half-way betwixt Agra and Calcutta. The streets of this holy city are extremely narrow, and the houses, which rise to the height of six stories, are in some cases united by galleries. The number of stone and brick houses from one to six stories high exceeds 12,000, and the mud houses to about 16,000, besides garden houses. The number of inhabitants is estimated at upwards of 600,000, exclusive of a large body of temporary residents who come hither on religious purposes from all parts of India. Benares may be called the University town of the Hindoos, as their laws and religion are here taught by Brahmins and learned men in various establishments for the purpose.

PORTUGUESE SETTLEMENTS.

The possessions of the Portuguese in India are now confined to Goa, and a small territory round it; Damaun, a seaport in the province of Guzerat; Diu, a small island near the southern extremity of the Guzerat peninsula; Dhelli, on the island of Timor; also Macao, in China; and establishments on Sumbhawa, Floris, and some others of the Eastern Isles. Goa is the only place here worthy of notice. It is situated on the west coast of India, in the province of Bejapoor, in lat. 15° 30′ N., 250 miles south-east of Bombay. During the period of Portuguese dominion in India, this was their splendid and populous capital, the head-quarters of their tyranny, the seat of their Inquisition. It is now a wilderness, of which the monasteries form the only tenanted portion, and a few miserable monks, half of them natives, are the only inhabitants. "Indeed (says Mr Hamilton) the city may be traversed from one extremity to the other without meeting a human being, or any other signs of former population, than pavements overgrown with grass, gardens and court-yards choked with underwood, and princely dwellings and venerable abbies mouldering rapidly to decay." There are still several churches in preservation, also the building once occupied by the Inquisition, which has been shut up for many years. Panjim, or New Goa, is situated five miles nearer the entrance to the harbour of Goa, and is now the seat of the Portuguese authorities, and of the business carried on. The territory in the neighbourhood of Goa, forty miles in length, by twenty in breadth, forms the possession of the Portuguese, and it was estimated, in 1808, that within this tract there were two hundred churches and chapels, and above two thousand priests.

EAST INDIA TRADE.

Before the trade to India was opened to private merchants in 1813, it was asserted that the extreme poverty of the natives, and the immutability of their habits, rendered it chimerical to expect a more extended consumption of British goods in Hindostan. But this prediction has been triumphantly disproved by the event. The declared value of the exports to India has increased five-fold since that time; and when the fall of price is taken into account, it may be safely affirmed that the increase in quantity is at least *eight-fold!* The change has operated to the advantage of both countries. It has reduced the price of Indian goods in Britain, and of British goods in India; and in the latter, as a consequence, articles of English manufacture are now spreading to every village. Calcutta, which formerly sent L.2,000,000 worth of piece goods to London every year, now receives the same amount from it. Though the progress of our manufactures has superseded several Indian articles in the English market, and thus destroyed certain branches of trade, the imports have scarcely diminished; and when the internal commerce of India, which has hitherto been almost entirely in the hands of the Company, is rendered as free as the external, there is a moral certainty that the imports will experience a great increase. The following table, showing the exports in the first year of free trade, and in 1828 (exclusive of the trade to China), well illustrates the effects of the change:—

Exports to India.		1814.	1828.
Woollen cloths, . .	pieces	12,500	33,400
Spelter, . .	cwts.	None.	84,000
Jewellery, . .	value	L.13,500	L.50,900
Machinery, .	do.	L.6,000	L.103,000
Iron, cast and wrought	cwts.	33,400	83,000
Hardware, . .	value	L.20,800	L.78,700
Cotton twist and yarn,	lbs.	None.	4,558,000
Muslins, plain, .	yds.	130,000	7,950,000
Do. printed, . .	do.	7,200	28,000
Calicoes, plain, .	yds.	82,600	22,461,000
Do. printed and dyed,	do.	507,600	12,381,000
British cotton manufactures—aggregate	value	L.109,400	L.1,621,000

It will be seen that the export of white calicoes has increased in fourteen years from 82,000 yards to 22,000,000!

The following table shows that the increase of the exports is entirely due to the activity of the private traders:—

Exports to India.	1814.	1821.	1828.
By the Company,	L.826,000	L.887,000	L.488,000
By private traders,	1,048,000	2,838,000	3,970,000

The following were the leading articles of export to India (exclusive of China), in 1832, with their declared value:—

Cotton manufactures . .	L.1,531,000
Cotton twist and yarn . .	309,000
Woollen manufactures . .	237,000
Copper, wrought and unwrought	364,000
Iron, wrought and unwrought	144,000
Hardware and cutlery . .	82,000
Wines	150,000
Beer and ale	87,000
Glass	101,000
Stationery	50,000
Books	27,000
Linen manufactures . .	49,000
Jewellery	33,000
Silk manufactures . . .	125,000
Apparel	32,000

Each of the other articles is under L.30,000.

Total value of the articles exported L.3,750,000.

The leading articles of importation from India (exclusive of China) in 1832, were the following:—

Imports from India.

		Quantity.	Value at Company's sale prices.
Indigo . .	lbs.	6,211,000	L.1,242,000
Raw silk . .	do.	1,842,000	1,180,000
Cotton wool . .	do.	35,210,000	807,000
Saltpetre . .	cwts.	229,000	413,000
Coffee . . .	lbs.	10,381,000	284,000
Sugar, raw . .	cwts.	175,000	200,000
Dyed cotton .	pieces	227,000	136,000
White calicoes and muslins . .	do.	79,000	40,000
Rice, not in husk .	cwts.	171,000	128,000
Pepper . .	lbs.	4,630,000	70,000
Tortoise shell . .	do.	30,000	77,000

Each of the other articles is under L.45,000.

About one-sixth of the goods brought from India have been till now imported by the Company, and five-sixths by private traders.

India now lies open to the enterprise of British capitalists, merchants, and manufacturers; and, judging from the foregoing statements, there can be little doubt but this great and magnificent region, with its hundred millions of inhabitants, will henceforward, by judicious management, afford a boundless scope for profitable adventure. The great advantages to be derived from the opening up of India to European traffic and civilised usages, will doubtless prove as beneficial to the natives as to the British. Already the country feels itself bettered in every respect by its subjugation. In the words of Pabrar, in his valuable work on the Resources of the British Empire—"Looking at its grand results as affecting the happiness of the human race, it must be confessed that never has a conquest turned out more advantageous and beneficial. All the immense Indian territories have been concentrated in a powerful confederation; a large river, immense deserts, and lofty mountains, constitute the strongest barriers against foreign invasion by land; while an extensive seacoast, and the mighty maritime power of Britain, defend it by sea. A great power, a central government, wisely and humanely presided over, and commanding all this confederation—all this immense amalgamation of states, has put an end to all the conflicting elements, and to all the civil wars waged by numberless and cruel tyrants, perpetually contending for empire; rapacity, tyranny, plunder, massacre, and savage cruelty, have entirely ceased."

Now that Europeans may purchase and hold lands, it may be anticipated that British capital and skill will speedily be directed to the cultivation of sugar, coffee, tobacco, and particularly cotton, all which produce, from the extraordinary cheapness of labour, may be increased to an incalculable extent, and with the most enlivening prospect of profit. Hitherto the system of jurisprudence established by the Company has been a vain mixture of Hindoo, Mahommedan, and English law, and by no means been calculated to preserve public tranquillity. Should the government proceed to modify and extend the system of administering the laws, at the same time relaxing the burden of taxation on land, and endeavouring to conciliate the natives by promoting those worthy of trust, much good might be anticipated. By these and other measures, suited to the genius of the people, a solid basis would be afforded for the investment of capital, and India would gradually improve both in its moral and physical condition. With the advancement of commercial intercourse, we might further expect the breaking down of a number of prejudices among the natives, and at length their reception of the principles of our beneficent faith. What a field is here offered for the speculations of the Christian and philanthropist!

WORDS FREQUENTLY USED IN REFERENCE TO INDIA, NOT EXPLAINED IN THE FOREGOING SHEET.

Adawlet, a court of justice.—*Bega*, a land measure, amounting in Bengal to about the third of an acre.—*Bungalow*, a dwelling formed of wood, bamboo, mats, and other light materials.—*Chokeydar*, a watchman.—*Choultry*, a place for the accommodation of travellers.—*Circar*, a large division of country.—*Coolies*, labourers, or porters.—*Coss*, a measure of distance not less than a mile, nor more than two miles.—*Crore*, ten millions.—*Cutwal*, a chief police officer.—*Dacoits*, robbers.—*Dewan*, a head officer of finance.—*Dewanny*, the privilege of exacting taxes in perpetuity.—*Durbar*, a court of audience.—*Gentoo*, a Portuguese term, signifying a Gentile.—*Ghaut*, a chain of hills, or pass among mountains.—*Hakim*, a governor.—*Howdah*, the seat elevated on the back of an elephant.—*Killadar*, the commander of a fort.—*Lack*, one hundred thousand.—*Lascar*, a native sailor.—*Lootie*, a plunderer.—*Musnud*, a throne.—*Nabob*, or *Nawaub*, a viceroy governor under the Mogul empire.—*Nizam*, an arranger.—*Nullah*, a small stream.—*Paddy*, rice in the husk.—*Pagoda*, a word of Europeans for a Hindoo temple.—*Perwana*, a licence.—*Pergunnah*, a certain number of villages, or tract of country.—*Peshwa*, a leader.—*Pundit*, a learned Brahmin.—*Puggies*, searchers for thieves.—*Raja*, a king or prince.—*Rajpoots*, literally, the offspring of kings, now meaning persons of distinction.—*Soubah*, a district of twenty-two circars.—*Subahdar*, the governor or viceroy of a soubah.—*Thugs*, robbers of Upper India.—*Tiffin*, a lunch, or mid-day meal.—*Vakeel*, an agent or ambassador.*

* For the most accurate and complete account of India, we beg to refer our readers to the East India Gazetteer, by Hamilton, 2 vols. 8vo. Much useful information, for those intending to proceed to India, will be found in the volumes of the Edinburgh Cabinet Library, on British India. Bishop Heber's Narrative, in 3 vols. 8vo. is too well known for its interesting details of Indian localities and manners to require any recommendation here.

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CHAMBERS'S
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No. 35. PRICE 1½d.

THE ART OF PRINTING.

REPRESENTATION OF THE STEAM-PRESS WHICH PRINTS "CHAMBERS'S JOURNAL," "INFORMATION FOR THE PEOPLE," AND "HISTORICAL NEWSPAPER," AT EDINBURGH.

[See Description on the Sixth and Seventh Pages of this Sheet.]

A. The printing cylinder, which takes the first impression from the types.
B. The cylinder which prints the second side.
C and D. Two drums, over and under which the sheet passes in its progress from one cylinder to the other.
E. The second form of types, after having been *once* inked, and about to pass under the second cylinder to receive the impression. (The first form cannot be seen, being under the board *f* between the cylinders.)
F. The ink-ductor and trough. A similar complete inking apparatus is at the other end.
G. The feeding or vibrating roller.
H. Two distributing rollers, for spreading the ink over
I. The inking-table.
K. Three inking-rollers.
L. The heap of paper, from which
M. The feeding-boy takes the sheets to lay them on tapes ready to be pushed into the machine.
N. A sheet of paper on the second cylinder, after having been printed on the first side.
O. Another sheet of paper, printed on both sides, just delivered upon the fly-board *f*, from which a boy takes and places the sheet upon a table.
P. The heap of printed paper.
Q. The receiving drum.
R. The belt from the engine which gives motion to the machine.
S T. Two large wheels which turn the cylinders.
U. The wheel which gives motion to the drums.
a a b. The tapes which conduct the sheets through the machine.
c. Stretching pullies for retaining the tapes at the proper degree of tension. (The corresponding set at the other end cannot be seen.)
d e. Pullies which guide the tapes in the margins of the paper.
g h i k m. Light copper rollers, round which the tapes pass after they quit hold of the paper.

ORIGIN AND HISTORY OF PRINTING.

PRINTING is the art of producing impressions from characters or figures, moveable and immoveable, on paper, or any other substance. There are several distinct branches of this important art—as the printing of books with moveable types or stereotype plates, the printing of copper plates and wood engravings, and the taking impressions from stone, called lithography. Our present object, however, is only to describe the art of printing books or sheets with moveable types, generally called *letter-press printing*, and which may undoubtedly be esteemed the greatest of all human inventions.

The art of printing is of comparatively modern origin: four hundred years have not yet elapsed since the first book was issued from the press; yet we have proofs that the principles upon which it was ultimately developed, existed amongst the ancient Chaldean nations. Entire and undecayed bricks of the famed city and tower of Babylon have been found stamped with various symbolical figures and hieroglyphic characters. These exceedingly interesting efforts of art in early times might at first readily be supposed as intended merely as decorative and ornamental, were it not that other reliques exist to suggest the probability of their being designed for a more useful purpose—historical, or otherwise. Some of the latter are solid clay figures, generally of a cylindrical form, whose shape and size forbid the idea of their having been employed in architecture, either for use or ornament, and which are inscribed, or rather stamped, with written characters, no less minute than regular. One of these precious remnants of antiquity, supposed to be upwards of 4000 years old, is preserved in the library of Trinity College, Cambridge. It may be described as being about seven inches high, and three in diameter at each end, increasing gradually in circumference in the middle, so as to resemble a wine cask. The characters impressed upon it run between regular lines from end to end of the figure—the space betwixt the lines increasing in the centre, and, on the whole, bearing the closest resemblance to the staves of a modern cask or barrel. There are evident marks of this figure having been cast in a mould, particularly a small blank space, about a quarter of an inch wide, which intercepts the foresaid vertical lines in the middle, or centre of the figure, and runs round its whole circumference, and where perhaps the printing mould had not joined. This rare piece of ancient learning and art, with other similar reliques, was presented to the College by the recently deceased General Sir John Malcolm, and is, of course, most carefully preserved. It must here be noticed, that the meaning of the characters impressed on these figures has never yet been discovered, and it is more than probable never will. It has long been a subject of disputation among philologists, whether these unknown characters were hieroglyphic or alphabetical, but the general, and as we should think the most probable opinion, is, that they are of the former description.

These exceedingly rude attempts at printing, as well as those of a much later date, it is well ascertained, were all executed by single blocks, which stamped off a whole subject or piece at once, and which were termed *typi fixi*. It is clear, therefore, that engraving in wood preceded, or rather was the direct original of the art of typography; and even to this day do the Chinese print their books in this manner, their endless vocabulary (amounting, as is conjectured, to about *eighty thousand* characters), as well as the peculiar structure of their language, rendering it utterly impracticable either to print their books with moveable types, or even to cast the latter separately. Their method of printing is as follows:—The work intended for the press is transcribed carefully upon sheets of thin transparent paper; each of these sheets is glued, with the face downwards, upon a thin tablet of hard wood; and the engraver then, with proper instruments, cuts away the wood in all those parts on which nothing is traced; thus leaving the transcribed characters in *relief*, and ready for printing. In this way, as many tablets are necessary as there are written pages. No press is used; but when the ink is laid on, and the paper carefully placed above it, a brush is passed over with the proper quantity of pressure. Du Hald, in his "Description de l'Empire de la China," published in 1736, says, that one man can thus, without fatigue, print ten thousand sheets per day; but such a statement is altogether preposterous. The Chinese chronicles state that the above mode of printing was discovered in China about 50 years before the Christian era, and the art of paper-making about 140 years afterwards; previous to which period, all their writings were transcribed or printed in volumes of silk cut into leaves of proper dimensions.

It is a curious enough circumstance, that, amongst the first attempts at printing by means of wood-engraving which can be traced to have been made in Europe, was the making of playing-cards for the amusement of Charles VI. of France. This was towards the latter end of the fourteenth century. Thereafter came prints from wood-blocks of human figures, single or in groups; the earliest existing specimen of which is in the possession of Earl Spencer, and dated 1423. It is by an unknown artist. These prints were at first without any text, or letter-press, as it is modernly termed; but after the groundwork of the art had been completed, its rise towards perfection was almost unparalleled in rapidity. Its professors composed historical subjects with a text or explanation subjoined. The pages were placed in pairs facing each other; and as only one side of the leaf was impressed, the blank pages came also opposite one another; which, being pasted together, gave the whole the appearance of a book printed in the modern fashion.

DISCOVERY BY GUTTENBERG.

The next step in the science of typography was that of forming every letter or character throughout a work separately, so as to be capable of re-arrangement, and forming all the succession of pages in a work, thereby avoiding the interminable labour of cutting new blocks of types for every page. And here, we cannot help remarking, it is curious that an idea seemingly so natural and simple should not have occurred to the Romans, who were unquestionably the most ingenious and scientific nation in ancient times. What renders this the more surprising, is the fact, which we learn from Virgil, that brands, with the letters of the owner's name, were in use in his time for the purpose of marking cattle. The credit of the discovery, however, was reserved for a German, John Guttenberg, who accomplished this important improvement about the year 1438. As this man was the first great improver of typography, to the study of which he exclusively devoted his whole time and attention, a short sketch of his life will only be a part of the history of the art. John Guttenberg, who is supposed to have been born at Mayence, or Mentz, in the beginning of the fifteenth century, settled at Strasburgh about the year 1424. In 1435, he entered into partnership with Andrew Drozheanis (or Dritzehen), John Riff, and Andrew Heelman, citizens of Strasburgh, binding himself thereby to disclose certain important secrets connected with the art of printing, by which they would attain opulence. The workshop was in the house of Dritzehen, who dying shortly after the work was commenced, Guttenberg immediately sent his servant, Lawrence Bieldich, to Nicholas, the brother of the deceased, and requested that no person might be admitted into the workshop, lest the secret should be discovered, and the *forms* (or fastened-together types) stolen. But they had already disappeared; and this fraud, as well as the claims of Nicholas Dritzehên to succeed to his brother's share, produced a lawsuit among the surviving partners. Five witnesses were examined; and from the evidence of Beildich, Guttenberg's servant, it was incontrovertibly proved that Guttenberg was the first who practised the art of printing with moveable types, and that, on the death of Andrew Dritzehen, he had expressly ordered the forms to be broken up, and the characters dispersed, lest any one should discover his secret. The result of this lawsuit, which occurred in 1439, was a dissolution of partnership; and Guttenberg, after having exhausted his means in the effort, proceeded, in 1445-6, to his native city of Mentz, where he resumed his typographic labours. Being ambitious of making his extraordinary invention known, and of value to himself, but being at the same time deficient in the means, he opened his mind to a wealthy goldsmith and worker in precious metals, named John Fust or Faust, and prevailed on him to advance large sums of money in order to make further and more complete trials of the art. Guttenberg being thus associated with Fust, the first regular printing establishment was begun, and the business of printing carried on in a style corresponding to the infancy of the art. After many smaller essays in trying the capabilities of his press and moveable types, Guttenberg had the hardihood to attempt an edition of the Bible, which he succeeded in printing complete, between the years 1450 and 1455. This celebrated Bible, which was the first important specimen of the art of printing, and which, judging from what it has led to, we should certainly esteem as the most extraordinary and praiseworthy of human productions, was executed with cut-metal types, on six hundred and thirty-seven leaves; and, from a copy still in existence in the Royal Library of Berlin, some of them appear to have been printed on vellum. The work was printed in the Latin language.

The execution of this—the first printed Bible—which has justly conferred undying honours on the illustrious Guttenberg, was, most unfortunately, the immediate cause of his ruin. The expenses incident to carrying on a fatiguing and elaborate process of workmanship, for a period of five years, being much more considerable than what were originally contemplated by Fust, he instituted a suit against poor Guttenberg, who, in consequence of the decision against him, was obliged to pay interest, and also a part of the capital that had been advanced. This suit was followed by a dissolution of partnership; and the whole of Guttenberg's apparatus fell into the hands of John Fust, who, from being the ostensible agent in the business of printing, and from the wonder expressed by the vulgar in seeing printed sheets, soon acquired the name of a magician, or one in compact with the devil; and under this character, with the appellation of Dr Faustus, he has for ages enjoyed an evil notoriety.

Besides the above-mentioned Bible, some other specimens of the work of Guttenberg have been discovered to be in existence. One in particular, which is worthy of notice, was found some years ago among a bundle of old papers in the archives of Mayence. It is an almanack for the year 1457, which served as wrapper for a register of accounts that year. This, says Hansard, would most likely be printed towards the close of 1456, and may consequently be deemed the most ancient specimen of typographic printing extant, with a certain date. That Guttenberg was a person of refined taste in the execution of his works, is sufficiently obvious. Adopting a very ancient custom, common in the written copies of the Scriptures and the missals of the church, he used a large ornamental letter at the commencement of books and chapters, finely embellished, and surrounded with a variety of figures as in a frame. The initial letter of the first psalm thus forms a beautiful specimen of the art of printing in its early progress. It is richly ornamented with foliage, flowers, a bird, and a greyhound, and is still more beautiful from being printed in a pale blue colour, while the embellishments are red, and of a transparent appearance. What became of Guttenberg immediately after the unsuccessful termination of his lawsuit with Fust, is not well known. Like the illustrious discoverer of the great Western Continent, he seems to have retired almost broken-hearted from the world, and to have spent most of the remainder of his days in obscurity. It is ascertained, however, that in the year 1465 he received an annual pension from the Elector Adolphus, but that he only enjoyed this small compensation for his extraordinary invention a period of three years, and died in the month of February 1468.

IMPROVEMENT BY SCHŒFFER.

It long formed a subject of contention amongst antiquaries and bibliomaniacs, by what means Guttenberg formed his types, but it is now pretty clearly ascertained that they were at first all individually cut by the hand. The mode of *casting* types in moulds has been very generally, and seemingly correctly, assigned to Guttenberg's successor, Schœffer. This individual was an industrious young man of inventive genius, an apprentice with Faust, who took him into partnership immediately after his rupture with Guttenberg, and who is supposed to have been initiated into the mysteries of the art by the latter. The first joint publication of Faust and Schœffer was a beautiful edition of the Psalms, which came out only about eighteen months after their going into partnership. Along with it appeared a declaration by them, claiming the merit of inventing the cut-metal types with which it was printed; but this pretension was evidently false; and, in fact, it afterwards appeared that the book had been four years in the press, and must, consequently, have been chiefly executed by Guttenberg. It is worthy of notice that the above publication was the very first to which the date, printer's name, and place of publication, were affixed.

To Schœffer, however, as said before, must be awarded the honour of completing Guttenberg's invention, by discovering the method of casting the characters in a *matrix*. In an account of Schœffer, given by Jo. Frid. Faustus of Aschaffenburg, from papers preserved in his family, we are informed that the artist privately prepared matrices for the whole alphabet; and when he showed his master (Faust) the letters cast from them, he was so well pleased that he gave his daughter, Christina, to him in marriage. Faust and Schœffer concealed the new improvement, by administering an oath of secrecy to all whom they entrusted, till the year 1462, when, by the dispersion of their servants into different countries at the sacking of Mentz, by the Archbishop Adolphus, the invention was publicly divulged, and the art was spread throughout Europe.

EARLY PROGRESS OF PRINTING.

Haerlem and Strasburgh were the first places to which the art of printing was transplanted from Mentz, and this at so early a date, that each of these places have their respective advocates as being the birth-place of it. From Haerlem, it passed into Rome in 1466, where its first professors were Conrad Sweinheim and Arnold Pannartz, who introduced the present Roman type in the following year, in printing Cicero's *Epistolæ familiares*. The Gothic character, from which our own *black-letter* was derived, was the next which was employed by the ancient printers; after which came the Italic; and so early as 1476, the first set of Greek characters was cast by the Italians—whether at Venice, Milan, or Florence, is a disputed point. In 1488, however, all previous attempts at the Greek character were eclipsed by a splendid edition of Homer's works, published at the last-named place, in folio, and printed by Demetrius, a native of Crete. To the Italians, too, belongs the honour of printing the first editions in the Hebrew language, and that almost contemporaneous with the Greek, at Soncino, a small town in the duchy of Milan.

In 1467, printing was set up in the city of Tours; at Reuthlingen and Venice in 1469; and, it is believed, at the same time in Paris. This city was the tenth town in Europe in which a printing press was established; it was set up by Ulrich Gering, a native of the canton of Lucerne, in the house of the Sorbonne, and in the year 1469. This Gering had been taught the art by Elias Helie von Lauffen, who introduced it into Switzerland, and commenced the operations of the Lucerne press, by publishing Marchesini's Biblical Lexicon Mamotrectus sive Primicerius, in the year 1470. The first work which issued from Gering's press, at the Sorbonne, was the "Epistolæ Gasparini Pergamensis; it was also published in the year 1470. Gering continued his labours until 1508, and died on the 23d of August 1510, bequeathing very considerable property for the benefit of young scholars and the poor of Paris. Strasburg was the next town which had the advantage of a press, and soon afterwards Lyons—the one in 1471, the other in 1473. In 1490, the art reached Constantinople; and here it may be remarked, in passing, that nothing can be more characteristic of the slothfulness and barbarous ignorance for which the Turkish nation enjoys so unenviable a pre-eminence, or rather, what may perhaps be alleged as the cause of such national degradation, is, that the art of printing has hitherto been most sedulously discouraged. It was introduced into Russia about the year 1560.

INTRODUCTION INTO ENGLAND.

Concerning the period and mode of introduction of the art of printing into England, little is known, but it is certain that it took place not long after its invention at Mentz. By many it is believed and affirmed to have been some time in the decade of 1450, during the reign of the unfortunate Henry VI. Another account—and that which had passed current with our historians and the world at large until the Restoration—assigned the credit of introducing it to a Mr William Caxton, a mercer and citizen of London, who, during his travels abroad, and his residence for many years in Holland, Flanders, and Germany, had thoroughly informed himself of the process, and upon his return, was induced, by the encouragement of many men of wealth and rank, to set up a press in Westminster Abbey, about the year 1471. Such was the tradition of our writers, till a little book, which had scarcely been before observed until the before-mentioned period (the Restoration), was taken notice of by the curious, with the date of its impression at Oxford, anno 1468. This book, copies of which are yet extant, is a small quarto of forty-one leaves, entitled "Expositio Sancti Jeronimi in Symbolum Apostolorum ad Papam Laurentium." At the same time (1664), a work was published by a Mr Atkins of London, entitled "Original and Growth of Printing in England;" in which an account is given of an ancient chronicle, said to have been found in the archbishop's palace at Lambeth, containing the particulars attending the first introduction of the art. By the latter, it would appear that it took place under the auspices of Thomas Bourchiers, Archbishop of Canterbury, during the reign of Henry VI. who sent R. Tourneur, master of the robes, and William Caxton, merchant, to Haerlem, who persuaded an under workman, named Corsellis, to come to England and set up a press at Oxford. It further mentions, that this transaction cost King Henry 1500 merks. But this single press was soon found insufficient for England; upon which the king set up another at St Alban's, and a third at Westminster; the latter being placed under the charge of William Caxton, in the year 1471.

It would be useless for us here to enter into the merits of the question concerning the authenticity of the above-mentioned chronicle, which at one time divided the literary world even to a violent degree. We will only observe, that the result of the disputation appears to be this:—The existence of the book before named establishes beyond a doubt that books were printed at Oxford by Corsellis, several years before Caxton set his press to work at Westminster, and therefore that that city has the honour of having been the first seat of the art in England; but Caxton was the first who introduced the printing with *moulded metal types*, the works by his predecessor having been executed merely with wooden ones. It is by our early writers not having attended sufficiently to this line of demarcation between the two stages of the art, that the misunderstanding has, as far as we can judge after much careful investigation, solely arisen. It is proper here to add, as a circumstance corroborative of the authenticity of the chronicle above mentioned, that in the second part of Shakspeare's Henry VI., there occurs a passage from which it might be inferred that printing had even then been for some time practised. This is where Jack Cade rails at Lord Treasurer Say for corrupting the morals of the community, by setting up a printing press, and encouraging the art.

After the art of printing had been thus introduced into Oxford and Westminster, it spread to St Alban's, Cambridge, Tavistock, Worcester, Canterbury, Ipswich, &c., in almost all cases by the encouragement of the churchmen of these places, and generally with the view of printing works of piety. About the year 1500, or probably somewhat earlier, Pynson was, by patent of Henry VII., invested with the office of king's printer, which may be regarded as the first instance of an appointment of this nature. At the close of the fifteenth and the commencement of the sixteenth century, London possessed a number of printers, but none whose name has been so celebrated as that of Wynken de Worde, a foreigner, and who had been instructed under Caxton. He improved the art considerably, and was the first printer in England who introduced the Roman letter—all previous printing, and much of a later date, being in the black or German letter.

FIRST PRINTED TESTAMENTS AND BIBLES.

Although at first countenanced by the clergy, the art of printing was soon looked upon with extreme jealousy by the church, which at length discovered that this invention was but too certainly calculated to revolutionise the whole fabric of society. The earliest efforts of the art, as we have seen, were directed to the multiplication of the Bible; but for a period of sixty or seventy years from the date of the invention, all the copies of the Scriptures which were printed were in the Latin or some other classic language, not understood by the people. But now a new era commenced. Certain printers began to issue the Bible in the English tongue, translated from the original, and this gave mighty offence to the church, or Romish hierarchy.

In 1526, Richard Grafton, a gentleman of liberal education, and who adopted the profession of printing, issued an edition of the New Testament in the English language, which drew down the wrath of the then Bishop of London. A proclamation was issued by this prelate prohibiting its use. "Understanding (says this document) that many children of iniquitie, maintaynors of Luther's sect, blynded through extreme wickedness, wandrying from the way of truth, and the Catholicke fayth, craftely have translated the New Testament inco our English tongue, entermedlying therewith many hereticall articles and erroneous opinions, pernicious and offensive, seducying the simple people," &c. The proclamation goes on to order all copies of the said New Testament to be brought to the bishop's vicar-general, to be burnt, under pain of excommunication, and incurring the suspicion of heresy. The penalty here set forth does not appear to have had any effect in prohibiting the use of the English Testament. As in the case of every attempt to shackle the press in ancient or modern times, the press was finally triumphant in the struggle. The success of the New Testament led to the publication, in 1535, of the whole Bible in the English language, being the translation of Miles Coverdale. But this noble undertaking was accomplished abroad. In 1539, England had the honour of executing an edition of the Bible in the English tongue, under the auspices of Cranmer and Henry VIII., and which was printed by Grafton and Edward Whitechurch. It would be needless to specify here the vicissitudes which the art of printing underwent in England from this period until recent times. For many years it had to struggle hard for a bare existence, and was from time to time placed under legal restrictions, seriously affecting both printers and the public. The eager desire for the acquisition of knowledge through the medium of printed books and sheets, which went on increasing throughout the eighteenth century, and the advancement of liberal sentiments in the legislature, at last silently, but efficiently and practically, secured what is called the "liberty of the press" in England; even although many of the absurd statutes in reference to the art of printing remained, and still remain, unrepealed.

INTRODUCTION INTO SCOTLAND AND IRELAND.

In the present day, we find letter-press printing pursued in almost every town in the realm. It was introduced into Scotland, and begun in Edinburgh, during the year 1507, only thirty years after Caxton had brought it into England. Since that period it has continued to be pursued with success in the Scottish metropolis, and, within the last thirty years, has there become the most distinguished craft in the city. Printing was not known in Ireland till about the year 1551, when a book in black-letter was issued from a press in Dublin; but till the year 1700, very little printing was executed in Ireland, and even since that period, the country has acquired no celebrity whatever in this department of the arts, although possessing some respectable printing establishments.

PROGRESS ON THE CONTINENT AND IN AMERICA.

The progress of printing on the Continent of Europe has been remarkably slow. Unless in the free states of Germany, where the art is pursued to an incalculable extent, the profession of the printer is almost every where under the severest restrictions, and little can be published without coming first under the scrutiny of censors appointed by the governments. The art is carried on in Paris perhaps with a greater degree of freedom than usual in other continental capitals, and from the presses in that city some exceedingly elegant works have been issued. But at Paris, as every where else, there is a general inferiority in the mechanism of the printing-office, when compared with that now in use in England and Scotland, except in those cases in which the presses employed have been imported from Great Britain.

While the art of printing has been by slow degrees creeping through the despotically governed states of Europe, and establishing itself at isolated spots in Oriental countries, every where creating distrust, and no where allowed to be exercised in furthering the great scheme of human improvement, it has been planted and widely ramified among the civilised inhabitants of North America. We are informed that the first printing-press established in the American colonies was one set up at Cambridge, in Massachusetts, in the year 1638, the era of the foundation of Harvard College of that place. It was only established by the exertions and joint contributions of different individuals in Europe and America; and there is no doubt but the mechanism and types were imported from England. The first work which issued from this press was the Freeman's Call, and the second, the Almanack for New England, both in 1639; the first book printed was the New England version of the Psalms, an octavo volume of 300 pages. In 1676, books began to be printed at Boston; in 1686, printing became known in Philadelphia; and, in 1693, in New York. In the year 1700, there were only four printing-presses in the colonies. Since that period, and especially since the revolution, which removed every thing like a censorship of the press, the number of printing-presses has greatly increased. The mechanism of the press has likewise been much improved in this country; and the Americans have copied the patent steam-press of Cowper of London, and now possess machines of this description. In 1800, the number of presses had increased to 500; in 1830, they amounted to 1200; and we learn that they are still increasing in number and extending their influence. A few years ago, the Cherokees, one of the tribes of native Indians, set up a press, and commenced a newspaper—a circumstance presenting us with an extraordinary instance of the growth of knowledge in America.

We shall now proceed to a description of the art in its various branches, though without entering into the more minute, and what would be tiresome, details of the profession.

OF THE TYPES.

Printers in early times made the letters which they used, but, in process of time, the necessity for a division of labour created a distinct trade of manufacturer of types, and it is only in rare instances in the present day that printers supply their own letter. The preparation of types requires much delicacy and skill. The first step in the process is the cutting of a punch or die, resembling the required letter. The punch is of hardened steel, with the figure of the letter cut upon its point. The letter is cut the reverse way. On this die being finished, it is struck into a piece of copper, about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper being so impressed with the representation of the letter, is called the matrix. The matrix is now fixed into a small instrument or frame, called the mould, which is composed of two parts. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter, and is made exceedingly true. The melted metal being poured into this space, sinks down to the bottom into the matrix, and instantly cooling, the mould is made to open with the instantaneous movement of a spring, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. In casting types, the founder stands at a table, and has beside him a small furnace and pot with heated metal, which he lifts with a small ladle. Type metal is a compound of lead and regulus of antimony, the latter giving hardness to the composition. The proper proportions of these metals is regulated by the size of the type, a greater quantity of antimony being employed for small than large letters.

When the type is cast from the mould, it is in a rough state, and as soon as a heap has accumulated on the caster's table, they are removed by a boy, who breaks off the superfluous tag of metal hanging at the end of each type. From the breaking-off-boy the types are removed to another place, where a boy is constantly engaged in rubbing or smoothing their edges upon a stone. Being now tolerably well cleaned, they are next removed to a table, and set up in long lines upon a frame, where they are polished and made ready for use. Whatever be the size of the types, they are all made of a uniform height, and must be perfectly square in their angles, otherwise it would be quite impossible to lock them together. A single irregular type would most likely derange a whole page. The height of a type is, or ought to be, exactly one inch; but founders, much to their discredit, do not act with uniformity in this particular, the letters of some founders being higher than those of others. But all the types of one class of any founder are always uniform in size and height; and to preserve their individuality, all the letters, points, &c. belonging to one class, are distinguished by one or more notches or nicks on the body of the type, which notches range evenly when the types are set. These nicks, as we shall immediately see, are also exceedingly useful in guiding the compositor. Types are likewise all equally grooved in the bottom to make them stand steadily.

The varieties of size of types in the present day amount to forty or fifty, enlarging by a progressive scale from the minutest used in printing pocket Bibles, to the largest which is seen in posting-bills on the streets. Printers have a distinct name for each size of letter, and use about twelve sizes in different descriptions of book-work; the smallest is called *Diamond*, and then follow, in gradation upwards, *Pearl*, *Ruby*, *Nonpareil*, *Minion*, *Brevier* (the type with which this sheet is printed), *Bourgeois*, *Long Primer*, *Small Pica*, *Pica*, and *English*. The larger sizes generally take their names thus—*Two-line Pica*, *Two-line English*, *Four*, *Six*, *Eight*, or *Ten-line Pica*, &c. Other nations have adopted different designations for their letters, principally from the names of their inventors; for instance, the French entitle Small Pica, *Philosophie*, from the first maker of the letter. All kinds of types are sold by weight by the founders, the price varying in amount according to the size of the letter. The smallest size, *Diamond*, costs about 12s. per pound; *Brevier*, about 3s. 6d.; *English*, about 2s.; and so in proportion for all intermediate sizes. Expensive as types thus are, their prices will not appear too high considering the immense outlay in cutting the punches and the general manufacture. In the *Diamond* size, 2800 go to a single pound weight of the letter *i*, and of the thinnest space about 5000.

A complete assortment of types is called a *Fount*, which may be regulated to any extent. Every type-founder has a scale showing the proportional quantity of each letter required for a fount; but it has to be remarked, that every language possesses its own scale. For the English language, the following is a type-founder's scale for the small letters of a fount of types of a particular size and weight:—

a	5500	h	6400	o	8000	v	1200
b	1600	i	8000	p	1700	w	2000
c	3000	j	400	q	500	x	400
d	4400	k	800	r	6200	y	2000
e	12000	l	4000	s	8000	z	200
f	2500	m	3000	t	9000		
g	1700	n	8000	u	3400		

It will be seen from this scale that the letter *e* is used much more frequently than any other character.

Types are nowhere manufactured so well as in Great Britain, and for their elegance and regularity of form, they have been much indebted to the late William Caslon, letter-founder in London. Mr Caslon was originally an engraver of ornamental devices on the barrels of fire-arms, and a maker of bookbinders' tools. The neatness with which he executed his work brought him into notice, and he was appointed to cut a fount of Arabic letters, for an edition of the New Testament. This occurred about the year 1720, and from this period he entered on a successful career as a letter-founder. Hitherto the types used in England had been mostly imported from Holland; but the decided superiority of Caslon's letters over those of all competitors at home and abroad, soon put a stop to the importation of foreign types; and were held in such estimation, as to be frequently sent to continental countries. From 1720 till 1780, few books were printed in England with the types of any other foundry, which still continues in existence in London.

The ingenuity and success of Caslon meet with a parallel in the case of the late Mr Alexander Wilson, type-founder in Glasgow. This person, by a strong effort of perseverance under difficulties, began to cut punches for types at his native town, St Andrews, about the year 1740, and there opened a letter-foundry—the first established in Scotland—in company with an equally enterprising individual named Bain. In 1744, Messrs Wilson and Bain removed with their foundry to the neighbourhood of Glasgow, in which city it still continues to flourish. Mr Wilson's style of letter was exceedingly elegant and neat, and these qualities led them to be employed in the printing of some beautiful editions of the Classics, by Messrs Robert and Andrew Foulis, the University printers. A branch of this Glasgow letter-foundry is now established in Edinburgh, under the firm of Wilsons and Sinclair. Besides this, the only other letter-foundry in Edinburgh is that of Messrs Miller and Company, type-founders to his Majesty for Scotland. The types manufactured by this house are unrivalled for neatness, beauty, and regularity, in which respects they compete with those of Wilson. They are largely employed in the printing of Bibles, newspapers, and other works in which a small type is required; and it is with letter from this extensive foundry that CHAMBERS'S JOURNAL and the present publication are executed.

The large letters, used in posting and hand bills, are manufactured chiefly at Sheffield. In this description of types very great improvements have also been made in recent times; and the varieties are becoming yearly more numerous and peculiar in character. The letter used in printing in North America is made principally at New York; and the style of both typography and presswork in that country is rapidly improving, and now almost competing with the products of the English press.

COMPOSING.

All the types in use in the printing-office are sorted in cases, or shallow boxes, with divisions. There are two kinds of cases—the *upper* and *lower case*; the latter lying nearest the compositor upon the frame for their support. In the upper case are placed all the capitals, small capitals, accented letters, figures, and characters used as references to notes. In the lower case lie all the small letters, points, and spaces to place betwixt the words. In the lower, no alphabetical arrangement is preserved; each letter has a larger or smaller box allotted to it, according as it is more or less frequently required; and all those letters most in request are placed at the nearest convenient distance to the compositor. By this ingenious and irregular division of the lower case, much time is saved to the compositor, who requires no label to direct him to the spot where lies the particular letter he wants. To a stranger in a printing-office, nothing appears so remarkable as the rapidity with which the compositor does his work; but habit very soon leads the hand rapidly and mechanically to the letter required. When Italic letters have to be introduced, they are taken from a separate pair of cases of the same fount.

The process of composing and forming types into pages may now be adverted to. Placing the copy or manuscript before him on the upper case, and standing in front of the lower case, the compositor holds in his left hand what is termed a composing-stick. Sometimes this instrument is of wood, with a certain space cut in it of a particular width of a line or column; but more commonly it is made of iron or brass, with a moveable side, which, by means of a screw, may be regulated to any width of line. In either case, the composing-stick is made perfectly true and square. One by one, the compositor lifts and puts the letters of each word and sentence, and appropriate points, into his stick, securing each with the thumb of his left hand, and placing them side by side from left to right along the line. When he places a letter in the stick, he does not require to look whether he is placing it with the face in its proper position. His object is accomplished by looking at what is called the *nick*, which must be placed outwards in his composing-stick. This is one of those beautiful contrivances for saving labour which experience has introduced into every art, and which are as valuable for diminishing the cost of production as the more elaborate inventions of machinery. When he arrives at the end of his line, the compositor has a task to perform in which the carefulness of the workman is greatly exhibited. The first letter and the last must be at the extremities of the line: there must be no spaces left in some instances, and no crowding in others, as we see in the best manuscripts. Each metal type is of a constant thickness, as far as regards that particular letter; though all the letters are not of the same thickness. The adjustments, therefore, to complete the line with a word, or at any rate with a syllable, must be made by varying the thickness of the spaces between each word. A good compositor is distinguished by uniformity of spacing: he will not allow the words to be very close together in some instances, and with a large gap between them in others. His duty is to equalise the spacing as much as he possibly can; and this is in some cases very troublesome. In composing poetry, or similar matter, where there is always a blank space at one of the ends of the line, spacing is very easily accomplished by filling up the blank with larger spaces, or *quadrats*. But whether prose or poetry, the matter of each line must be equally adjusted and *justified*, so as to correspond in point of compactness with the previously set lines. The process of composing is greatly facilitated by the compositor using a thin slip of brass, called a *setting-rule*, which he places in the composing-stick when he begins, and which, on a line being completed, he pulls out and places upon the front of the line so completed, in order that the types he sets may not come in contact with the types behind them, and smoothly glide into their places to the bottom of the composing stick.

When the workman has set up as many lines as his composing-stick will conveniently hold, he lifts them out into an elongated board, with a ledge on one or perhaps both sides, termed a *galley*, by grasping them with the fingers of each hand, and thus taking them up as if they were a solid piece of metal. The facility with which some compositors can lift what is called a *handful* of moveable type without deranging a single letter, is very remarkable. This sort of skill can only be attained by practice; and one of the severest mortifications which the printer's apprentice has to endure, is to toil for an hour in picking up about a thousand letters, and then see the fabric destroyed by his own unskilfulness, leaving him to mourn over his heap of broken type, technically called *pie*.

Letter by letter, and word by word, is the composing-stick filled; and by the same progression the galley is filled by the contents of successive sticks. When the compositor has set up as many lines as fill a page, he binds them tightly round with cord, and removes them from the galley. Sometimes, as in the case of newspaper and similar work, the *handfuls* of type are accumulated till they fill the galley, and are then removed in long columns. After the matter is thus so far prepared, it is the duty of the compositor to take an impression or *first proof* from the types, and then correct the errors he may have made. Proofs are usually taken by means of an old large press kept for the purpose. In the office of Messrs Chambers, in which the present sheet is composed, this lumbering piece of furniture is not required, all proofs of galleys and pages being taken by a small iron roller, which runs on raised ledges upon a neat metal table, on which the types are placed, and giving a sufficient impression to the compositor without any trouble. After the galley matter is corrected, and re-corrected by the compositor, it is divided into pages of the size wanted; and head-lines, or figures indicating the number of the page, being added, the pages are arranged upon a large firm table, and there securely fixed up in an iron frame or *chase*, by means of slips of wood and wedges, or *quoins*.

This process, which is called *imposing*, being completed, and the face of the types being levelled by a *plainer* and mallet, the *form*, as it is called, is proved and prepared for press. Proof-sheets being taken, they are subjected to the scrutiny both of a *reader* employed in this peculiar function in the office, and of the author. These having made their marks pointing out words and letters to be altered or corrected, the compositor once more goes over the form, correcting the errors by lifting out the letters with a bodkin, and, when revised, the sheet is pronounced ready for working. It may be explained that the imposing table at which all these corrections are made, is composed of smooth stone or marble, on the top, from the circumstance of materials of that nature not being liable to rust from the water which is often thrown upon the types while preparing them for the press, or in laying them out for distribution after working off.

It need scarcely be told that the size of books greatly varies; but the sizes are all reducible to a standard determined by the number of leaves into which a sheet of paper is folded. The most common size is *octavo*, each sheet of which contains eight leaves, or sixteen pages; the next is *duodecimo*, containing twelve leaves, or twenty-four pages in the sheet; and the next *octodecimo*, or eighteens, containing thirty-six pages in a sheet. There are many other sizes, such as the larger *quarto* (which is the size of the present sheet), the smaller *twenty-fours*, &c. The knowledge of placing pages of types in a form so as to produce, when printed, a regular series upon paper, is one of the branches of the art to be acquired by the young compositor.

PROGRESSIVE IMPROVEMENTS IN STYLE.

From what has been detailed, it will readily be supposed that the style of preparing pages of types for the press has been greatly improved since the invention of printing. When we examine old printed books, the difference of style of execution is very striking. The early printers were frequently governed by the wish to make their printed pages bear a resemblance to the old manuscript books formerly in use; and upon the whole, much less taste was displayed, in respect of neatness and accuracy, than might have been expected from the intelligent class of men who first cultivated the "divine art." The following particulars, relative to the early productions of the press, will show how the style of book-printing was gradually improved:—"With respect to their forms, they were generally either large or small folios, or at least quartoes: the lesser sizes were not in use. The leaves were without running title, direction-word, number of pages, or divisions into paragraphs. The character itself was a rude old Gothic mixed with Secretary, designed on purpose to imitate the handwriting of those times; the words are printed so close to one another, that it was difficult and tedious to be read, even by those who were used to manuscripts, and to this method; and often lead the inattentive reader into mistakes. Their orthography was various, and often arbitrary, disregarding method. They had very frequent abbreviations, which in time grew so numerous and difficult to be understood, that there was a necessity of writing a book to teach the manner of reading them. Their periods were distinguished by no other points than the double or single one—that is, the colon and full point; but they a little after introduced an oblique stroke, thus /, which answered the purpose of our comma. They used no capital letters to begin a sentence, or for proper names of men or places. They left blanks for the places of titles, initial letters, and other ornaments, in order to have them supplied by the illuminators, whose ingenious art, though in vogue before, and at that time, did not long survive the masterly improvements made by the printers in this branch of their art. Those ornaments were exquisitely fine, and curiously variegated with the most beautiful colours, and even with gold and silver; the margins, likewise, were frequently charged with variety of figures of saints, birds, beasts, monsters, flowers, &c., which had sometimes relation to the contents of the page, though often none at all. These embellishments were very costly; but for those that could not afford a great price, there were more inferior ornaments, which could be done at a much easier rate. The name of the printer, place of his residence, &c. &c. were either wholly neglected, or put at the end of the book, not without some pious ejaculation or doxology. The date was likewise omitted, or involved in some cramps circumstantial period, or else printed either at full length, or by numerical letters, and sometimes partly one and partly the other—thus, one thousand CCCC and lxxliii, &c.; but all of them at the end of the book. There was no variety of characters, no intermixture of Roman and Italic; they are of later invention; but their pages were continued in a Gothic letter of the same size throughout. They printed but few copies at once, for 200 or 300 were then esteemed a large impression; though, upon the encouragement received from the learned, they increased their numbers in proportion."

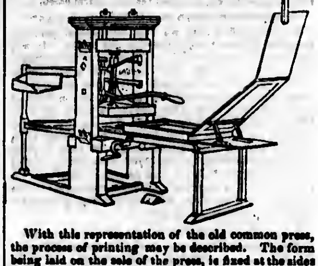
About 1469-70, alphabetical tables of the first words of each chapter were introduced, as a guide to the binder. Catch-words (now generally abolished) were first used at Venice, by Vindelinus de Spire. Early printed books had no signatures. Signatures are those letters of the alphabet which are put at the bottom of the right hand pages of sheets to distinguish their order. When the alphabet is finished, a second begins A a, or 2 A, instead of a single A; and when that is terminated, A a a, or 3 A, begin the third, and so on. In order to indicate more correctly the order of each sheet, printers add figures to the initial letter on the third, fifth, and seventh pages; the numbers of these figures, which do not pass the middle of the sheet, point out the size of the edition. Thus, A 2 on the third page, A 3 on the fifth, and A 4 on the seventh, show a work to be in 8vo; in the 12mo size, A 5 on the ninth page, and A 6 on the eleventh page, &c.; but it is now customary to give signatures only on the first and third pages of 8vo, and on the first, third, and fifth pages of 12mo.

In some modern French works, figures are substituted for letters, and the other leaves are marked by asterisks. The invention of signatures is ascribed by M. Marolles to John of Cologne, who printed at Venice in 1474; the Abbé Rive attributes it to John Koelhof, a printer at Cologne, and contemporary with the former, from whom we have a work dated in 1472. It is, however, of little consequence who was the originator, for, on the whole, signatures are rather a clumsy expedient, merely to direct the binder in folding the sheet, and are generally much too conspicuous upon the pages.

One of the chief improvements in the style of typography has been the dismissal of abbreviations and connected letters from the founts. Formerly, abbreviations were very common: the word *they* was indicated by the letter *y* and a small *e* above it; the conjunction *and* was indicated by &, which is a contraction of *et*. There were many of this species of abbreviations in printing both the English and Latin languages, and these were not more unseemly than the connected letters; such, for instance, as the junction of the letters c and *t* by a curve stroke from the top of one to the other. In recent times, all these connected letters have been disused, with the exception of *ff* and *fi*, because the head of the common *f* would press against the *l*, and be broke. Another very great improvement has been effected in the dismissal of the long *s*, in cases of two of this letter coming together.

PROCESS OF PRINTING.

The duties of the compositor do not involve the process of printing. When the forms are duly prepared in the composing-room, they are carried into the press-room, and come entirely under the charge of the pressmen. The earliest printing-presses were exceedingly rude, and seem to have resembled the common screw press, with a contrivance for running the form under the point of pressure. This must have been not only a laborious and slow operation, but one exceedingly defective, from the difficulty of regulating the impression, and the endangering of the face of the types. The defects in these original presses were at length remedied by an ingenious Dutch mechanic, Willem Jansen Blaew, who carried on the business of a mathematical instrument maker at Amsterdam. He contrived a press, in which the carriage holding the form was wound below the point of pressure, which was given by moving a handle attached to a screw hanging in a beam having a spring, which spring caused the screw to fly back as soon as the impression was given. This species of press, which was almost entirely formed of wood, continued in general use in every country in Europe, till the beginning of the present century. With certain lever powers attached to the screw and handle, it is here represented.



With this representation of the old common press, the process of printing may be described. The form being laid on the sole of the press, is fixed at the sides so as to render it immoveable from its position. There are two men employed: one puts ink on the form either by means of stuffed balls or by a composition roller—the other works the press. The latter lifts a blank sheet from a table at his side, and places it on what is called the *tympan*, which is composed of parchment and blanket stuff, fitted in a frame like a drum (and hence its name), and which, by means of hinges connecting it with the sole, folds down like a lid over the form. As the sheet, however, would fall off in the act of being brought down, a skeleton-like slender frame, called a *frisket*, is hinged to the upper extremity of the tympan, over which it is brought, to hold on the paper. Thus, the frisket being first folded down over the tympan, and the tympan next folded down over the form, the impression is ready to be taken. This is done by the left hand of the pressman winding the carriage below the *platten* or pressing surface, and the impression is performed by the right hand pulling the handle attached to the screw mechanism. The carriage is then wound back, the printed sheet lifted off and another put on the tympan, the form again inked, and so on successively. In the above engraving the press appears with the frisket and tympan sloping upwards, ready to receive the sheet, the frisket being sustained from falling backwards by a slip of wood depending from the ceiling. One of the greatest niceties connected with this art, is the printing of the sheet on the second side in such a manner that each page, nay, each line, shall fall exactly on the corresponding page and line on the side first printed. To produce this desirable effect, two iron points are fixed in the middle of the sides of the frame of the tympan, which make two small holes in the sheet during the first pressure. When the sheet is laid on to receive an impression from the second form, these holes are placed on the same points, so as to cause the two impressions to correspond. This is termed producing *register*; and unless good register is effected, the printing has a very indifferent appearance. Expert workmen perform these operations with surprising rapidity, though with considerable labour. The two men employed at a press take the process of pulling and inking for alternate quantities. After the forms are wrought off, they are washed in a solution of potash to remove the remains of the ink, which is of a thick oleaginous character, and then carried back to the composing-room to be distributed. This last operation is very speedily performed by the compositors.

To suit paper for printing, it is necessary to wet it some hours previous to its being used. This is done by dipping alternate quires in water, and afterwards pressing the mass with a heavy weight, till the whole is in a half dry state or of a damp consistency.

INK AND INKING ROLLERS.

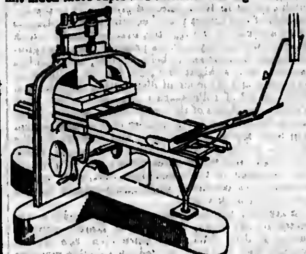
Much of the beauty of good printing depends on the quality of the ink, which it requires very considerable skill to manufacture. Among the old race of printers, little attention was paid to this department of the art; and it is only within the last thirty or forty years that the efforts of printing-ink manufacturers have been directed to the production of a material possessing the qualities of depth and durability of colour. It is now manufactured in London and Birmingham in a very superior manner, and from thence is supplied to printers all over the United Kingdom. Good printing-ink is made of genuine linseed oil, boiled to the consistency of a syrup, and then well mixed and ground with lamp-black. To be excellent, it must be stiff without strong adhesion, and keep soft and mellow, but dry quickly as soon as it is on the paper; above all, it must keep the colour, and not turn yellow after being printed with some time. It is made of different qualities, from 1s. 6d. to 5s. and upwards per pound weight.

One of the greatest of recent improvements in the art of printing is in the mode of inking the forms. From the days of Guttenberg, this had been done by stuffed cushions, or balls covered with skins, by which no regularity could be preserved, and no speed acquired. Earl Stanhope, when he invented his improvement on the press, attempted the plan of inking by means of rollers, but he could not discover any species of skin suitable for the purpose; all that this nobleman so anxiously desired, was at length achieved by the mere chance observation of a process in the Staffordshire potteries, where rollers formed of a composition were used. A Mr Forster, employed at a bookseller's printing-office at Weybridge, was the first who applied it to letter-press printing, by spreading it, in a melted state, upon coarse canvass; the inventors of printing machines soon caught the idea, and, by running the composition as a coat upon wooden cylinders, produced the perfect inking rollers. The composition is formed of treacle and glue, which, being heated and melted together, and poured into long iron moulds, produce a soft and pliable substance, nearly resembling soft India rubber, admirably adapted for distributing the ink over the surface of the types. The inking-roller is composed of a wooden centre covered with composition, is connected at each end with a handle, after the plan of a common garden-roller. The ink to be used is placed upon a metal table of an appropriate construction, and a portion being lifted by the roller, it is fully distributed over its surface, by rolling backward and forward on the smooth part of the table. The roller is then rolled once or twice over the face of the types, which is found a much better process than daubing them with the old-fashioned balls.

IMPROVED PRINTING-PRESSES.

It is exceedingly remarkable, that, notwithstanding the importance of the art of printing, the structure of the presses in universal use remained the same, without any improvement, till about the beginning of the present century. Before the introduction of presses upon an improved construction, the whole of the work of the printer was executed by the wooden press, of which we have given a representation above. But this press was liable to many objections. The surface communicating the impression, or *platten*, was generally only the size of half a sheet, and so after one portion of a form was pressed, the carriage had to be still farther wound in, and the remaining portion pressed. The consequence was, that, besides losing time, the impressions upon a single sheet were not always uniform, one part being perhaps harder pressed than the other. The clumsiness of the mechanism, the length of time occupied in working, and the labour to the pressman, afforded sufficient reasons for the attempt to improve the structure and general character of the press; nevertheless, as we have said, it was long before suggestions of this kind were carried into effect. The individual to whom the great honour is due of improving the printing-press, was the late Charles Earl of Stanhope, a nobleman who devoted much of his time to mechanical science, and who died greatly regretted in the year 1816.

Lord Stanhope's improvements did not go the length of altering the general form or construction of the press. He left the same plan to be pursued of winding the carriage below the *platten* by a handle and *rounce*, and of pulling the impression by the application of the right hand to the seat of power. What he accomplished was the constructing of the press with iron instead of wood, and that of a size sufficient to print the whole surface of a sheet, and of applying such a combined action of levers to the screw as to make the pull a great deal less laborious to the pressman; the mechanism altogether being such as to permit much more rapid and efficient working.



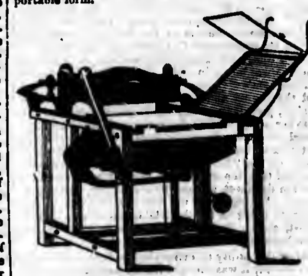
The *Stanhope press*, which is here represented, consists of a massive frame of iron, cast in one piece. This is the body of the press, in the upper part of which a nut is fixed for the reception of the great screw, and its point operates upon the upper end of a slider fitted into a dovetail groove formed between the two vertical bars of the frame. The slider has the platten firmly attached to the lower end of it; and, being accurately fitted between the side guides, the platten must rise and fall parallel to itself when the screw is turned. The weight of the platten and slider is counterbalanced by a heavy weight behind the press, suspended by a lever which acts upon the slider to lift it up, and keep it always bearing against the point of the screw.

There are two projecting pieces cast with the main frame, to support the carriage when the pull is made; to these, rails are screwed, and placed exactly horizontal for the carriage to run upon, when it is carried under the press to receive the impression, or drawn out to remove the printed sheet. The carriage is moved by a rounce or handle, with leather girths, very similar to the wooden press. Upon the axle of this handle a wheel is fixed, round which leather belts are passed, one extending to the back of the carriage to draw it in, and two others which pass round the wheel in an opposite direction to draw it out. By this means, when the handle is turned one way, it draws out the carriage; and by reversing the motion, it is carried in. There is likewise a check strap which limits the motion of the wheel, and, consequently, the action of the carriage. The principal improvement of Earl Stanhope's press consists in the mode of giving motion to the main screw of it, which is not done simply by a lever attached to the screw, but by a second lever. The main screw has a short lever fixed on the upper end of it, and this communicates by an iron bar or link to another lever of rather shorter radius, which is fixed upon the upper end of a second spindle, and to this the handle or lever by which the press is worked is fixed. Now, when the workman pulls this handle, he turns round the spindle, and, by the connection of the rod, the main screw turns with it, and causes the platten to descend with it and produce the pressure. But it is not simply this alone, for the power of the handle is transmitted to the screw in a ratio proportioned to the effect required at the different parts of the pull; thus, at first, when the pressman takes the handle, it lies in a direction parallel to the frame, or across the press; and the short lever (being nearly perpendicular thereto) is also nearly at right angles to the connecting rod; but the lever of the screw makes a considerable angle with the rod, which therefore acts upon a shorter radius to turn the screw; because the real power exerted by any action upon a lever is not to be considered as acting with the full length of the lever between its centres, but with the distance in a perpendicular, drawn from the line in which the action is applied to the centre of the lever.

The obvious excellence of the Stanhopian improvement in gaining power for the handle, led a number of printers to apply this species of lever power to the screw of the common press, but we believe not with marked success. The improvements of Lord Stanhope were speedily followed by the attempts of other individuals in Great Britain and America, to remedy the ancient defects in printing mechanism. So numerous, indeed, have these attempts been since the beginning of the present century, that it is quite out of our power to mention them in detail. With, we believe, one or two exceptions, all the modern improvers of the printing-press have confined their efforts chiefly to the process of communicating pressure to the platten, so as to modify labour, and procure greater rapidity of working. In these cases the screw has been generally dismissed, and power procured sometimes by the action of two or more inclined planes working against each other, in other instances by fulcrums and levers, and in others by the straightening of a joint. The latter is an exceedingly simple and beautiful form of power, and may easily be comprehended when we say, that it resembles the bending and straightening of the knee-joint of the leg: when the knee of the upright bar of the press is bent, the platten is drawn up; and when the knee is forced by a lever into a perpendicular position, the platten sinks, and the pressure is communicated. This may be considered the most efficient mode of compressing the platten yet discovered, and it would be difficult to rival it in the properties of simplicity and rapidity of execution. Nevertheless, such is the number and variety of improved presses in the present day, that it would not be easy to decide upon which has the best claims to the notice of printers. Among those which have gained a large share of approbation, may be mentioned the *Columbian press*, which is of American invention. This new press was brought to this country in 1818, by Mr George Clymer of Philadelphia, and made the object of a patent. The pressing power in this instance is procured by a long bar or handle acting upon a combination of exceedingly powerful levers above the platten, and by many workmen this press is greatly preferred to any other.

The various improved presses which we have noticed are, in most cases, made of at least three sizes, namely, *demy*, *royal*, and *super-royal*—that is, they are respectively able to print sheets of these sizes; and they accordingly vary in price from about L.50 to L.80 each. They are nearly all manufactured by the patentees in London. In the present day, the old wooden press of Blaew is entirely discarded from use in printing, and it is only to be seen in an obscure corner of the printing-office, reduced to the humble character of a proof-press.

The only instance worth mentioning, in which an improved press was made of quite a new construction, was in the case of the ingenious invention of Mr John Ruthven of Edinburgh. This mechanician contrived a press in which the types stand upon a fixed frame or table, while the pressing part or platten is brought over the form by being hurled forward on wheels. On being brought over the form, a depending hook or notch at each end of the platten is caught and pulled down by the combined action of levers beneath the table, and operated upon by the left hand of the pressman. This was an exceedingly meritorious invention, and many presses on this plan were manufactured and sold, but experience has evinced that the contrivance is only valuable when applied to small presses, not larger than foolscap size, and chiefly useful for executing jobs. Mr Ruthven makes his presses as small as quarto size; and as they stand on a table, and can be easily wrought by any gentleman, no better press could be recommended to the notice of the amateur printer. The following cut presents a correct representation of Mr Ruthven's press, which it will be perceived is of an exceedingly compact and portable form.



THE CHAPEL.

It is worth while to remark, that till the present day the phraseology used in relation to the mechanical details of the printer, possesses certain traces of the early connection of the art with men of learning. A number of the technical terms, as may be seen from the descriptions we have given, are a corruption of Latin words. We may instance *tympan*, from tympanum, a drum, and *stet*, which is used as a mark in correcting proof-sheets, and which is from the Latin word to stand. The name *brevier*, applied to a certain size of type, originated in that letter being first used in printing the Breviaries of the Romish church. An exceedingly old practice prevails among printers of calling their office a *Chapel*, and under this title the compositors, pressmen, and all others engaged in the office, have been in the habit of meeting together, and forming a species of lodge, in order to settle affairs connected with the internal arrangements of the office, or any disputes which may occur among members. The general improvement in every thing connected with printing establishments, and the advance of manners, have greatly modified the spirit which used to prevail in these confederacies; nevertheless, the appellation of *the chapel* remains, and is of traditionary interest. It has been supposed by many writers that the title of Chapel originated in Caxton's exercising the profession of a printer in one of the chapels in Westminster Abbey; and it is exceedingly probable that it has an origin of this nature, for printing was at first carried on in many places in England in connection with religious houses. Hence, in M'Creery's poem, entitled "The Press," the author has the following lines:—

> "Our art was hail'd from kingdoms far abroad,
> And cherish'd in the hallow'd house of God;
> From which we learn the homage it receiv'd,
> And how our sires its heavenly birth believ'd.
> Each printer hence, howe'er unblest his walls,
> E'en to this day his house a CHAPEL calls."

PRINTING BY MACHINES.

After all the ingenuity of Lord Stanhope and that of his successors had been lavished on the press, still the process of printing could not be executed but with considerable fatigue, and at a rate of speed seldom greater than that of throwing off 250 impressions, or 125 complete sheets, in an hour. It must appear obvious that this was a state of things quite incompatible with the advancement of knowledge, and the necessity for producing a large quantity of impressions in a short space of time, particularly as regarded newspapers. It became apparent that an entire revolution should be effected in the structure of the press; that the flat printing surface should be discarded, and cylinders brought into use. We have now to describe how this great new invention, applied to printing-machines, came to be adopted.

In 1790, Mr Nicholson, the editor of the Philosophical Journal, procured a patent for certain improvements in printing, which patent embodies almost every principle since so successfully applied to printing-machines; and although he did not carry his views into practical effect, little has been left for subsequent engineers to do, but to apply, in the most judicious manner, the principles he laid down in his patent. He may therefore be justly considered as the originator of the great modern improvements in printing machinery; for with him originated the ideas of taking the impressions from types by means of cylinders, and of inking the form with rollers instead of balls, which constitute the two essential parts of all effective modern printing-machines.

Whether Mr Nicholson's ideas were known to Mr König, a German, is now uncertain; but to him is due the distinguished merit of carrying steam-printing first into effect. Mr König, conceiving it possible to apply steam-power to produce accelerated speed with the common press, after various unavailing efforts to obtain assistance from the printers on the Continent, came to England. Arriving in London about 1804, he submitted his scheme to several printers there with no better success, until introduced to Mr Bensley senior, who, attracted by Mr König's plans, entered into arrangements with him. After persevering for some time in various attempts to accelerate the speed of the common press, and at the same time render the attendance of the man who inks the types unnecessary, his exertions resulted, to use his own words, "in discovering that they were only employing a horse to do what had been before done by a man." He in consequence gave up all idea of his projected improvements of the common press, and turned his attention to CYLINDRICAL PRINTING.

After continued experiments for some years, a small machine was made, in which the two leading features of Nicholson's invention were embraced (the cylinders and the inking-rollers), which he exhibited to Mr Walter, proprietor of the Times newspaper; and, on showing what further improvements were contemplated, an agreement was entered into for the erection of two machines for printing that journal. Accordingly, on the 28th November 1814, the public were apprised that the number of the Times of that date was the first ever printed by machinery, steam propelled. At this period but few persons knew of any attempts going on for the attainment of this object; whilst, among those connected with printing, it had often been talked of, but treated as chimerical.

After the utility of cylindrical printing had been thus proved, it was thought highly desirable that the principle should be applied to printing fine book-work, where accurate register is indispensable. This was, to a certain extent, attained, by using two large cylinders, the sheet of paper being conveyed from the bottom of the first cylinder (where it had received the first impression) by means of tapes, leading in a diagonal direction to the top of the second cylinder, round which the sheet was carried till the second side was printed. The first machine of this description was erected at Mr Bensley's office, where it continued at work for some years, till more modern machines superseded it.

So sanguine were the patentees (Mr König, Mr Bensley, and Mr R. Taylor) that no further improvement could be effected, that, in March 1817, they issued a prospectus, offering three kinds of machines at high prices, and requiring a considerable annual premium; but we believe these offers were not embraced.

In the course of 1818, Mr Napier, and Messrs Applegath and Cowper, took out patents for improvements in cylindrical printing machinery. Mr Napier's invention consisted principally in using grippers instead of tapes, as in König's, for seizing hold of and leading the sheet of paper round the cylinders—a contrivance which answers the purpose admirably. The cylinders, which are of a small circumference, are placed so, that, though revolving securely on their axles, and giving a sufficient strength of impression, they rise and fall alternately—rising to avoid touching the types at the part where there is no paper to be pressed, and falling to give the impression when the sheet is ready for receiving it. These cylinders are placed close together, and the machine occupies not more than half of the space of an ordinary book-printing machine. This press of Mr Napier may be kept in motion by manual labour, but steam-power is preferable. Ingeniously as this machine has been constructed, the principles upon which it works have made it give way in general estimation to those of Applegath and Cowper. These mechanicians' patent, which expired in 1832, referred principally to the application of two drums placed betwixt the cylinders, to insure accuracy in the register, over and under which the sheet was conveyed in its progress from one cylinder to the other, instead of being carried, as in König's machine, in a straight line from the one cylinder to the other; and the mode of distributing the ink upon tables instead of rollers—two principles which have secured to machines of this construction a decided preference for fine work. Machines of this construction have been made by Applegath and Cowper for the principal printing establishments in London, Paris, Edinburgh, and many other cities; and it is nearly upon the model of their machines that other manufacturers now construct their steam-presses for the execution of book-work.

In Ireland, the first steam printing-machine was erected by Mr Gunn, for Mr P. D. Hardy, printer, Dublin, in July 1833; and since then, the Dublin Evening Mail has been printed by a double machine of Mr Gunn's construction, which throws off that journal at the rate of about 2300 an hour.

In America, and on the Continent, machines were introduced shortly after their invention in England, and are now generally used, but principally for newspapers. Mr König established a manufactory for printing-machines at Frankfort-on-the-Maine, which is still carried on, we believe, successfully.

Printing-machines are now made of various kinds, adapted to the peculiar descriptions of work for which they are required. These descriptions of work may be classed under two distinct heads, namely, the printing of newspapers, one side at a time, and the printing of a better kind of sheets, or book-work, both sides at a time. There can be nothing more easy than to make a machine capable of first printing one side of a sheet of paper, and afterwards the second, by the removal of one form and the introduction of another; but this process will not produce *register*: the second side may or may not be on the back of the first, and the work is therefore of a very inferior appearance, though suitable enough for newspapers, in the working of which dispatch is alone required. This kind of press is therefore the best adapted to gain that end; for the first side of the paper may be printed deliberately, and the second side be made up to the last moment of time, and then thrown off. To produce a machine to print both sides at a time, and with perfect register, no small degree of mathematical accuracy, and no small share of ingenuity in the mechanician, are required. The great and important object to be attained in this kind of machine, is to cause the sheet, after it has received its first impression, to travel along the sides of the cylinders and drums at such a rate as to meet the types of the second side at the exact point which will cause the second side to fall with perfect accuracy upon the back of the first. To accomplish this exceedingly desirable end, the cylinders and drums must revolve at precisely the same speed as the carriage underneath; and, therefore, any inaccuracy in the turning of the axles, the cutting of the teeth of the wheels, or any other deficiency, however slight, will produce bad registered sheets, and create an enormous degree of vexation to the printer. With these explanatory remarks, we pass on to a notice of four different machines, calculated to produce register and non-register sheets, under various modifications and rates of speed.

1. A machine with one cylinder, called a single machine, generally used for printing newspapers; it throws off from 900 to 1200 an hour on one side, requiring two boys, one to lay on the paper, and another to receive it when printed.

2. A machine with two cylinders, called a double machine, but only printing from one form of types at the rate of from 1600 to 2200 an hour, requiring two boys to lay on the sheets, and two to take them off, exclusively used for newspapers. It consists of two small cylinders about ten inches in diameter, placed about five inches apart, and suspended from a beam at each end. A camb or eccentric causes the beams to vibrate, and with them the cylinders to rise and fall about one-half of an inch. The cylinders turn in opposite directions, and as the machine only prints one form at a time, that cylinder only which is turning in the same direction as the types, is permitted to rest upon the form, and take the impression, so that a sheet is printed by each cylinder alternately every time the type-carriage goes backwards or forwards. Two boys feed the paper into the machine, at two drums placed about three feet above the carriage, and the sheets are led down to the cylinders by tapes, which also convey it, after being printed, to the end of the machine, where two boys receive the sheets and lay them straight in a heap, ready to be again put through the machine when the second form is placed on the type-carriage to print the other side. There is a distinct and complete apparatus for inking the types at each end, similar in principle to that which will be found described in the account of the book-machine. In 1829, a machine of this description, made by Applegath and Cowper, was introduced into Scotland by Messrs Gray, the enterprising proprietors and publishers of the North British Advertiser.

3. A machine, similar to that used by the Times, with four printing cylinders, requiring the attendance of eight boys, and throwing off about 4000 sheets an hour. To attempt to describe this machine without diagrams, is difficult; but a general idea may be conveyed of its principle, by its being considered as two double machines placed in contact. There are four printing cylinders, about nine inches in diameter each, placed close together in pairs, but with a space of about seven inches between the centre ones, in which space there are two inking-rollers. Each pair of cylinders are secured to the ends of two strong beams, by means of adjustable connecting rods; to these beams a slight vibrating motion is given, by means of cambs, so as to cause the alternate cylinders to rise and fall about one-fourth of an inch. The type-carriage and inking-tables have a reciprocating motion, and the movements are so adjusted that those two alternate cylinders shall be depressed and press upon the types, whose motion coincides with the carriage, and, of course, the other two alternate cylinders are by the same means raised sufficiently to permit the types to pass free under them, till the carriage changes the direction of its motion, when the position of the cylinders is reversed, and the pair which formerly took the impression from the types are in their turn raised. Thus, every time the form of types moves backwards or forwards, two sheets of paper are printed. The paper is fed into the machine over four drums, placed in pairs over each other, at a considerable height above the machine, by four boys. The sheets are led down from the drums to their respective cylinders by means of broad tapes, and by other tapes they are conducted out to the ends of the machine, where they are received by four other boys, when printed, ready to be again passed through the machine to receive the impression on the second side.

This ingenious machine has only two inking apparatuses, one situated at each end. There are three pairs of inking-rollers, one pair at each end, close to the two outer cylinders, the remaining pair being placed between the two centre cylinders. The inking-tables are about three feet wide, and the motion of the carriage is sufficiently long to bring each table not only under its respective pair of inking-rollers, but also to enable each table alternately to ink the centre pair. Thus, the form is first inked by one of the outer pairs of rollers; the first cylinder is raised; in passing under the second, an impression is given, and, of course, the ink is taken from the form, but it immediately becomes inked anew by the centre pair of rollers; the third cylinder is raised; the form passes to the fourth cylinder, where another impression is taken; and the motion of the form being continued a little farther, it gets again inked from the outer pair of rollers at the opposite end of the machine from whence it started. In its return, the two cylinders which had just taken the impression are raised; the other two now print in their turn, the inking process going on as before; and two sheets are again thrown off.

The fourth kind of machine is called a book or perfecting machine, printing both sides of the sheet in register before it leaves the machine. The machine from which the engraving at the head of this article is taken, is one of this description, and bears a resemblance to that of Applegath and Cowper. It was planned and contrived by Mr Robert Gunn of Edinburgh, and made by the well-known engineers, Claud Girdwood and Company of Glasgow. It has now printed our Journal and other publications for some months, in a style which is hardly equalled, and certainly is not surpassed. We shall now proceed to describe it as intelligibly as the nature of the subject will permit, so as to convey to our readers a general idea of the principles upon which it is constructed. The machine is about fifteen feet long by five broad, and consists of a very strong cast-iron framework, secured together by two ends and three other cross pieces. To this frame all the parts of the machine are fixed. Parallel with the sides of the machine, and about two feet apart, are placed two rails the whole length of the frame, and upon these rails the type-carriages move backwards and forwards, small pullies being interposed between the rails and the type-carriages to diminish friction.

There are two type-carriages connected together, at such a distance apart that each form of types may be acted upon by its respective cylinder so as to produce the impression. The carriages are made perfectly level, and upon them the forms are placed, and secured by wedges.

The outer extremity of each type-carriage forms an iron table, upon which the ink is laid, and spread or distributed, and thence called the inking-tables. They are about half an inch lower than the surface of the types, so as to prevent their soiling the tapes when passing under the cylinders. To the type-carriages and inking-tables thus connected together, a reciprocating motion is given, by means of a short vertical spindle placed in the centre of the machine with a pinion at its upper end, which works into the teeth of a double rack, and above the pinion are a small stud and friction pulley. The rack is secured to the under side of the carriages by slides, which permit it to move freely only from side to side, being guided in its lateral movement by a set of levers which form a parallel motion. The object of this lateral motion of the rack is to allow it to move from the one side round to the other side of the pinion, and thus convert its continuous rotatory motion into a reciprocating one in the type-carriages. The stud and pulley on the top of the upright spindle are for the purpose of leading the rack round the pinion at the turns. The upright spindle is driven by a pair of bevelled wheels from the main shaft.

The two printing cylinders are nearly nine feet in circumference each, and are placed about two feet apart. They are accurately turned, so that the surfaces of the type-carriages and the cylinders may be perfectly parallel. The axis of each cylinder works in brass bearings in the upright framework, where, by means of screws, the degree of pressure with which the cylinders are allowed to rest upon the types, may be regulated to any degree of nicety. Over about two feet of the circumference of each cylinder which forms the printing surface, two folds of cloth, called blankets, are stretched by means of rollers placed inside the cylinder. The lower blanket is seldom changed, but the upper one on the second cylinder (which stands in the stead of what are called slip-sheets in hand-press printing) must be shifted as soon as the ink which it has absorbed from the printing on the first side of the sheet begins to set off, or soil the paper when receiving the second impression. This shifting is speedily effected, by unrolling a sufficient quantity of the cloth off one roller, and winding it up on the other, to present a clean portion to the printing surface. There are two narrow slits in each cylinder parallel with its axis, through which the blankets pass from the rollers inside, to the periphery of the cylinder.

The cylinders have a continuous rotatory motion towards each other, given by two large toothed wheels, whilst the type-carriages move backwards and forwards under them. The movements are so contrived that the type-carriages shall have gone and returned to the same point during the period that the cylinders have made one entire revolution; consequently, each successive impression is taken from the types by the same part of each cylinder, and thus, in order to bring the impression level, the same facility for patching or overlaying is afforded as at the hand-press.

The two drums placed between the cylinders are for the purpose of causing the sheet of paper to pass smoothly and accurately from one printing cylinder to the other, and do not *turn* the sheet, as represented by all the accounts of the machine which we have seen. The two drums, and the cylinder A, are connected together by toothed wheels, so as to cause the circumferences of the cylinders and drums to move together with one uniform velocity, and thereby prevent any sliding or shifting of the two systems of tapes over each other during their motion round the cylinders and drums; as, upon this, much of the perfection of the register depends.

The drum D has a very important function assigned to it, namely, making register. From various causes, such as the heat or moisture of the room, the state of the paper, or any inaccuracy in adjusting the forms, the register may become slightly irregular; and to obviate this, the second drum is suspended by a screw at each end, so as to permit it to move up or down to the extent of about an inch. Upon a little consideration, it will be obvious, that, if you increase or diminish the distance between the points where the two impressions are given, you accelerate or retard the sheet, while in its progress to receive the second impression, to the same extent; and as the raising or lowering of the drum has this effect, register is secured by turning its screws, and thus altering its position, as circumstances require. The lateral register can only be adjusted by placing the forms accurately on the type-carriages; but as it is not affected by the same causes as the register in the other direction, it very seldom requires alteration.

There are two complete inking apparatuses, one at each end of the machine; both are precisely similar, one being required to ink each form. We shall describe the one at the left end of the machine, which inks the second form:—About eight inches above the form is the ink-trough F, forming the bottom and back of a square box or receptacle for the ink: the front edge of the bottom being ground to fit very accurately to the surface of an iron roller, called the ductor, which forms the front of the trough, in which it slowly revolves inwards in fixed bearings at the ends. The trough is adjustable by means of three screws placed behind, which press the scraper so close to the ductor as to permit a stratum or film of ink, of the requisite thickness, to remain upon it. This film of ink is so thin, that from one to two inches in breadth, and of the length of the form, is requisite to ink the types for a single impression. The ink is taken from the ductor by a small composition roller G, called the feeding-roller; this roller is placed between the extremities of two levers or arms, fixed parallel upon a horizontal rod across the machine. By means of a crank motion from the cylinder shaft and adjustable connecting rods, a vibrating motion is given to the levers, so as to cause the feeding-roller to press for a short time against the ductor at one extremity of its movement, and to rest upon the inking-table at the other end of its vibration: in other words, this roller, by the motion of the press, is caused to rise at the proper time, and take down ink to the table, and in its descent meets the table exactly as it approaches. This may be reckoned the most beautiful and interesting part of the process of machine-printing. From the way in which the feeding-roller lays the ink, it is spread over the whole surface of the table by passing twice under the distributing-rollers before the table advances to the inking-rollers, which causes a degree of perfection in the distributing of the ink hitherto unattained.

To the ductor, a rotatory motion, which can be varied at pleasure, is given by means of a gut band which passes over two cones of pullies, one on the cylinder axle, and the other on the end of the ductor. By this arrangement, the quantity of ink which the feeding-roller receives can be varied at pleasure, by merely shifting the position of the band upon the cones.

Under the ductor are two distributing rollers, as they are technically called, placed diagonally across the machine *in opposite directions*, and resting in open bearings, which allow the rollers to rest with their weight upon the inking table as it passes under them. The result of this disposition of the rollers is a compound motion precisely similar to that of two cork-screws, but in opposite directions; the adhesion of the elastic surfaces of the rollers upon the table causing them to revolve upon their centres, whilst their diagonal position gives them a motion in the direction of their length. The ink is thereby spread equally over the surface of the table, ready to be taken by the inking-rollers. Close to the cylinders at K are three rollers, called inking-rollers, because they ink the types. They revolve in open bearings, and lie parallel to the cylinder.

Having described the inking apparatus in detail, we shall now explain its combined action. The inking process, then, consists of five parts:—There is the body of ink in the trough, from which the ductor takes a film of the requisite thickness.—From the ductor the ink is taken by the feeding-roller, and by it laid upon the table.—Over the surface of the table the ink is equally distributed by the compound motions of the distributing rollers.—When so spread, the reciprocating motion of the carriages brings the table under the inking-rollers, which thus receive the colour; and as the types also pass, in going and returning, under the inking-rollers, they become inked.

As the cylinders move in opposite directions, it must be obvious that that cylinder alone can print whose motion is coincident with the type-carriage at the time; and this occurs alternately, when the forms, after being inked, are passing inwards under their respective cylinders—the first form being printed when the type-carriages are moving from right to left of the engraving, and the second form when they are returning from left to right. As the forms, after the impressions are taken, have to return under the cylinders to be inked anew, a portion of each cylinder is turned down to a smaller radius, so as to allow the types to pass clear.

The apparatus for putting the paper into the machine is placed at one end, in front of the boy M. It consists of a series of broad tapes placed close together, passed over two small rollers about five feet apart. The ends of the tapes are secured to a wooden bar placed across, with its ends fastened to two endless leather belts. On an axis are fixed two large pullies, over which, and a roller (not shown in the drawing, but situated under the laying-on board) the two belts pass, and are secured. On the end of the axis with the pullies is a segment of a wheel with ten teeth, with a lever projecting from it. Another segment, with a projecting stud, is attached to the side of the large wheel, which in its revolution causes the stud first to act upon the lever, so as to throw the teeth of the two segments into gear, and by that means the series of endless tapes are made to move forwards about twelve inches, at first with a gradually accelerating motion, and soon at a uniform velocity, so that the sheet of paper, which lies upon the series of endless tapes, may not be displaced by a sudden jerk, and that it may be thrust into the machine with the same velocity as the cylinders.

To prevent the paper from slipping when going in, there are two projecting studs fixed to the tapes *behind* the sheet; up to these studs, and to a side guage, the boy places the paper. The instant the two segments become disengaged, the one with which the tapes are connected is drawn back by a gut band and balance-weight to its original position, ready for the next sheet.

We now come to treat of the tapes, which steadily lead the sheets of paper in their mazy course through the machine. They are about half an inch broad, made of strong materials, and are formed into two series of endless bands, arranged at certain distances apart, so as to fall into the interstices and margins of the forms, and are guided or retained in their proper positions by the moveable grooved guiding pullies *e*, *d*, and by the stretching pullies *c*, which are for the purpose of retaining the tapes at the proper degree of tension, being moveable, so as to correspond with the position of the other pullies. All the tapes meet together on the top of the receiving drum Q, at the point where the sheet is received into the machine; proceed in contact round the under part of the first cylinder, over the first drum, under the second, over and round the second cylinder to the point at which the printed sheet is thrown out, where they diverge; the one series *o o* then returns under the rollers *g* and *h*, over the stretching pullies *c* and the roller *i*, to the guiding pullies *d*, whence we traced them. The others, after quitting the point where the two series separated, pass upwards between the cylinders, over the guiding pullies *e*, down under the rollers *k* and *m*, over the stretching pullies (not seen, being concealed by the boy M), and up to the receiving drum Q, where the two series of tapes again meet.

The operation of printing is thus performed:—A boy M stands upon an elevated stool near the end of the machine, with a mass of damped paper lying on a board at his right hand. He takes a sheet off the heap, and lays it upon the broad tapes, placing it accurately to the guages: at the proper instant the sheet is pushed or drawn forward to where the two series of margin tapes meet, and being seized between them, is led round part of the receiving drum to the point where it and the cylinder nearly touch; it there leaves the drum, and embraces the first cylinder upon the printing blanket—the motion continuing, brings it to the lowest point of the cylinder at A, where it comes in contact with the first form of types moving in the same direction, and the impression is gradually taken line by line. As the sheet is printing, it moves upwards till it meets the first drum, which it passes over; then under the second drum; leaves that and comes upon the printing surface of the second cylinder, in an inverted position, that is, with the unprinted side of the sheet outermost, ready for the impression of the second form, which it receives at the lowest point of the cylinder, where it meets the second form of types, and is perfected. The sheet is by this time at the point where the two series of tapes diverge, and is there thrown out upon the fly-board placed between the cylinders, whence the sheets are taken by a boy, and laid in a heap upon a table before him.

The machine is put in motion by a belt from a steam-engine passing round a pulley on a horizontal shaft, which, by means of toothed wheels, gives motion to all the cylinders, drums, and type-carriages; the small rollers are turned by the tapes. The machine may be stopped at any instant by turning the handle of a lever, which shifts the belt from the fast to a loose pulley, without stopping the engine.

To produce an impression with a flat surface from a large form, requires a force of about from forty to fifty tons! and even with a cylinder, where a line only is impressed at a time, the pressure is little short of a ton. But, in the machine, to prevent any undue pressure of the cylinders upon the forms, there are wooden bearers, of the same height as the types, screwed upon the sides of the carriages under the ends of the cylinders; thus effectually shielding the types from the enormous and injurious pressure which a cylinder might, through accident or otherwise, be caused to exert.

Such is a description of the machine which is constantly employed in printing "CHAMBERS'S EDINBURGH JOURNAL," "HISTORICAL NEWSPAPER," and the present work, "INFORMATION FOR THE PEOPLE," and which it executes, as we have said, in a style not surpassed by any other species of press. In point of breadth of cylinder and type-carriage, this machine was originally intended to print a double sheet of these publications, or two separate sheets, and it still could do so if necessary. Hitherto it has printed only single sheets, but with so much greater rapidity than was previously calculated upon, and done its work so extremely well, that there has been found no occasion to make it produce two sheets at a time. The rate of speed at which it was calculated to print, was 750 sheets in the hour—the usual rate at which Cowper's best book-machines work; but it has been found that it will send forth with ease 800 an hour, or, if necessary, 900 an hour, or fifteen sheets in the minute, perfect and complete. From the time it was put up and fairly set to work, it has produced, in general, 8000 sheets per day, never "tiring" in its arduous labour, and never stopping unless during the night and on Sundays, or when it happens to outstrip our compositors in the execution of their department of the work. Prodigious as the quantity of printing is which this excellent machine executes, and great as is its rate of speed, not less astonishing is the smallness of the power employed in keeping it going, and the lightness of the duty of those who attend on its operations. It is placed at the end of a large well-lighted apartment on a ground floor, and the power is communicated to it by a belt proceeding by a hole cut in the wall from a small steam-engine, standing in a side-room. This engine is of no more than two-horse power, and is kept in motion by a boiler in a place adjacent. To regulate the engine, a man is employed, and the same person supplies the furnace with coal. Of this necessary article, about half a ton, or three shillings worth, is consumed daily: it will be recollected that coal is a cheap commodity in Mid-Lothian.

The printing-machine is under the superintendence of a steady person, well acquainted with the art of printing: it is his duty to place and displace the forms, to watch the impressions to see that the printing does not go out of register, to supply fresh bundles of paper; and take away the lots which have been printed; to regulate the darkness of the inking, to mend the tapes when any of them are accidentally broken, and, in short, to take complete cognisance of the whole process. The only other individuals engaged about the machine are the two boys, whose figures appear in the cut—the one doing nothing but laying on blank sheets, and the other as continuously taking them out when printed. These, therefore, form the complement of individuals employed in connexion with the process of steam-printing; but in the same apartment in which our machine works, other two men are engaged—one whose duty consists in damping and preparing the paper, carrying forms, &c.; and another, who is constantly engaged in counting off the printed sheets, and putting them in quires, preparatory to their being packed up, and sent off to the booksellers in the various parts of the country.

The nature and extent of the steam-press establishment which prints our sheets in Edinburgh, are now described; and it may be mentioned, that, on a similar, but more extensive scale, is the establishment of our agents in London, at which the editions of our works are printed for circulation in England. It will readily be supposed that the expense of erecting the machinery, which we have noticed, is by no means inconsiderable, even although printing-machines have fallen in price since the expiry of the patents. The machine of which we have given an engraving, cost upwards of L.300; but the erection of the steam-engine, the outlay for blanket stuff for the cylinders, and other accessories, amounted to at least L.300 additional. The cost of Cowper's printing machinery in London is considerably higher; this, however, some consider to be partly compensated by the exceeding accuracy and elegance of the workmanship.

Judging from the extraordinary perfection to which steam-printing has been brought within a very few years, it might reasonably appear that no farther improvements could be effected on this department of the printing art. But there is no discovered limit to human ingenuity. Every year is producing some curious if not valuable addition to printing machinery, and at present no one can foresee the termination to this as well as any other class of improvements. Besides those various descriptions of machines above alluded to, as being principally in use, there are others calculated to execute work of a more peculiar nature. Perhaps the most wonderful of these ingenious pieces of mechanism is a machine which has been made to print two colours by only one impression. The manner in which this apparently difficult duty is performed is singularly interesting. The printing cylinder, instead of revolving on its axle in a fixed socket, as in the other machines, is made to roll backwards and forwards, and the table for the types is stationary. The cylinder in retiring from giving the impression is followed by three inking-rollers, which, having received their ink from the distributing-plate, apply a fresh charge to the surface of the types. So far for one colour. When two colours, we shall suppose blue and red, are required to be printed, a portion of the form to be blue is placed on the table, and the other portion to be red is placed on a table directly underneath. This under form is inked by the advancing and retiring of rollers in the same manner as is the case with that above; being inked, the table heaves upwards, and the form or types are pushed into interstices left open for them in the upper form. Thus both surfaces are brought upon a level, and remain so till the cylinder effects the impression, when the lower instantly sinks. The sheet, when printed, is carried away by endless tapes, or cloth, and deposited on a table placed for the purpose. The forms used in this process are usually blocks or plates, dissected according to fancy, and the upper table not being solid, but composed of jointed brass susceptible of alteration, to permit the introduction of the under form, the printing of two colours at once is as simple as it is ingenious. On the same principle, three or more colours may be used, only by having additional tiers of inking rollers, distributing surfaces, and plates. We believe Sir William Congreve was the original inventor of the machine which has thus been applied to the purpose of printing in various colours. Hitherto, the work which has been executed by it has consisted chiefly of the stamp-duty marks for the Excise, and for bank-notes, fancy labels for druggists, and other similar jobs.

The only other peculiar machine which we may here notice, is one invented by Mr Cowper, intended to print from convex stereotype plates. The plates, instead of being fixed flat upon blocks, as will shortly be described, are fastened upon the cylinders, so as to give them a bent form, and the printing is effected with the face of the plate or type surface downwards; wherefore the paper is placed undermost instead of uppermost, as in all other printing. This mode of taking impressions is, however, more fanciful than useful, and is applied principally to the printing of religious tracts or other common work.

The introduction of printing machinery, either in adaptation to newspapers or books, has been effected more from the enterprise of certain individual printers, than from a general conviction among the members of the trade that it was an improvement upon the old process of printing. It was hardly, indeed, to be expected that printers, who had been so long accustomed to see the impression taken from types by means of flat surfaces, could all at once be reconciled to the use of cylinders instead. Accordingly, when they were first introduced, a prejudice existed, and still exists, with many in the business, that the face of the types is much more greatly injured by machines than by the ordinary press; whereas experience has demonstrated that this opinion is unfounded, because, in fact, the sharp angles of the letters are worn away by the paper being pressed by the soft elastic blanket into the interstices of the letters, and this is effected as completely when the impression is taken with a flat surface, as when a cylinder is used. The latter prints literally only a line at a time, and that minute portion of the circumference of a cylinder of nearly three feet in diameter, which presses upon the types, may, for all practical purposes, be safely considered a flat surface. From our own experience in both modes of printing, we would say that new types are much sooner worn down in their finer parts and acute angles by the pressure of cylinders than by that of the platten of a manual press; but then, on the other hand, such is the power—the searching pressure of cylinders, that a fount of types *will print well a great deal longer by a machine than by a hand-press.* We are confirmed in this belief by the opinion of different individuals who possess steam-printing machinery. The prejudice against cylindrical printing has led to very numerous and expensive attempts to apply steam-power to machines with flat printing surfaces. Some of these made by Napier have succeeded tolerably well, but they have never yet been found to equal, either in point of expedition, quality of work, or economy, the cylindrical machine. The last improvement in this description of machine was patented by a person in Newcastle, the leading feature of whose invention consists in placing the forms of types in a *vertical* position. We consider all attempts of this nature quite hopeless and fantastic.

Whatever may have been the prejudices of printers with regard to cylindrical printing, they have not been more strong than the dislike of the pressmen to the application of this greatest of all improvements in the art. It was believed by the operative printers generally, that machines would ruin their trade, and that henceforward they would perhaps spend their days in poverty and wretchedness. But the experience of a few years has proved how ill-founded these melancholy anticipations have been. It is now seen that manual and machine presses possess each peculiar characters, and do not trench upon the work of each other to an extent worth mentioning. The hand-press is much superior to the machine when the impression is limited to 750 or 1000 copies; it being hardly worth while to prepare the forms, to alter the tapes and blankets, and to set the machine a-going, for so small an impression. Hand-presses, therefore, will most likely always command the printing of books of limited impressions, and when particularly fine work is required. Presses wrought by men are, however, entirely unavailing when the impressions come to be thousands in number. This fact was strikingly developed in our own case. Before our steam-press was erected, we had sometimes the greatest possible difficulty to get our Journal printed. The impression for Scotland, which was 25,000 copies weekly, occupied two presses night and day for six days in the week, there being eight men employed, four acting as a relief during the night. Even by this incessant toil, our publication was frequently kept back so late as to prevent the dispatch of country parcels. It almost appeared that human nature could not stand up against such violent labour. No amount of wage seemed to be able to cause the workmen to remain sober. Notwithstanding the utmost attention of the master printers, the stereotype plates were damaged, and the paper wasted. On one occasion, we could not get the work printed at any price in Edinburgh, and were compelled to send it to Glasgow—a distance of 44 miles—to be executed. Such occurrences as these, and the dreadful harassment of mind which ensued, led us to think of removing the printing of our publications altogether to London. From this step, however, we were saved by Messrs Ballantyne and Company kindly undertaking to execute our printing with their machines; and with these our Journal was printed until our own machine was erected in October 1833. Those only who have experienced the same species of vexation which we had done, can understand the feeling of delight which animated us on first seeing this machine regularly at work, and both by the quantity and quality of its produce, affording a joyful prospect of future tranquillity.

We mention the above circumstance with the view of pointing out the utter inability of hand-presses, when large impressions, especially of periodicals, are required. Granting that they could, by calculation, execute the impressions in good time, it is too much to expect that human beings can, day after day, and week after week, exert their muscular strength to such a painful and body-killing extent. By the removal of our printing and that of others from hand-presses, it, moreover, does not appear that the quantity of work suitable for manual labour is lessened. The appetite for reading which sheets like the present create, leads to the reading, and, consequently, to the increased printing of books, and that in most instances by presses wrought with the hand.

By the erection of steam-presses, the three grand requisites, speediness of execution, quantity, and cheapness of labour, are procured to an extent demanded by the necessities of the age, and, without the aid of printing-machinery, the tide of knowledge and human improvement would be forced back greatly to the injury of society. Nothing, in our opinion, within the compass of British manufacturing industry, presents so stupendous a spectacle of moral power, working through the means of inert mechanism, as that which is exhibited by the action of the steam-press.

APPENDIX.—Stereotyping.

We may now offer a brief explanation of the process of stereotyping, which has been of immense service to literature. Stereotyping is the manufacturing of fictitious pages of types, and the invention is generally attributed to a Mr William Ged, of Edinburgh, about the year 1725. When the art was properly made known, it was hailed with acclamation by the printing and publishing world; but as experience developed its powers, it was found to be strictly applicable only to a particular kind of work.

When a page is intended to be stereotyped, the same process of putting up the types is gone through that we have already mentioned; instead, however, of being carried to the press, the page is plastered over with liquid stucco to the thickness of about half an inch, so that a level cake is formed on the surface of the types. As soon as the stucco hardens, which it does almost immediately, the cake is separated from the types, and, on being turned up, shows a complete hollow or mould-like representation of the faces of the types, and every thing else in the page. There being no longer any use for the types, they are carried off and distributed. As for the cake, it is put into an oven, and baked to a certain degree of heat and hardness, like a piece of pottery. It is next laid in a square iron pan, having a lid of the same metal, with holes at the corners. At the bottom of the pan there is a moveable plate, called the floating-plate; and upon this plate, which has a smooth accurate surface, the mould is placed with its face downwards. The lid being now placed and held tightly on by a screw, the pan, by the assistance of a crane and other mechanism, is immersed in a pot of molten lead, and being allowed to fill by means of the holes, it is at length taken out and put aside to cool. On opening the pan, a curious appearance is presented. The lead has run into the mould side of the cake, and formed a thin plate all over, exhibiting the perfect appearance of the faces of the types on which the stucco was plastered. Thus is procured a plate, or fictitious page of types, not thicker than the sixth of an inch. When the plate comes out of the pan, it is in a somewhat rude state, and has to be carefully pruned at the edges, its little specks picked clean, and, if necessary, one or more bad letters cut out, and replaced by soldering in the heads of moveable types. The plate is also planed upon the back by means of an ingenious rotatory cutting machine upon which it is fixed.

The stereotype plates, so prepared, are next taken to the printing-office, and made ready for press. This is done by placing them upon iron or wooden blocks, so that both plate and block make up the exact height of a page of real types. They are fixed to the blocks by the aid of small metal catches at the sides, head, and foot, which catches are held fast by slips of furniture properly wedged. Notwithstanding the great care taken in making the plates level and of a uniform thickness, it is seldom they are perfect; and to make them as accurate as possible for a fair impression, scraps of thin pasteboard or paper are placed betwixt them and the blocks at the thinnest parts. When the impression is completed, the plates are unfixed, packed up, and laid aside for future use. Now for the specific utility of stereotyping.

In all cases of common book-work it is best to print from types to the amount of the copies required, and then distribute the types; but in most cases of books published in parts, sheets, or numbers, stereotyping becomes absolutely necessary. It is easy to perceive the reason for this. When books are published in numbers, it often happens that many more copies are sold of one number than of another; and unless the types be kept up to complete sets in the hands of the publisher, or to print copies according to the increased demand, a serious loss is sustained. The manufacture of stereotype plates is, therefore, simply a means of keeping up fictitious types to answer future demands, at an expense greatly inferior to that of keeping the actual pages standing, or of putting the types up anew.

As this publication, as well as the Journal, is regularly stereotyped, there has, perhaps, hardly ever occurred such a remarkable instance of the value of this vast improvement in the typographic art. The very manner in which the work is effected furnishes matter for surprise. The types being put up on the premises of the publishers, are sent off in pages to a stereotype foundry, where two sets of plates are moulded, and the pages are then returned. One set of plates is kept for use in Edinburgh, and the other sent in a box by the royal mail or steam-vessel to London, where it is immediately subjected to a steam-press, and, in a few hours, made to produce twenty thousand or more printed sheets. By this wonderful process, the expense of setting up the types in London is avoided, and the publishers thereby permitted to extend the circulation of their works on the most liberal principles, and in a very quick manner, all over the empire, both to the benefit of the booksellers and the public. At the outset of the Journal, stereotyping most unfortunately was not resorted to; in consequence of this oversight, some of the numbers were put up in types four and five times, to print off additional supplies; and it has only been since the whole were regularly stereotyped, as well as printed with machinery, that the work has produced any profit commensurate with the exertions bestowed upon it, or been conducted with satisfaction to the parties concerned.

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NATURAL PHILOSOPHY.

NATURAL PHILOSOPHY is a term of wide import and comprehensive meaning. It is not confined to one science alone, but includes many; all, indeed, which teach the nature and properties of actually existing substances, their motions, their connections with each other, and their influence on one another. It is sometimes also called *Physics*, from a Greek word which signifies *nature*. But that word has now a more circumscribed meaning, being, in common discourse, confined to that branch of natural philosophy connected with bodily health.

All those subjects of human investigation which are dignified with the appellation of sciences, may be divided into three grand classes. The first, which relate to *number* and *quantity*, and teach the properties of numbers and figures, are called *Mathematics;* the second, which relate to *matter*, and treat of the properties of the various bodies with which we are made acquainted by means of the senses, or by philosophical experiment, are called *Natural Philosophy;* and the third, which relate to *mind*, and investigate its nature, and the motives and rules of human actions, and the ends to which they ought to be directed—in other words, those sciences which treat of the moral nature of man, both as an individual and as a member of society, are called *Intellectual* or *Moral Philosophy*. With the first and third of these classes we have nothing to do at present, though to treat of them forms a part of the plan of this work; and therefore we will revert to them upon a future occasion. It is to the second class of sciences that our attention is for the present to be entirely devoted.

The sciences included in the general term Natural Philosophy may be divided into two great branches. The first and most important, and on that account sometimes called *Natural Philosophy*, but more properly *Mechanical Philosophy*, investigates the sensible motions of all bodies. The second investigates the constitution and qualities of all bodies, and is designated by various names, according to its different objects. Of the sciences composing this class, there are several to which the generic appellation of Natural History has been given. These are, *Botany*, which treats of the arrangement, classification, and habits of vegetable bodies; *Zoology* (a word derived from the Greek, and signifying to speak of animals), which teaches the arrangement, classification, habits, &c. of the lower animals; *Geology* (from two Greek words, signifying to speak of the earth), which investigates the nature of the strata of the earth, and the causes which produced them; to that department of the subject which treats of the waters of the earth, the name of *Hydrology* is sometimes given; *Meteorology*, which teaches the nature and causes of the phenomena which take place in the atmosphere; *Mineralogy*, which teaches the arrangement, the structure, and the nature of minerals, and treats of the earth composed of these masses; and *Crystallography*, the science which teaches the forms of crystals. Crystals are those bodies which, when they cohere into solid masses, assume a determinate figure or form. This science, which is of recent origin, is still in its infancy; for although the exact shape of almost every crystal may be determined, yet the laws by which a certain species of matter is made to assume it, are by no means very manifest. As far as experiment has gone, the intimate constitution of solid bodies appears to be very complicated, and little can be said to be known upon the subject, philosophically speaking. *Chemistry* is sometimes separated from natural philosophy, but, in accordance with the enlarged definition of the term which we have adopted, it forms a part of it. It unfolds the nature of the intimate particles, the atoms of bodies, their relations to each other, and the laws by which their combination and decomposition are affected. Here we have a very broad line of demarcation between it and that branch of the subject called mechanical philosophy. The latter treats of the relation of mass to mass, together with their sensible motions; and the other, of atom to atom, including all the phenomena resulting from their mutual attractions. Closely connected with both zoology and botany are those sciences which have, what we may term, the surname of *Physiology* given them: these are animal, vegetable, and comparative physiology; and to assist the memory of the reader, it may be mentioned, that they all have reference to a *living* object, or at least to one which had life. Physiology relates to the phenomena of life in general. Animal physiology, or anatomy, teaches the structure and functions of animals. Vegetable physiology, or anatomy, teaches the structure and functions of vegetables. And comparative physiology, or anatomy, teaches the structure and functions of the lower animals, as compared with the human frame, which is the most perfect of all. *Medicine* is another, and a most important branch of the subject. It teaches the nature of diseases, the causes, cures, and the means of preventing them.

It cannot be denied that such a distribution of the subject is necessarily imperfect, on account of one science becoming intimately and unavoidably blended with another. "Thus," says Lord Brougham, "chemistry shows the qualities of plants with relation to other substances, and to each other; and botany does not overlook those same qualities, though its chief object be arrangement. So, mineralogy, though principally conversant with classifying metals and earths, yet regards also their qualities in respect of heat and mixture. So, too, zoology, besides arranging animals, describes their structures, like comparative anatomy. In truth, all arrangement and classifying depends upon noting the things in which the objects agree and differ; and among those things in which animals, plants, and minerals agree, must be considered the anatomical qualities of the one, and the chemical qualities of the other. From hence, in a great measure, follows the second observation, namely, that the sciences mutually assist each other. Mechanical philosophy, in like manner, assists, though, in the present state of our knowledge, not very considerably, both chemistry and anatomy, especially the latter; and chemistry very greatly assists both physiology, medicine, and all the branches of natural history."

The first great head is Mechanical Philosophy, or what may be termed Natural Philosophy proper. It consists of various subdivisions, each constituting a science of great importance. At the head is placed *Dynamics*, from the Greek word signifying power or force, and it teaches the laws of motion in all its varieties. This science may be said to form the foundation of the other branches of mechanical philosophy, and should be looked upon as forming a portion of every other rather than a distinct and separate one of itself. When applied to the motions of the heavenly bodies, it forms the science of *Physical Astronomy;* and when to the calculation, production, and direction of motion, forms the science of *Mechanics*, or, more properly, *Practical Mechanics*. The term practical has been prefixed to distinguish this branch of the subject from that which comprehends every thing relating to motion and force. When forces act upon bodies so as to produce rest, that branch of mechanics which investigates the subject is termed *Statics*, from a Greek word signifying standing still. These divisions again branch out into distinct subdivisions, each having a name corresponding to the states of the bodies treated of, whether solid, fluid, or aëriform, and also according as we consider the equilibrium or motion of matter in the three states above named.

The application of dynamics to the pressure and motions of fluids, such as water, constitutes the science of *Hydrodynamics*, from the Greek words signifying water, and power or force. This science is again divided into two others; first, *Hydrostatics*, which treats of the equilibrium or the weight and pressure of liquids, from the Greek words for balancing of water; and, secondly, *Hydraulics*, which treats of their motion, from the Greek name for certain musical instruments played with *water* in *pipes*. When dynamics is applied to fluids, light and invisible, like atmospheric air, it constitutes the science of *Pneumatics*, from the Greek word signifying breath or air. Pneumatics relates to the equilibrium or movements of aërial fluids under all circumstances of pressure, density, and elasticity. With the pressure of air upon all bodies on the earth's surface, the ancients were entirely unacquainted. To Galileo and his pupil Torricelli we are indebted for this important discovery. Intimately connected with the last science is that branch of natural philosophy called *Acoustics*, which treats of the nature of sound, and the laws of its production and propagation. The science of sound was cultivated from the earliest ages; but although both Pythagoras and Aristotle were acquainted with the manner of its transmission through the air, and also investigated the nature of harmony, until Bacon and Galileo, Mersenne and Wallis, Newton, Lagrange, and Euler, showed its nature and laws, and submitted it to mathematical scrutiny, it can scarcely be said to have risen to the elevated station of a separate science. We keep out of view its application in the delightful art of music. Its progress has been constant and accelerated, and is now considered an important branch of experimental and mathematical science.

One of the most extensive and interesting branches of natural philosophy is the science of *Optics*, from the Greek word to see. It treats of the properties of light and of vision, as performed by the human eye. Closely connected with light is *heat*, the laws of which, together with the subjects of electricity and magnetism, fall within the jurisdiction of natural philosophy.

Such is a brief outline of the extensive range of sciences comprehended under the generic term of Natural Philosophy. Some of them, such as astronomy and mechanics, we have already treated of; and it is not our purpose to recapitulate here what was stated in the numbers of this work devoted to these branches of the subject. But, connected in a particular manner with these, there are certain topics, such as the properties of bodies, and the laws of matter and motion, which it was not found convenient to discuss to the full extent which their importance entitles them to in the articles above named. To these points, therefore, we propose to direct our attention at present. The other sciences, such as acoustics, pneumatics, hydrostatics, hydraulics, optics, &c. will be fully treated of in some future numbers of this work. The present article is therefore to be considered principally as an introduction to the study of natural philosophy.

PROPERTIES OF MATTER.

Matter, or that of which all bodies are composed, whose existence is made known to us by means of the senses, or by the test of philosophical experiment, is possessed of various properties, some of which are termed essential, because we cannot conceive of matter existing without them. There are others which do not appear to be essential to matter—that is, we could conceive of the existence of matter which was destitute of them, but which, nevertheless, are never found wanting in matter—they are called general or contingent properties; and there is a third class of properties which can, by certain methods, be conferred upon matter. These various properties we shall describe according to their relative importance.

IMPENETRABILITY.

By impenetrability, is meant the property which all bodies possess of occupying a certain portion of space, by virtue of which they exclude other bodies from existing in the same place at the same instant. There is clearly a difference here between the meaning of the word as it is employed scientifically, and as it is used in common language. In the usual sense we call any hard body, such as a stone, impenetrable, because it firmly resists our efforts to pierce it. But as it is understood philosophically (although we can condense, pierce, and remove the greater number of them), all bodies are alike impenetrable, because they equally possess the property of excluding other substances from the space which they occupy. When any body, such as the human hand, is plunged into water, the water is displaced so as to make room for the hand which has been immersed; for a liquid and a solid can no more occupy the same place at the same time than two solids. There are cases in which a condensation takes place, when two fluids are mixed together, so that a considerable deal less space is occupied by the two together than was occupied by them in a separate state. But this arises from a chemical combination having taken place; the particles of the substances, by the mysterious agency of chemical attraction, have been drawn closer together; thus the whole fluid occupies less space than it did formerly. In the same way, a sponge, by being compressed, has its particles brought nearer to each other, and of course it has less bulk than it had before it was squeezed. Indeed, the hand and the sponge together occupy the same space as the latter did singly. A nail, driven into a piece of wood or other soft material, under certain circumstances does not enlarge the general size of the body; but in penetrating it, it displaces its particles, and occupies the space which they occupied, and accordingly they are rendered more dense, or become more solidified than they were before, just in the same way as the particles of the sponge when compressed. In the one case, the particles are condensed from without, and the other from within. But these particles still occupy a certain quantity of space which cannot be occupied by other particles at the same time, for in every case in which the attempt is made, although this apparently seems to be effected, it will be found that the one has been removed to make way for the other.

EXTENSION OR MAGNITUDE.

All bodies which are observable by the senses are found to occupy a certain portion of space—that is, they possess extension or magnitude; and those which are so small as to elude investigation in this manner, are considered by the understanding to possess it. Indeed, the impenetrability of matter presupposes its extension or magnitude. It is impossible to conceive of matter, however minute may be the particle, without connecting with it the idea of its having a certain bulk, and filling a certain quantity of space. In common phraseology, we express this property of bodies by the word size; but the most appropriate term is volume. Thus, we say the volume of a terrestrial or celestial globe is so many cubic inches. When the *lines* and *surfaces* of a body are spoken of, the external limits of its magnitude are implied. Lines are the limits which separate the several surfaces of the same body. They are also called edges. Thus, the line which separates the top from one of the sides of a box is denominated an edge. The quantity of a surface is called its *area*, and the quantity of a line is termed its *length*. Thus, we say the area of a floor is so many yards, and the length of a rope is so many yards. Volume, area, and length, however, are sometimes expressed by the word magnitude. The dimensions of magnitude or extension are usually entitled length, breadth, and depth; and they vary of course very considerably in different bodies, according to their shape. Height and depth are the same dimension, considered in different points of view. When a body is measured downwards, it is said to be so many feet, &c. deep; when measured upwards, it is said to be so many feet, &c. high. Breadth and width express the same dimension.

FIGURE.

When we say that every body possesses figure, we mean that the extension of every body is bounded. The figure or the shape of a body is indicated by the limits of extension. If we place our hand upon a solid body, we become sensible of its impenetrability and extension, for it resists the entrance of the hand within its dimensions; and that this obstruction commences in certain places, and has certain limits, which limits determine its figure. Figure and volume are entirely independent of each other, and should be carefully distinguished. Bodies which have the same figure may possess very different volumes. For instance, an orange and the globe have the same figure, but not the same volume; and bodies may have the same volume, but possess different figures. Thus, two masses of matter may have the same volume, although the one be round and the other square. The figure of a body is its shape or form, the volume of a body is its size or dimensions. In general, nature assigns regular forms to her productions. Besides those which belong to living bodies, minerals also possess them, as we see in the great variety of crystals. Many of these are alike remarkable for the symmetry of their form and the transparency of their colour.

But further, with regard to figure in general: When the subject is attentively considered, some difficulties arise with regard to figure being essential to matter; and two questions might be asked, which at first sight appear rather embarrassing to answer. 1. Can we not suppose a mass of matter to increase in extension till it becomes infinitely large; and if so, how can we assign any bounds to it; for by these, figure is determined? and, 2. Has a fluid, such as water, any figure? In reference to the first question, we reply, that, although we can *conceive* of a mass of matter larger than any assignable quantity or being indefinitely large, yet our minds cannot *rest* for a moment in contemplation of such a mass of matter, without at the same instant conceiving of its extremities, and thus associating it with determinate dimensions. The human intellect is not capable of grasping at infinity; for the very means which we employ to enable us to speculate or reason upon the subject, lead us to conceive of finite size. Hence, all bodies which we either perceive or conceive, do in reality possess the property of figure. With regard to the second question, we reply, that the terms *figure* and *regular figure* are not to be confounded with each other; for although it would be absurd to say that fluids have any constant or regular figure, it would be equally erroneous to deny, that, at any given instant of time, they have a definite and actual figure. The cohesion, however, which exists amongst the particles of fluids is so much inferior to that of solids, that the figure of these bodies is liable to be disturbed by the slightest cause. But whenever one figure is destroyed, another must be assumed, however different it may be from the former; for without we admit this fact, we must admit the annihilation of matter, which is an absurdity, and not at all indicated by any thing which we observe in the world around us.

The three properties above described, viz. impenetrability, extension, and figure, are the most important of those which belong to matter. They may be considered as the principal tests of materiality; and where they can neither be detected by the senses, nor made demonstrable by reason, there can be no matter.

DIVISIBILITY OR SEPARABILITY.

The susceptibility of matter to be separated into parts, is a fact rendered familiar to us by every day's observation. The melting of sugar in a tea-cup, of salt in our soup, and a thousand other examples, have taken place before our eyes a thousand times. To the practical subdivision of matter there seems to be no assignable limit; and many of the instances of it which may be found in philosophical investigations, almost exceed credibility. The useful arts, also, furnish many striking examples; but it is in the organised world that the most astonishing proofs of the extreme divisibility of matter are to be found.

The blood which flows in the veins of animals is not as it seems, an uniformly red liquid. It consists of small red globules, floating in a transparent fluid called serum. In different species these globules differ both in figure and in magnitude. In man, and all animals which suckle their young, they are perfectly round or spherical. In birds and fishes they are of an oblong spheroidal form. In the human species, the diameter of the globules is about the 4000th of an inch. Hence it follows, that, in a drop of blood which would remain suspended from the point of a fine needle, there must be about a million of globules.

Small as these globules are, the animal kingdom presents beings whose whole bodies are still more minute. Animalcules have been discovered, whose magnitude is such, that a million of them does not exceed the bulk of a grain of sand; and yet, each of these creatures is composed of members as curiously organised as those of the largest species; they have life and spontaneous motion, and are endued with sense and instinct. In the liquids in which they live, they are observed to move with astonishing speed and activity; nor are their motions blind and fortuitous, but evidently governed by choice, and directed to an end. They use food and drink, from which they derive nutrition, and are therefore furnished with a digestive apparatus. They have great muscular power, and are furnished with limbs and muscles of strength and flexibility. They are susceptible of the same appetites, and obnoxious to the same passions; the gratification of which is attended with the same results as in our own species. Spallanzani observes, that certain animalcules devour others so voraciously, that they fatten and become indolent and sluggish by overfeeding. After a meal of this kind, if they be confined in distilled water, so as to be deprived of all food, their condition becomes reduced; they regain their spirit and activity, and amuse themselves in the pursuit of the more minute animals which are supplied to them; they swallow these without depriving them of life, for, by the aid of the microscope, the one has been observed moving within the body of the other. These singular appearances are not matters of idle and curious observation. They lead us to inquire what parts are necessary to produce such results. Must we not conclude that these creatures have heart, arteries, veins, muscles, sinews, tendons, nerves, circulating fluids, and all the concomitant apparatus of a living organised body; and, if so, how inconceivably minute must these parts be! If a globule of their blood bears the same proportion to their whole bulk, as a globule of our blood bears to our magnitude, what powers of calculation can give an adequate notion of its minuteness!—*Lardner*.

The transparent wings of certain insects are so attenuated in their structure, that 50,000 of them placed over each other would not form a pile a quarter of an inch in height.

In the manufacture of embroidery, it is necessary to obtain very fine gilt silver threads; to accomplish this, a cylindrical bar of silver, weighing three hundred ounces, is covered with about two ounces of gold; this gilt bar is then wire-drawn, until it is reduced to a thread so fine, that 3400 feet of it weigh less than an ounce. The wire is then flattened by passing it between rollers under a severe pressure—a process which increases its length, so that about 4000 feet shall weigh one ounce. Hence, one foot will weigh the 4000th part of an ounce. The proportion of the gold to the silver in the original bar was that of 2 to 300, or 1 to 150. Since the same proportion is preserved after the bar has been wire-drawn, it follows that the quantity of gold which covers one foot of the fine wire is the 150th part of the 4000th of an ounce; that is, the 720,000th part of an ounce.

The quantity of gold which covers an inch of this wire will be twelve times less than that which covers one foot. Hence, this quantity will be the 8,640,000th part of an ounce. If this inch be again divided into 100 equal parts, every part will be distinctly visible without the aid of microscopes. The gold which covers this small but visible portion is the 864,000,000th part of an ounce. But we may proceed even further: This portion of the wire may be viewed by a microscope which magnifies 500 times, so that the 500th part of it will thus become visible. In this manner, therefore, an ounce of gold may be divided into 432,000,000,000 parts. Each of these parts will possess all the characters and qualities which are found in the largest masses of the metal. It retains its solidity, texture, and colour; it resists the same agents, and enters into combination with the same substances. If the gilt wire be dipped in nitric acid, the silver within the coating will be dissolved, but the hollow tube of gold which surrounded it will still cohere and remain suspended.

Dr Wollaston succeeded in obtaining platinum wire, the diameter of which did not exceed the 3000th part of an inch. A quantity of this wire, equal in bulk to a common die used in games of chance, would extend from Paris to Rome. Newton determined the thickness of transparent substances by observing what colours they reflected. A soap bubble, which is a thin shell of water, and the matter of soap, reflects different colours from different parts of its surface. Immediately before the bubble bursts, a black spot may be observed near the top. At this part, the thickness has been proved not to exceed the 2,500,000th of an inch.

Amongst other instances of the divisibility of matter, we may notice the following:—The particles of light afford an admirable proof of the fineness and tenuity to which matter can be reduced. They descend from a distance which in some cases can scarcely be calculated, with extraordinary velocity; and whilst they strike upon the most delicate part of the human body, the [illegible]e, the blow is imperceptible. How inconceivably minute, therefore, must the atoms of light be! The effluvia given forth by a single grain of musk has been known to perfume a large apartment for twenty years, and yet at the expiry of that period there was no sensible diminution of the odoriferous matter. In the process of abrasion we have a striking illustration of the divisibility of matter. The particles of sand in the Arabian desert have, by their attrition, polished the hard rocks over which they have been drifted by the winds, during a long succession of ages. The toe of the bronze statue in the church of St Peter's at Rome, has been actually worn away by the kisses of ardent pilgrims! Yet how infinitely small must have been the quantity which attached itself to the lip of the devotee at each salutation!

Such are some of the remarkable phenomena connected with the divisibility of matter; and we are naturally led to inquire, is matter infinitely divisible, or are there certain constituent atoms which are incapable of farther division? The latter supposition is the one most generally admitted, yet there is no denying that it seems scarcely a legitimate inference. For however small a particle may be, we can easily conceive of one still smaller—for instance, by simply supposing that same particle halved. To the understanding, without reference to direct observation, it seems as absurd to assign limits to the divisibility of matter, as boundaries to space, which is considered infinite. Nevertheless, philosophers are of opinion, that, by a due consideration of phenomena, the existence of constituent material atoms is not only rendered probable, but almost morally certain, although we are unable by direct observation to prove the fact. The most remarkable of these phenomena is the formation of crystals, of which an account is given in the number of this work upon Chemistry. The details of the process of crystallisation give indications that the ultimate atoms of which the crystallised substances are composed, have a determinate figure. And it appears reasonable to presume that all bodies are composed of atoms; that the different qualities with which we find different substances endued, are a result of the figure and magnitude of these atoms; that the latter are indestructible and immutable by any natural process, and that although so minute as to elude the most refined analysis which human ingenuity has contrived to bring them under observation, yet as possessing magnitudes which they do not exceed.

POROSITY.

That the minute indestructible atoms of bodies are not in a state of actual contact, but are separated at some distance from each other, although that is imperceptible, is an unquestionable fact, notwithstanding that it appears at first sight unwarranted. In the article Chemistry, we have shown that the attraction subsisting amongst the particles of bodies is overcome by the repulsive agency of heat; that the latter exists even in the coldest bodies; and that, wherever it is present, it tends to keep the particles asunder. Hence it follows, that the volume of a body consists partly of material particles, and partly of interstitial spaces, which spaces are either an absolute void, or filled by some substance different from the body in question. These spaces are denominated *pores*, and the quality of having these is denominated porosity. The crossing of the constituent crystalline needles or plates in bodies also produces porosity. In some cases these are visible to the eye; in others they are brought within the sphere of observation by means of the microscope, and in all they can be proved to exist in some way or another. Owing to this circumstance, some bodies, such as water, become more bulky when rendered solid, than what they were when in the liquid state. The proportion of the quantity of matter to the volume, is called the *density*, which is always in an inverse ratio of the porosity.

The instances of porosity are numerous in every department of the material world, but those which are connected with animal and vegetable bodies are the most remarkable. Bone is a tissue of cells and partitions, and, when seen through a microscope, may be said to resemble a honeycomb. Wood appears as if it were a bundle of hollow tubes, like a pan pipe, for instance. If the end of a cylinder of straight wood be immersed in water, whilst the other is forcibly blown into, the air will be found to pass through the pores of the wood, and rise in bubbles through the water. A piece of wood, sunk to a great depth in the ocean, and exposed to the pressure there, has its pores filled with water, and becomes nearly as heavy as a stone. Thus, the boat of a whale-fishing ship, which had been dragged far under water by a whale, on being afterwards drawn up, was supposed to be bringing a piece of rock with it.

A piece of cork, in a strong close glass vessel nearly full of water, may be seen floating at the top; but if more water be then forcibly pumped into the vessel, the cork will be squeezed and reduced in size, until at last it becomes heavier than water, and sinks. On afterwards allowing water to escape, the cork will resume its bulk, and rise. A cork sunk two hundred feet under water will never rise again of itself.

A bottle of fresh water, corked, and let down thirty or forty feet into the sea, often comes up again with the water saltish, although the cork be still in its place; the explanation being, that the cork, when far down, is so squeezed as to allow the water to pass in or out by its sides, but on rising resumes its former size.*

The *compressibility* and *dilatability* of matter are qualities closely allied to porosity. By the former word is meant that quality in virtue of which a body allows its volume to be diminished without the quantity or mass of matter being diminished. It arises, of course, from the constituent particles being brought nearer to each other, and is effected in various ways; but the term compressibility is only applied to it when it is caused by the agency of mechanical force, as by pressure or percussion. All bodies are capable of being diminished in bulk, which is a conclusive proof of their porosity. But some of them have the power of resuming their former volume, when the force which diminished it is withdrawn. This quality is termed *elasticity*. All hard bodies, as steel, glass, ivory, &c. are elastic; and a great number of soft ones, as caoutchouc or India rubber, silk thread, a harp string, &c. The aëriform fluids, such as atmospheric air, are all exceedingly elastic; and so are liquids, such as water, but to a smaller extent. Elastic bodies vary much as to the extent to which they will yield without breaking, and as to the degree of perfection with which they regain their former state. A good sword may be bent until its ends meet, and resume its former straightness so perfectly as to appear as if it had never been disturbed. Other bodies, again, will retain something of a curvilinear shape. Marble and ivory are both very elastic. A billiard ball of the latter scarcely loses even its polish by long wear, although the parts which were struck yielded at every blow which they received. A marble chimney-piece, long supported by its ends, is found to have acquired a permanent bend. The elasticity of bodies is a quality of great utility, as is shown in time-pieces, such as watches, whose steel springs, although much and constantly bent, resume their original form when freed at the end of a century. Carriage-springs, gun-locks, &c. &c. are also instances of the usefulness of elasticity. Beds, sofas, couches, &c. derive their value from this property of matter as much as from their softness; indeed, their softness may be said to be derived from this quality. Air shows its elasticity at the greatest degree of rarefaction to which human ingenuity has as yet been able to carry it. A small quantity of air enclosed in a bladder, if freed from the pressure of the surrounding atmosphere by means of an air-pump, will, in virtue of its elasticity, raise a weight of several pounds. If a balloon were full while at the surface of the earth, it would infallibly burst when it ascended into the higher regions of the air. The density of the atmosphere, at the height of about $3\frac{1}{2}$ miles, is about one-half of what it is at the surface of the globe.

In recent times, the compressibility of water and other fluids has been determined by experiment. Mr Perkins, of London, found that a column of water an hundred times as heavy as the atmosphere (that is, exerting a pressure of 1500 lbs. upon every square inch) compresses water about [illegible] part of its whole magnitude.

Dilatability is the opposite of compressibility. It implies that quality of bodies by which they are enabled to be expanded in volume without being increased in the mass. The effect may be produced in several ways, for some bodies, as we have seen, have a natural tendency to dilate or expand after mechanical pressure is removed from them. But heat is the grand agent of nature, as well as art, in dilatation. This is manifested in an innumerable variety of natural phenomena, as well as philosophical experiments. As the subject, however, was treated of under Chemistry, it is unnecessary here to recapitulate the facts there brought under review. It may be stated generally, that the reduction of temperature, considered with reference to mechanics, is equivalent to compression, since it diminishes the volume without altering the mass; whilst an elevation of temperature is, on the same principle, equivalent to dilatability, since it enlarges the body without increasing the mass.

INERTIA.

In the number of this work devoted to Astronomy, we gave a general view of this property of matter, but it will here be necessary to enter more minutely into the subject.

From observation it must have early become evident to mankind that matter is incapable of spontaneous change of place. The history of the human mind, in its gradual progress from the savage to the civilised state, from the condition of ignorance to that of knowledge and philosophical superiority, is perhaps very similar to that of any individual mind, from the first dawn of reason, to the highest state of mental cultivation of which it is susceptible. One of the first inquiries of a child, when it sees either an object moving through the air, or upon the surface of the ground, is, How does it fly? how is it driven along? There is always a reference to some cause, some extraneous influence by which the state of rest of a body is broken, and it is enabled to shift from place to place. But this does not convey all the meaning which is implied in the word inertia. It expresses the resistance which matter makes to a change of state, whether that be motion or rest—in other words, that a body at rest would for ever remain so, were it not disturbed by some external cause; and that a body in motion would for ever continue to move on, were it not acted upon by external influence, and brought to a stand still. Every-day experience proves the truth of the first proposition, and many instances might be adduced of the stubbornness or obstinacy of matter, as its inertia is sometimes figuratively called, to yield to any impression given it, and its tendency to remain quiescent. When the sails of a ship are unfurled to the breeze, slowly and heavily at first she gets into motion, but gradually her speed increases as the force by which she is impelled overcomes the inertia of her mass. A great force is necessary at first to set a vehicle in motion, but when once this is effected, it goes onward with comparative ease, so that, in fact, a strong effort is necessary before it can be stopped. If a person be standing in it when it is suddenly set a-going, his feet are pulled forward, whilst his body, obeying the law of inertia, remains where it was, and he accordingly falls backwards. On the other hand, if the vehicle be suddenly stopped, and the individual be standing in the same position as formerly, the tendency which his body has to move forward—for it acquired the same motion as the carriage by which it was borne along—will cause him to fall in the opposite direction. Casualties of this description frequently occur to those on horseback, who are thrown over the necks of their steeds, or fall behind them, according as the animal stands still suddenly, or starts off unexpectedly. A man jumping from a coach at full speed will certainly fall prostrate on the ground, if he leaps down as if he were descending from a body at rest, to one which is in the same state; for when he makes the attempt, his body has the same motion as the coach; and when the feet arrive at the ground, the motion in the lower part is arrested, whilst it continues in the upper part; and thus he finds himself thrown from the perpendicular into the horizontal position. Dr Arnott mentions the following ingenious method which a traveller adopted to escape from a beast of prey:—"An African traveller saw himself followed by a tiger, from which he could not escape by running; but perceiving that the animal was watching an opportunity to seize him by the usual spring or leap, he artfully led it to where the plain terminated in a precipice covered by brushwood, and he had just time to transfer his hat and cloak to a bush, and to retreat a few paces, when the tiger sprung upon the bush, and, by the motal inertia of its body, was carried over the precipice and destroyed." Innumerable instances might be adduced illustrative of this law of nature. The following is a familiar one:—Upon the tip of the finger let a card be balanced, and a piece of money—say a shilling—laid upon it. Let the card then be smartly struck, and it will fly from beneath the coin, leaving it supported upon the digit. This arises from the inertia of the metal being greater than the friction of the card which passes from beneath it.

Coursing, or a hare-hunt, affords a striking illustration of inertia. In that cruel sport, the hare seems to possess an instinctive consciousness of the existence of this law of matter. When pursued by the greyhound, it does not run in a straight line to the cover, but in a zig-zag one, like the path of the lightning. The hare *doubles*, that is, suddenly changes the direction of its course, and turns back at an oblique angle with the direction in which she had been running. The greyhound, which is a far heavier body, unable to resist the tendency of its mass to persevere in the rapid motion which it has acquired, is impelled a considerable distance forward before it can check its speed and return to the pursuit. But, in the meantime, the hare has been enabled to shoot far ahead in the other direction; and although a hare is much less fleet than a greyhound, by this most scientific manœuvring it often escapes its pursuer. Those who have witnessed the perhaps still more cruel practice of horse-racing, may have observed that the horses shoot far past the winning-post before their speed can be arrested. This is also owing to the inertia of their bodies.

NATURAL PERMANENCY OF MOTION.

Although it seems to be an idea impressed upon our minds by every day's observation, that a body at rest would never move of itself, yet, that once set in motion, it has an equal tendency for ever to move in the direction in which the impulse is given, is by no means so apparent. The fact is, that motion is looked upon rather as unnatural to matter; and so late as the time of the celebrated Kepler, philosophers did not hesitate to affirm, as a maxim, "that matter is more inclined to rest than to motion." Hence, let us not be surprised that in the present day many receive with caution, and believe with diffidence, that the one quality is as natural to matter as the other. Reason, observation, and experience, prove to us that the same causes which destroy motion in one direction, are capable of producing as much motion in the opposite direction. Thus, if a wheel, spinning on its axis with a certain velocity, be stopped by a hand seizing one of the spokes, the effort which accomplishes this is exactly the same as, had the wheel been previously at rest, would have put it in motion, in the opposite direction, with the same velocity. If a carriage drawn by horses be in motion, the same exertion of power in the horses is necessary to stop it as would be necessary to *back* it if it were at rest. Admit this as a general principle, and it becomes evident that a body which can destroy or diminish its own motion, must also be capable of putting itself into motion from a state of rest, or of increasing any motion which it has received. But this latter is contrary to experience, and we must be compelled to admit that a body cannot diminish or destroy any motion which it has received. "Let us," says Dr Lardner, "inquire why we are more disposed to admit the inability to produce rather than destroy motion in itself. We see those motions which take place around us on the surface of the earth subject to gradual decay; and if not renewed from time to time, they at length cease. A stone rolled along the ground, a wheel revolving on its axis, the heaving of the deep after a storm, and all other motions produced on bodies by external causes, decay when the exciting cause is suspended; and if that cause do not renew its action, they ultimately cease.

But is there no exciting cause, on the other hand, which thus gradually deprives those bodies of their motion? and if that cause were removed, or its intensity diminished, would not the motion continue or be more slowly retarded? When a stone is rolled along the ground, the inequalities of its shape, as well as those of the ground, are impediments which retard and soon destroy its motion. Render the stone round, and the ground level, and the motion will be considerably prolonged. But still small asperities will remain on the stone and on the surface over which it rolls. Substitute for it a ball of highly-polished steel, moving on a highly-polished steel plane truly level, and the motion will continue without sensible diminution for a long period; but even here, and in every instance of motion produced by art, minute asperities must exist on the surfaces which move in contact with each other, which must resist, gradually diminish, and ultimately destroy, the motion.

Independently of the obstructions to the continuation of motion arising from friction, there is another impediment to which all motions on the surface of the earth are liable—the resistance of the air. How much this may affect the continuation of motion, appears by many familiar effects. On a calm day, carry an open umbrella with its concave side presented in the direction you are moving, and a powerful resistance will be opposed to your progress, which will increase with every increase of the speed with which you move."

Nature, in the organisation of animals, has made numerous provisions to facilitate their movements in the elements where they reside. Thus, fishes are sharp before and behind, and this shape enables them to dart more rapidly through the water. Birds have somewhat of a similar form, and thus their progress through the resisting air is facilitated. Every motion on the surface of the earth is retarded by the resistance of air and friction. But in the celestial spaces, we see motion freed from any such obstacles, and there it would appear to be eternal. The countless orbs with which the heavens are spangled, roll on with unerring regularity, and with a velocity which apparently has never diminished since these luminaries were projected from the Creator's hand into their appointed orbits. This alone, had we no other proof, is sufficient to correct the error or prejudice, that

* Arnott's Elements of Physics, vol. i. p. 34.

motion is always tending to rest. There is nothing with which we are acquainted in a state of absolute rest. The moon wheels round the earth, the earth round the sun, and the sun itself moves round its axis, as well as round the centre of gravity of the solar system. There is doubtless, also, in the great universe, a remote point to which, as to a magnet, he is turned, and with all his bright luminaries, his dazzling retinue of planets and comets, he is almost imperceptibly tending.

It is easy to perceive why we are not sensible of the motion of the earth: it evidently arises from every thing moving at the same rate as itself. The *common* motion, which belongs to all bodies, has no effect upon any new motion which may be given them. A man, for instance, who throws up a ball with the intention of catching it as it descends, can do so as easily on horseback as standing still upon the ground, on the deck of a ship as in the arena of a theatre. The ball evidently acquires the same forward motion as the person who throws it up; and, therefore, there is no more art necessary to catch it when both are rapidly moving, than the usual adroitness which is practised when the performer is standing still. Hence, leaping through a hoop upon horseback is by no means so miraculous a performance as it is generally supposed to be. The equestrian does not leap forward, for this would project him over the horse's ears; but merely jumps upwards, and allows his motal inertia to carry him through.

ACTION AND REACTION.

We now turn our attention to the effects of inertia or inactivity, as illustrated by cases in which two bodies at least are necessary. If in a straight line we place three bodies of equal weights—say A, B, and C—six inches apart from each other, and moving A towards B, which is in the middle, so as to strike it, both masses will move towards C after the impact. But the speed of A will only be half of that which it possessed before it touched B; and A, having thus lost half of its velocity, has given to B, which was before quiescent, just exactly that amount of motion. If B consisted of two masses, each of which was equal to A, in this case the velocity of the triple mass after impact would be one-third of the velocity from A to B. Thus, after collision, A loses two-thirds of its velocity, and B, which consists of two masses, each being equal to the former, each of these two receives one-third of A's motion; so that the whole motion received by B is two-thirds of the motion of A before impact, for by it exactly as much motion is received by B as is lost by A. A similar result to this will be obtained whatever proportion may subsist between the masses A and B. In general, therefore, when a mass A in motion impinges upon a mass B at rest, to find the motion of the united mass after impact, "divide the whole motion of A into as many equal parts as there are equal component masses in A and B together, and then B will receive by the impact as many parts of this motion as it has equal component masses."

But let us suppose the mass B to be moving instead of quiescent, and suppose it moves as well as A towards C, but with less velocity, so that A shall overtake it and impinge upon it: after the impact, the two masses will move towards C with a common velocity, the amount of which is half the sum of their velocities before impact. Thus, if A have the velocity 7, and B 5, the velocity of the united mass is 6, being the half of 12, the sum of 7 and 5. When A and B are not equal, the motion of the united mass may be thus ascertained:—Suppose A is divided into 10 component parts, and B into 8, each of which parts are equal in the mass, let then the velocity of A be 20, so that the motion of each of the parts being 20, the motion of the whole will be 10 multiplied by 20, or 200. In the same manner, let the velocity of B be 16, the motion of each part being 16, the whole motion of the eight parts will be 128. Then the sum of the whole motions towards C will be 328; and since none of this can be lost by the impact, nor any motion added to it, this must also be the whole motion of the united masses after impact. Being equally distributed amongst the thirty-six component parts of which the united masses consist, each part will have a thirty-sixth of the whole motion. Hence, 328 being divided by 36, we obtain the quotient 9.4, which is the velocity with which the whole moves. Such is the method of ascertaining the common velocity of two masses which impinge upon each other whilst moving in the same direction. It is not speed or velocity alone which determines the quantity of motion, but the masses moved must also be estimated.

In the foregoing case we have supposed the bodies moving in the same direction: let us now consider them as moving in opposite directions. Suppose A and B two equal bodies which move from two points, say two feet apart, and meet at C, equidistant from each of these two points, or exactly midway between them. In this case, the equal motions in opposite directions will destroy each other, and both masses will be reduced to a state of rest. The mass A loses all its motion in the direction A C, which is supposed to be transferred to B at the moment of impact. But B, having previously had an equal quantity of motion in the direction B C, will now have two equal motions impressed upon it, in directions immediately opposite, and these motions neutralising each other, the mass becomes quiescent. Thus, as in the former instances, the motion which is lost by one body is just transferred to another, consistently with the principle of "action and reaction." We shall further illustrate this part of the subject by a quotation from Dr Lardner:—"The masses A and B being still supposed equal, let them move towards C with different velocities. Let A move with the velocity 10, and B with the velocity 6. Of the 10 parts of motion with which A is endued, 6 being transferred to B, will destroy the equal velocity 6, which B has in the direction B C. The bodies will then move together in the direction C B, the four remaining parts of A's motion being equally distributed between them. Each body, therefore, will have two parts of A's original motion, and 2 therefore will be their common velocity after impact. In this case, A loses 8 of the 10 parts of its motion in the direction A C. On the other hand, B loses the entire of its 6 parts of motion in the direction B C, and receives 2 parts in the direction A C. This is equivalent to receiving 8 parts of A's motion in the direction A C. Thus, according to the law of 'action and reaction,' B receives exactly what A loses. Finally, suppose that both the masses and velocities of A and B are unequal. Let the mass of A be 8, and its velocity 9; and let the mass of B be 6, and its velocity 5; the quantity of motion of A will be 72, and that of B, in the opposite direction, will be 30. Of the 72 parts of motion which A has in the direction A C, 30 being transferred to B, will destroy all its 30 parts of motion in the direction B C, and the two masses will move in the direction C B, with the remaining 42 parts of motion, which will be equally distributed among their 14 component masses. Each component part will, therefore, receive three parts of motion: and accordingly 3 will be the common velocity of the united mass after impact.

When two masses, moving in opposite directions, impinge and move together, their common velocity after impact may be found by the following rule:—Multiply the numbers expressing the masses by those which express the velocities respectively, and subtract the lesser product from the greater; divide the remainder by the sum of the numbers expressing the masses, and the quotient will be the common velocity; the direction will be that of the mass which has the greater quantity of motion."

The force of a body in motion depends, therefore, upon the mass and upon the velocity; and hence it follows, that any body, however small, may be made to move with a force equal to another body, however great, provided the former receives a degree of velocity great enough to compensate for the superiority which the latter possesses on account of its mass.—See this further illustrated under *Attraction*.

LAWS OF MOTION.

Newton, in his Principia, gives the consequences of the property of inertia above explained, under the form of three propositions which are entitled the "laws of motion." They have been already given in the number of this work upon Astronomy, but must be here recapitulated, in order to illustrate what follows:—

1. Every body must persevere in its state of rest, or of uniform motion in a straight line, unless it be compelled to change that state by forces impressed upon it.

2. Every change of motion must be proportional to the impressed force, and must be in the direction of that straight line in which the force is impressed.

3. Action must always be equal and contrary to reaction; or the actions of two bodies upon each other must be equal, and directed towards contrary sides.

Inertia and force having already been defined, the first law becomes self-evident, or is an identical proposition. The second will be explained when we come to treat of the composition and resolution of force. The third has been so far rendered intelligible, and will be further illustrated as we proceed.

The fact already mentioned, that the force with which a body moves is estimated by the velocity of the motion and the mass, or weight of the thing moved, we have frequent practical illustration of. If to two balls, the one weighing one pound and the other two pounds, we communicate the same degree of force, the lighter body will move with twice the speed of the heavier one. Yet, although the velocities are different, they strike another body with exactly the same force, and are capable of overcoming the same resistance. Bodies may be regarded as reservoirs of force or motion, always ready to return as much as they have received. Momentum is the name given to the motion in a body, with reference to the production by it of new motions, or the overcoming of resistances, and is but another term for the *quantity of motion*.

A cannon-ball, according to the quantity of motion in it, may have only the force or momentum that will bruise a plank; or it may have enough to penetrate a tree, or even to shoot its rapid way through a block of the hardest stone.

A block of wood, floating against a man's leg with moderate velocity, would be little felt; but a loaded barge, coming at the same rate, and pressing it against the quay, might break the bones; a large ship, again, although moving no faster, would crush his body against any fixed obstacle; and an island of ice, opposed in its approach to another, even a first-rate man-of-war, would destroy it, as meeting barges destroy an egg-shell.

A hailstone falling, strikes rudely; a stone rolled from a height as of old, the besieged against the besiegers, carries death with it to many; an avalanche, breaking from its hold on a mountain steep, may sweep away a village.

To meeting bodies of equal mass the shock is the same, whether the motion be shared between them or be all in one; if their size be different, the shock is greatest to the smaller body.

If a running man come against a man who is standing, both receive a certain shock. If both be running at the same rate in opposite directions, the shock is doubled. In some such cases as when swift skaters have met, the shock has proved fatal.

The meeting of fists of boxers not unfrequently dislocate or break bones.

A man's skull is fractured more certainly by its being dashed against a tree or beam while he is on a galloping horse, than by the blow of a similar beam shot at him with the velocity of a horse.

When two ships in opposite courses meet at sea, although each may be sailing at a moderate rate, the destruction is often as complete to both as if with a double velocity they had struck against a rock. Many melancholy instances of this kind are on record. In the darkness of night, a large ship has met one smaller and weaker, and, in the lapse of a few seconds, have followed the shock of the encounter, the scream of the surprised victims, and the horrible silence, when the waves had again closed over them and their vessel for ever. In November 1825, on the coast of Scotland, the Comet steam-boat was thus destroyed, and carried to the bottom with her about seventy passengers, into whose ears the drowning water rushed, before the sounds of arrested music and joy had died away. —*Arnott.*

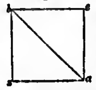
COMPOSITION AND RESOLUTION OF FORCE.

Force may be defined to be that which produces motion or pressure. If two equal forces act upon the same point of a body, in exactly opposite directions, the body acted upon will remain at rest. Such forces are the simplest examples of equilibrium, and the truth of this principle is self-evident. If, however, one of the forces be greater than the other, the body acted upon will move in the direction given to it by the superior force. Thus, then, we may infer, that when a body is driven in immediately opposite directions by two unequal forces, it is affected in exactly the same manner as if it were driven by a single force, equal to the difference between the two forces, and acting in the direction of the greater force.

This single force, whose action is equivalent to the combined action of two or more forces, is called their *resultant*, and the process by which a single force equivalent in its effect to two or more other forces is found, is called the *composition of force*. On the other hand, two or more forces may be found whose combined effects are equivalent to that of a given force; the process by which these are determined is called the *resolution of force*, and the two or more forces which are equivalent to the single force, are called its *components*.

We have only considered the simple instance in which the directions of the forces are in the same straight line; but let us now examine the more complex case, in which two forces act on the same point in different directions. This we shall illustrate by the following figure.

Fig. 1.



Let *b* be the original place of a ship, *e* is the east wind, and *s* the south wind. By the operation of these two aëriform forces, the vessel will at every instant be moved a little south and a little east, and will, in reality, go in a south-east direction; that is, in the diagonal or middle line *b a*, which shows the true course of any body set in motion in the above manner. The figure is called the *parallelogram of forces*, and is an important help to the understanding of many facts in natural philosophy. The minute examination of the subject belongs to technical mathematics, but the general truths are perfectly intelligible to the mathematics of common sense.

When two forces act upon a body, like the wind and tide in the last example, the result is the same, whether they act together or one after the other. For instance, if the wind drive a vessel one mile south, as from *b* to *s*, fig. 1, and, immediately afterwards, the tide drive it one mile east, as from *s* to *a*, the vessel will be in the same place at last, viz., at *a*, as if she had been driven at once south-east in the line *b a*, by the simultaneous action of the two. Therefore, by drawing the lines *b s* and *b e*, to represent the force and direction of the two causes of motion, and by then adding one of them, or an equivalent, to the end of the other, as *s a* to *b e*, or *e a* to *b s*, the square or parallelogram is sketched, of which the middle line, or *diagonal*, as it is called, shows the resulting direction of the forces, and the true course of the body obeying them.

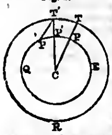
What is thus true of the effect of continued forces like wind and tide, is true, also, of momentary impulses; like the blows of clubs simultaneously striking a ball, or of two billiard balls striking a third.

In the case above supposed, the forces are equal, but if one be greater than the other, the figure becomes oblong; and in cases where the forces cross each other obliquely, it takes various shapes, but in every case the diagonal shows the *result*. Where various forces cross each other so obliquely as to be represented by lines drawn in almost opposite directions, would form a parallelogram having scarcely any breadth; that is to say, the diagonal would become next to nothing; thus proving that opposing forces neutralise or destroy each other. When forces cross so acutely as to advance nearly parallel to each other, the *resultant* is longer than either of the constituents; when, however, they cross obliquely, the *resultant* is less than either of them. But in all cases where the two forces are equal, with whatever obliquity they cross each other, the resulting direction must be midway between them. A boat impelled by oars goes straight, although the direction in which the oars act is constantly changing; because the changing obliquity of the force is the same on both sides. Similar observation will apply to almost every body impelled by instruments projecting from its sides, and acting against a fluid. The motions of fishes, the act of swimming, the flight of birds, are all instances of the same kind.

An instance of the composition of motion is afforded when a stone is let fall from the mast of a ship in full sail. As the vessel is sailing forward when the stone is let fall, it might be expected that during its descent it would reach the deck behind the mast. But it is found to fall at the foot of the mast just as it would have done had the ship been at rest. To account for this, let *b s*, fig. 1, be the position of the mast of the ship when the stone is dropped. The mast is moving forwards with the vessel in the direction *b e*, so that in the time which the body would take to fall to the deck, the top of the mast would move from *b* to *e*. But the stone having the same motion as the mast, it is affected by two motions, that of the vessel expressed by *b e*, and its descending motion as expressed by *b s*. Hence, by the composition of motion, it will be found at the opposite angle *a* of the parallelogram at the end of the fall. During the fall, however, the mast has advanced with the vessel to *e a*, so that the body falls exactly at the foot of the mast.

"An instance of the composition of motion," says Dr Lardner, "which is worthy of some attention, as it affords a proof of the diurnal motion of the earth, is derived from observing the descent of a body from a very high tower. To render the explanation of this more simple, we shall suppose the tower to be on the equator of the earth. Let E P Q, fig. 2, be a section of the earth through the equator, and let P T be the tower. Let us suppose that the earth moves on its axis in the direction E P Q. The foot P of the tower will, therefore, in one day, move over the circle E P Q, while the top T moves over the greater circle T T′ R. Hence it is evident that the top of the tower moves with greater speed than the foot, and therefore in the same time moves through a greater space. Now, suppose a body placed at the top: it participates in the motion which the top of the tower has in common with the earth. If it be disengaged, it also receives the descending motion T P. Let us suppose that the body will take five seconds to fall from T to P, and that in the same time the top T is moved by the rotation of the earth from T to T′, the foot being moved from P to P′. The falling body is therefore endowed with two motions, one expressed by T T′, and the other by T P. The combined effect of these will be found in the usual way by the parallelogram. Take T *p* equal to T T′, the body will move from T to *p* in the time of the fall, and will meet the ground at *p*. But since T T′ is greater than P P′, it follows that the point *p* must be at a distance from P′ equal to the excess of T T′ above P P′. Hence the body will not fall exactly at the foot of the tower, but at a certain distance from it, in the direction of the earth's motion; that is, eastward. This is found, by experiment, to be actually the case; and the distance from the foot of the tower at which the body is observed to fall, agrees with that which is computed from the motion of the earth, to as great a degree of exactness as could be expected from the nature of the experiment.

Fig. 2.



The properties of compounded motions cause some of the equestrian feats exhibited at public spectacles to be performed by a kind of exertion very different from that the spectators generally attribute to the performer. For example, the horseman standing on the saddle, leaps over a garter extended over the horse at right angles to his motion; the horse passing under the garter, the rider lights upon the saddle at the opposite side. The exertion of the performer in this case is not that which he would use were he to leap from the ground over a garter at the same height. In the latter case, he would make an exertion to rise, and, at the same time, to project his body forward. In the case, however, of the horseman, he merely makes that exertion which is necessary to rise directly upwards to a sufficient height to clear the garter. The motion which he has in common with the horse, compounded with the elevation acquired by his muscular power, accomplishes the leap."

If a billiard ball strike the cushion of the table obliquely, it will be reflected from it in a certain direction, forming an angle with the direction in which the latter was struck. It is technically termed the angle of incidence; the other is called the angle of reflection. If bodies were perfectly elastic, these angles would always be equal to each other (as in the case where light is reflected from a polished surface); but this not being the case, the angle of incidence is less than the angle of reflection; and with the same obliquity of incidence the more imperfect the elasticity is, the less will be the angle of reflection.

Motion is sometimes called *absolute* or *relative*. The latter is easily explained. If, whilst a vessel is passing through the waters, a man on deck walks from one extremity to the other, he has a relative motion, which is measured by the space upon the deck over which he treads in a given time. But he is also impelled through the deep along with the vessel in another direction. If it so happen that, as he passes from stem to stern, his motion in one direction be exactly equal to the ship in the opposite direction, the man will be relatively to the surface of the sea, and that of the earth, at rest. Thus relatively to the vessel he is in motion, whilst relatively to the earth he may be considered as at rest. This, however, is not absolute rest; for the surface itself is moving by the diurnal rotation of the earth upon its axis, as well as by the annual motion in its orbit round the sun. These motions and others connected with the earth, must be all compounded by the theorem of the parallelogram of forces, before we can obtain the *absolute state* of the body with regard to the motion or rest.

ATTRACTION.

In the numbers of this work devoted to Astronomy and Chemistry, the various kinds of attraction were pointed out; but in this place it will be necessary to enter more fully into the subject, particularly that part of it pertaining to terrestrial gravity.

Although, from the law of inertia, matter is incapable of itself of changing its state, yet wherever we cast our eyes over the wide panorama of creation, we find that state to be in constant but regular fluctuation. There is not in the universe such a thing as absolute rest, or even of absolute uniform and rectilinear motion. There are in nature a series of forces in continual operation, whose existence is demonstrated by their observed effects, but whose nature, seat, and mode of operation, are entirely unknown to us: these are called by the general name of *attractions*. These forces may be primarily distributed into two classes. In the first are comprised all those attractions which exist between the molecules or constituent particles of bodies; and in the second, those which exist between the bodies themselves, or between masses of matter. Those belonging to the first class have been treated of at sufficient length in the article Chemistry. Those of the second class, connected with magnetism and electricity, have been treated of in the article devoted to Electricity and Galvanism. These attractions are only naturally manifested between bodies of particular kinds, or are made to develope themselves by certain artificial processes. But there is an attraction exhibited by bodies of every description and under all circumstances; an attraction which is totally independent of the nature of the constituent parts of bodies, and depends for its intensity only upon the mutual size and distance of the masses. This attraction is called the attraction of gravitation.

GRAVITATION.

In explaining this important law of nature, we shall avail ourselves of the description given of it in two popular works upon Mechanics; namely, that of Dr Lardner, and that contained in the Library of Useful Knowledge.

The earth is a mass of matter, nearly, but not exactly, of a globular form, the diameter being about eight thousand miles. This enormous mass possesses the property of attracting towards its centre all smaller bodies placed near its surface; so that, if they be perfectly free to move, and opposed by no obstacle, they will move in straight lines towards the centre of the globe, and will continue so to move, until they reach the surface. If the part of the surface which they meet be solid, or even a liquid specifically heavier than the descending bodies, their further approach to the centre will be obstructed; but in that case the attraction towards the centre will be manifested by the force with which the bodies press upon the resisting surface. If the bodies thus supposed to have met the surface in their approach towards the centre happen to meet a liquid, as the sea, and be specifically heavier than it, they will still continue to approach the centre, moving through the liquid, until, in fine, they be stopped either by a liquid heavier than themselves, or a hard surface. All lines which are drawn from points without a globe to its centre, are evidently perpendicular to its surface; and hence, bodies, in moving towards the centre of the earth, attracted by its influence, move perpendicularly to its surface; and when their progress is obstructed by that surface, they press on it perpendicularly with a force equal to that with which they are attracted towards the centre.

This attraction, which the earth exerts upon all bodies placed near its surface, is called *terrestrial gravity*; and the force with which any body drawn towards the centre is pressed upon an horizontal plane, is called the *weight* of that body. It must be very obvious that the common effects of falling bodies, and of pressures produced by weight, are perfectly accounted for in the preceding observations. This attraction is by no means peculiar to the earth, but is common to all material substances, whatever be their form, quantity, or position. In this respect, the force of gravity differs from magnetism, and other attractions which are only resident in substances of particular species. If the earth were a large magnet, those peculiar substances only which are affected by the loadstone would have weight, or would fall to the surface when unsupported. All other bodies would rest indifferently in any position in which they might happen to be placed, and would move upwards just as readily as downwards. But every material substance is susceptible of the attraction of gravity; and what is more, it is susceptible of this in the exact proportion of its mass. Thus, if the mass of the earth were doubled, it would exert a double attraction on all bodies placed near it; and, consequently, the weights of all bodies would in that case be doubled. If its mass were tripled, the weights of all bodies would be tripled, and so on. In general, therefore, the attraction of the earth for a body in its vicinity, is proportional to its mass.

We have stated that gravity is an attraction common to all material substances; if so, then it may be asked, Why do not the various bodies placed near the earth's surface attract the earth towards them? If a body be disengaged at any height from the surface, it will be drawn by the attraction of the earth, and will, consequently, descend in a straight line perpendicular to the surface. But since the body attracts the earth, why does not the surface *ascend* towards the body, being drawn by the attraction of the body on the earth; in which case, the surface of the earth and the body would meet at some place intermediate between their first positions? We answer, that in fact this very effect takes place. The surface of the earth *does* approach the descending body; and that descending body not only attracts the mass of the earth towards it, but attracts it with exactly as much force as that by which the earth attracts the descending body. Why, then, it will be asked, is not the rapid approach of the earth to meet the descending body perceptible? To explain this, we must go into some farther details relative to the Composition of Force, and repeat the doctrine of Action and Reaction.

If two bodies, A and B, be moving with the same velocity, the forces with which they move will be equal, provided their masses or quantities of matter be equal, but not otherwise. If the mass of A be greater than the mass of B, its force will be greater in the same proportion. This will be very evident if we consider the forces with which they would strike any obstacle opposed to them. If B be a musket-ball, and A be a cannon-ball of one hundred times the weight, both being projected with the same speed, A will strike any obstacle with one hundred times the force with which B would strike it. In general, then, when the velocities with which bodies are moved are the same, their forces are proportional to their masses or quantities of matter.

Now, let us suppose that the masses of the bodies A and B are equal, but that they move with unequal velocities; that is, that they move through different spaces in the same time. Let the space described in one second by the body A be *a*, and let the space described in the same time by the body B be *b*, these spaces are called the velocities of the bodies. The equal bodies thus moving with different velocities, will move with different forces. It is evident that the body which has the greater velocity will have the greater force, and that also in the same proportion as its velocity is greater. If two equal bullets be successively projected from the same gun, but with different charges of powder, that which is projected by the stronger charge will strike the mark with a proportionally greater force. But in this case, the only difference in the motions of the bullets, is, that one has a greater velocity than the other. Hence we perceive, that, "when equal masses are in motion, their forces are proportional to their velocities."

We have thus separately considered the cases in which unequal masses are moved with equal velocities, and in which equal masses are moved with unequal velocities; and we have seen that the forces are, in the one case, proportional to the masses, and in the other, to the velocities. Now, if unequal masses be moved with unequal velocities, it is natural to expect that we should, in comparing the forces, take into account both the velocities and the masses. It appears that the moving force of a body may be increased or diminished, by increasing or diminishing either its mass or its velocity, or both. In fact, if the number representing the mass be multiplied by the number representing the velocity, the product thus obtained will represent the moving force. Thus, if the masses of two bodies, A and B, be in the ratio of the numbers 8 and 5, and the velocities of these bodies be in the ratio of the numbers 7 and 3, their moving forces are as the product of 8 and 7 to the product of 5 and 3; that is, as 56 to 15. It appears, therefore, that in this instance the force of A bears a much higher ratio to the force of B than either the mass of A bears to the mass of B, or the velocity of A to the velocity of B; the reason of which is, that the mass and velocity conspire in imparting to A a superior moving force. In general, then, we conclude that the moving forces of bodies are proportional to the products of their masses and their velocities.

Since, then, the moving force of a body depends conjointly on its mass and its velocity, it necessarily follows that, if, while we increase its velocity in any proportion, we diminish its mass in the same proportion, its moving force will be the same; for it will lose as much force by the diminution of its mass as it gains by the increase of its velocity. In like manner, if, when we increase its mass, we diminish in the same proportion its velocity, the moving force will be unaltered; for as much will be lost by the diminished velocity as will be gained by the increased mass.

To return to the case of the earth, and a body near its surface: They attract each other with equal forces; and, therefore, in their consequent approach to each other, the earth must have a velocity as many times less than that of the falling body, as the mass of the earth is greater than that of the falling body. Since all bodies which can be submitted to these circumstances, must be infinitely smaller than the earth, the space through which the earth approaches them in their fall must be infinitely smaller than the space which they fall through.

To take a very improbable and extreme case: Suppose a ball of earth, of a diameter equal to the tenth part of a mile, were to be placed at an height above the surface equal to the tenth part of a mile, let us consider what space the earth would move through to meet it. The earth's diameter being about 8000 miles, and spheres being as the cubes of their diameters, the mass of the earth would have to the mass of the ball the ratio of 512,000,000,000,000 to 1; consequently, if the tenth part of a mile were divided into 512 millions of millions of equal parts, one of these parts would be pretty near the space through which the earth would move towards the falling body. In the tenth part of a mile there are somewhat less than 6400 inches; if this were divided into 512 millions of millions of parts, each part would be the eighty millionth part of an inch; it is, therefore, through a space less than this that the earth would move, under the circumstances which we have supposed.

It is therefore quite evident, that, with respect to falling bodies, the earth is to be considered at rest.

We have stated that bodies attract each other in proportion to their quantities of matter. Hence, the earth attracts different bodies with different forces. A piece of lead contains a considerably greater quantity of matter in the same bulk than a piece of cork, and accordingly we find that the earth attracts it with a proportionally greater force; in other words, it has greater weight. It is for this reason that *weight* is justly assumed as the measure or exponent of the quantity of matter in any substance, whatever, in other respects, be the species or qualities of that substance.

But it is not *alone* the masses of bodies which determine their mutual attractions. Their distances from each other affect this force. It is found that the force of attraction decreases as the distance is increased, but in a still greater proportion. Thus, for example, a body placed upon the surface of the earth, at the distance of 4000 from its centre, is attracted by a certain force towards that centre. At double that distance, or at 4000 above the surface, it would only be attracted with the fourth part of that force, and it would in fact lose three-fourths of its weight.

The earth being globular, or nearly so, it follows that the lines in which its attraction acts converge towards its centre, and that at different parts of the earth the lines in which falling bodies descend are not parallel, but are such as, if continued, would intersect at the centre. In considering, however, the action of gravity on bodies, at places not far distant on the surface of the earth, we may assume, without sensible error, that the directions in which it acts are parallel, and that they are all perpendicular to the same horizontal plane. A distance as great as one mile will only produce a deviation from parallelism amounting to less than one minute, or the sixtieth part of a degree.

Although the intensity of terrestrial gravity increases as the distance decreases, and although the motion of a falling body as it approaches the earth is accelerated, yet the height through which we are enabled to observe its descent, bears so small a proportion to the whole distance from the centre of the earth, that the change of intensity cannot be practically estimated. The increase can be proved to be one part in 4000, a very insignificant quantity. In explaining the laws of falling bodies, therefore, we shall assume, that, in their entire descent, they are urged by a force of uniform intensity.

The force of gravity is not exactly the same at every part of the earth's surface; it is greatest at the poles, and least at the equator. But the cause of this will be explained when we come to speak of centrifugal force, and the motion of pendulums. However, the attraction of the earth at any given place acts upon a body at all times with the same degree of force; and since it acts separately and equally on every particle of matter without reference to the kind of body which is thus operated upon, it follows that, whatever be the species of matter of which bodies are composed, or the magnitude of their masses, they should all descend to the earth with the same velocity. Yet common observation does not verify this fact. For instance, when a bird is shot in the air, the body of the animal descends rapidly downwards, whilst the feathers that may have been torn from it flicker about, and are a long time in reaching the surface of the ground. What are termed light substances, such as thistle-down, paper, &c., fall slowly and irregularly, whilst denser substances, such as stones and metals, fall rapidly. And we are not without instances in which the earth, instead of attracting, seems to repel bodies; thus, vapour, balloons, &c., actually ascend. But these are easily explained when we consider that the earth is surrounded to the height of about fifty miles by an atmosphere composed of a thin aëriform fluid. Through this elastic medium light bodies ascend, just as a cork rises in a vessel of water, to the bottom of which it has been forcibly pressed; because bulk for bulk the balloon and the cork are lighter than the element in which they move. By another application of the same principle, we perceive the reason why a ball of cotton and another of lead, both of the same size, fall to the ground with different degrees of velocity. It is evident that the resistance of the air is in proportion to the volume of a body; hence it obstructs the fall of both the above-named substances in a like degree. But the cotton being attracted in a less degree than the lead in proportion to its bulk, yet having the same resistance to overcome, is more slow in penetrating the atmosphere, and does not reach the earth so soon as the lead. It can be shown by direct experiment, that light and heavy bodies would fall to the ground at the same rate, were there no atmosphere. If by means of an air-pump we extract the air from a tall glass vessel, and having, by means of a wire passing air-tight through the top of the vessel, disengaged a feather and a piece of metal at the same instant, they will be found to descend with the same speed, and strike the bottom at the same moment. Under *Pneumatics*, the phenomena connected with aëriform fluids will be resumed.

ACCELERATED MOTION AND ACCELERATED FORCE.

It must have been observed by every one, that the velocity with which a body moves is increased as it approaches the ground. Owing to the inertia of matter, any force continuing to act on a mass which is free to obey it, produces in the mass a quickening or accelerated motion; because the force which set the body into motion in the first instant continues to impel it from the principle of inertia, whilst accession of force, which it continues to receive at every successive moment, increases the motion. Hence, a falling body under the influence of attraction is as it were a reservoir, receiving at every instant fresh velocity and momentum. A ball dropped from the hand can be caught again in the first instant; but after a little delay, it will be pursued in vain. An arrow impelled into the sky may be perceived as its point "upon the curl hangs pausing;" at that instant a bird of heaven might seize the harmless messenger of death with its bill; and even for some time after it has begun to descend, the eye can readily follow it, but as it nears the earth, its velocity becomes so great that we frequently lose sight of it altogether. When the lightning stroke detaches a fragment of rock from the brow of a hill, the ponderous mass moves slowly at first; but when once fairly launched, it acquires fresh velocity and momentum at every instant, and, bounding from steep to steep with impetuous speed, drives every obstacle before it. The falls of Niagara afford an illustration of the same truth, upon nature's most magnificent scale. At first "the broad column which rolls on and shows,

> "More like the fountain of an infant sea
> Torn from the womb of mountains by the throes
> Of a new world,"—(BYRON),

bends heavily and slowly over the precipice; then becoming a thinner and thinner sheet as it descends, at last, enveloped in an atmosphere of foam and mist, it flashes into the phlegethon below,

> "Rivalling the lightning's flash in ruin and in *speed*."

Thus, then, it is clear that a new impulse is given to a body every instant of its fall, by which means it acquires additional velocity; and its final velocity is composed of the aggregation of all the small increments of additional speed which are so communicated. As we are at present to consider the force of attraction invariable, it follows that the velocity communicated to the body at each moment of time will be the same, and, therefore, that the whole quantity of velocity which obtains at the end of any given time, is proportional to the length of that time. Thus, if during one second of time a certain velocity be produced in a body, when it has fallen two seconds it will have acquired twice that velocity, and so on. Such is the fundamental principle or characteristic of *uniformly accelerated motion.*

Besides the time of the fall of a body, and the velocity at each instant, the spaces through which it moves in given intervals of time, counted either from the commencement of the fall, or from any proposed epoch of the descent, are equally important objects of inquiry. The space is moved through with varying speed, but as the velocity increases uniformly with the time, the average speed is obtained by ascertaining that which the body had in the middle of the interval which elapsed between the beginning and the end of the fall; and thus the space through which the body has actually fallen is that through which it would move in the same time with this average velocity uniformly continued. The fact is, that the velocity of the body, after half the whole period of the descent, is half the final velocity. Hence it follows, that between the three quantities, the height, the time, and the final velocity, which enter into the investigation of the phenomena of falling bodies, there are two fixed relations:—First, the time counted from the beginning of the fall, and the final velocity, are proportional the one to the other; so that as one increases, so does the other. Secondly, the height being equal to half the space which would be moved through in the *time* of the fall, with the *final velocity*, must have a fixed proportion to these two quantities, viz. the time and the final velocity, or must be proportional to the product of the two numbers which express them. Dr Lardner ingeniously illustrates this doctrine as follows:—

"But since the time is always proportional to the final velocity, they may be expressed by equal numbers, and the product of equal numbers is the square of either of them. Hence, the product of the numbers expressing the time and final velocity is equivalent to the square of the number expressing the time, or to the square of the number expressing the final velocity. Hence we infer that the height is always proportional to the square of the time of the fall, or to the square of the final velocity.

The use of a few mathematical characters will render these results more distinct, even to students not conversant with mathematical science. Let S express the height from which the body falls, V the final velocity, and T the time of the fall, and let the square of any of these quantities, or rather of their numerical expressions, be signified by placing the figure 2 over them—thus, T^2 or V^2. The sign × between two numbers signifies that they are to be multiplied together. These being premised, the results of the reasoning in which we have been just engaged, may be expressed as follows:—

V	increases proportionally with	T	[1]
S	. . . .	V × T	[2]
S	. . . .	T^2	[3]
S	. . . .	V^2	[4]

The theorems [3] and [4] follow from [1] and [2]; for since by [1] T is proportional to V, it may be put for V in [2], and by this substitution V × T becomes T × T, or T^2. In the same manner, and for the same reason, V may be put for T, by which V × T becomes V × V, or V^2.

By these formularies, if the height through which a body falls freely in one second be known, the height through which it will fall in any proposed time may be computed. For since the height is proportional to the square of the time, the height through which it will fall in *two* seconds will be *four* times that which it falls through in *one* second. In *three* seconds it will fall through *nine* times that space; in *four* seconds, *sixteen* times; in *five* seconds, *twenty-five* times, and so on. The following, therefore, is a general rule to find the height through which a body will fall in any given time:—Reduce the given time to seconds, take the square of the number of seconds in it, and multiply the height through which a body falls in one second by that number; the result will be the height sought.

The following table exhibits the heights and corresponding times as far as 10 seconds:—

Time	1	2	3	4	5	6	7	8	9	10
Height	1	4	9	16	25	36	49	64	81	100

Each unit in the numbers of the first row expresses a second of time, and each unit in those of the second row expresses the height through which a body falls freely in a second.

If a body fall continually for several successive seconds, the spaces which it falls through in each succeeding second have a remarkable relation among each other, which may be easily deduced from the preceding table. Taking the space moved through in the first second still as our unit, four times that space will be moved through in the first two seconds. Subtract from this 1, the space moved through in the first second, and the remainder 3 is the space through which the body falls in the *second* second. In like manner, if 4, the height fallen through in the first two seconds, be subtracted from 9, the height fallen through in the first three seconds, the remainder 5 will be the space fallen through in the third second. To find the space fallen through in the fourth second, subtract 9, the space fallen through in the first three seconds, from 16, the space fallen through in the first four seconds, and the result is 7, and so on. It thus appears, that, if the space fallen through in the first second be called 1, the spaces described in the second, third, fourth, fifth, &c. seconds, will be expressed by the odd numbers respectively, 3, 5, 7, 9, &c. This places in a striking point of view the accelerated motion of a falling body, the spaces moved through in each succeeding second being continually increased.

If velocity be estimated by the space through which the body would move uniformly in one second, then the final velocity of a body falling for one second will be 2; for with that final velocity the body would in one second move through twice the height through which it has fallen.

Since the final velocity increases in the same proportion as the time, it follows, that, after two seconds, it is twice its amount after one, and after three seconds thrice that, and so on. Thus, the following table exhibits the final velocities corresponding to the times of descent:—

Time	1	2	3	4	5	6	7	8	9	10
Final velocity	2	4	6	8	10	12	14	16	18	20

The numbers in the second row express the spaces through which a body with the final velocity would move in one second, the unit being, as usual, the space through which a body falls freely in one second.

A body falling freely by the force of gravity, descends in one second of time through a height of about 16 feet; in two seconds, it would therefore fall through four times that space, or 64 feet; in three seconds, through 9 times the height, or 144 feet; and in four seconds, through 256 feet. In order, therefore, to be enabled to observe the phenomena for only four seconds, we should command an height of at least 256 feet. But further, the velocity at the end of the first second would be at the rate of 32 feet per second; at the end of the second second, it would be 64 feet per second; and towards the end of the fall, it would be about 120 feet per second. It is evident that this great degree of rapidity would be a serious impediment to accurate observation, even though we should be able to command the requisite height."

MR ATTWOOD'S MACHINE.

But this difficulty was obviated by Mr Attwood, a natural philosopher of the last century, who constructed a machine of a very simple nature, by which the law theoretically deduced was experimentally proved. Into the groove of a wheel turning on its axle with very little friction, he inserted a fine silken cord, to the ends of which were attached two equal cylindrical weights. When both were placed at exactly the same distance from the ground, of course they balanced each other and remained at rest. When, however, to one of the weights a small additional weight was added, the equilibrium was destroyed; the loaded weight began to descend, whilst the other one rose. Under these circumstances, the descent of the loaded weight is a motion of the same kind as the descent of a body in the air falling by the force of gravitation; that is, it increases according to the same laws, though at a diminished rate. To render this plain, suppose that the loaded weight descends from a state of rest through one inch in a second, it will descend through four inches in two seconds, through nine in three, and so on. Thus, in twenty seconds it would descend through 400 inches, or 33 feet 4 inches, a height which could easily be commanded.

RETARDED MOTION.

With respect to a falling body, we have observed that its velocity is increased in proportion as it continues to descend. But in regard to a body which is projected upwards, the reverse of this takes place. Whatever is thrown perpendicularly into the air, loses a part of its velocity at every instant, on account of the force of gravity acting upon it as a drag weight, so to speak, which finally compels it to change its course, and return to the earth from whence it arose. Any body thus sent upwards, say a musket-ball, would have, but for the resistance of the air, at corresponding points of the ascent and descent, an equal velocity; and, on reaching the ground, it would have acquired exactly the velocity with which it departed.

We have seen that a body falls four times as far in two seconds as it does in one, although the velocity at the end of two seconds is only doubled. In the same manner, a body shot upwards with double velocity rises four times as far as if shot with a single velocity; if shot with triple velocity, it rises nine times as far, and so on.

An upward jet of water is small below where it issues from the orifice of a pipe with a high degree of velocity, but it becomes more bulky as the fluid loses its velocity in ascending, and at the top it often spreads laterally like a palm tree, so that any light round solid will continue supported and playing upon its summit. The same circumstance takes place when air is forcibly blown through a hollow tube held perpendicularly. The rise of a pendulum from the bottom of its arc, is an exact copy, reversed, of its previous descent to that point. To this subject we shall turn our attention after we have described one of the most important phenomena of nature, namely,

CENTRIFUGAL FORCE.

Centrifugal force will be easily understood, after the description which has been given of the inertia of matter. By this law, when a body is set in motion, its tendency is to continue for ever to move in the direction in which the impulse is given, unless it be deflected from it by an efficient force.

A body moving in a circle, then, or curve, is constrained to do what is contrary to its inertia. A person on first approaching the subject might suppose that a body, which for a time has been constrained to move in a circle, should naturally do so when set at liberty. But on reflecting that a circle is as if made up of an infinite number of straight lines, and that the body moving in it has its motion bent at every step of the progress, the reason is seen why constant force becomes necessary to keep it there; a force just equal to the inertia with which the body tends, at every point of the circle, to pursue the straight line, called a tangent, of which that point is the commencement. The force required to keep the body in the bent course is called *centripetal* or centre-seeking force; while the inertia of the body tending outwards, that is, to move in a straight line, is called the *centrifugal* or centre-flying force. An apparatus, called a *whirling table*, has been constructed for the purpose of exhibiting experimental illustrations of the laws of centrifugal force. By this machine we are enabled to place any proposed weights at any given distances from centres round which they are whirled, either with the same angular velocity, or with velocities having a certain proportion. Threads attached to the whirling weights are carried to the centres round which they respectively revolve, and there, passing over pullies, are connected with weights which may be varied at pleasure. When the whirling weights fly from their respective centres by reason of their centrifugal force, they draw up the weights attached to the other ends of the threads, and the amount of the centrifugal force is estimated by the weights which it is capable of raising.

With this instrument, the following experiments may be exhibited:—

Exp. 1. Equal weights whirled with the same velocity at equal distances from the centre, raise the same weight, and therefore have the same centrifugal force.

Exp. 2. Equal weights whirled with the same angular velocity, at distances from the centre in the proportion of one to two, will raise weights in the same proportion; therefore, the centrifugal forces are in that proportion.

Exp. 3. Equal weights whirled at equal distances with angular velocities, which are as one to two, will raise weights as one to four; that is, as the squares of the angular velocities: therefore, the centrifugal forces are in that proportion.

Exp. 4. Equal weights whirled at distances which are as two to three, with angular velocities, which are as one to two, will raise weights which are as two to twelve; that is, as the products of the distances two and three, and the squares one and four, of the angular velocities: hence, the centrifugal forces are in this proportion.

The centrifugal force must also increase as the mass of the body moved increases; for, like attraction, each particle of the moving body is separately and equally affected by it: hence, a double mass, moving at the same distance and with the same velocity, will have a double force. The following experiment verifies this:—

Exp. 5. If weights which are as one to two be whirled at equal distances with the same velocity, they will raise weights which are as one to two.—(*Lardner.*)

The consideration of centrifugal force proves, that, if a body be observed to move in a curvilinear path, some efficient cause must exist which prevents it from flying off, and which compels it to revolve round the centre. If the body be connected with the centre by a thread, cord, or rod, then the effect of the centrifugal force is to give tension to the thread, &c. If an unyielding curved surface be placed on the convex side of the path, then the force will produce pressure on this surface. But if a body is observed to move in a curve without any visible material connection with its centre, and without any obstruction on the convex side of its path to resist its retreat, as is the case with the motions of the planets round the sun, and the satellites round the planets, it is usual to assign the cause to the attraction of the body in the centre. The sun is the centre of our system, and it is customary to say that the attraction of the sun, neutralising the effects of the centrifugal force of the planets, retains them in their orbits.—(*See our article on Astronomy.*)—This phraseology, however, is scarcely correct, inasmuch as we are totally ignorant of the proximate cause of that tendency which the planets have of moving towards the central orb of their several systems. But to enter into an examination of subtleties so refined as these, would be out of place here.

Examples of centrifugal force present themselves to us wherever we look over the wide expanse of nature's works, or the ingenious inventions of man. Dr Arnott, in his able work on Natural Philosophy, enumerates a great number, of which the following are the most striking:—

A sling cord is always tight while the stone is whirling, and its tension is of course the measure both of the centripetal and centrifugal force.

In a corn-mill, the grain being admitted between the stone through an opening in the centre of the upper one, is then kept turning round between them, and is, by its centrifugal force, always tending and travelling outwards until it escapes as flour from the circumference.

A tumbler of water placed in a sling, may be made to vibrate like a pendulum with gradually increasing oscillation, and at last to describe the whole circle, and continue revolving about the hand without spilling a drop; the water, by its inertia of straightness or centrifugal force, tending more away from the centre of motion towards the bottom of the tumbler, even when that is uppermost, than towards the earth by gravity.

In the same manner as solid bodies laid on a whirling table are thrown off, so water in a vessel which is caused to spin round in any way, as on the centre of a horizontal wheel, instead of lying at the bottom, is raised all round against the sides of the vessel.

A man or a horse turning a corner at speed, leans much inwards, or towards the corner, to counteract the centrifugal force, that would throw him away from it.

In skaiting with great velocity, this leaning inwards at the turns becomes very remarkable, and gives occasion to the fine variety of attitudes displayed by the expert; and if the skaiter, in running, finds his body inclined to one side, and in danger of falling, he merely makes his skait describe a slight curve towards that side, and the tendency of his body to move straightly, or its centrifugal force refusing to follow in the curve, restores the perpendicularity. Skaiting becomes to the intelligent man an intellectual as well as a sensitive or bodily treat, from its exemplifying so pleasingly the laws of motion.

The reason also why a spinning-top stands, will be understood here:—While the top is quite upright, the extremity of its peg, being directly under its centre, supports it steadily; and although turning so rapidly, has no tendency to move from the place. But if the top incline at all, the *side* of the peg, instead of the *point*, comes in contact with the floor; and the peg then becomes as a little roller, advancing quickly, and describing a curve somewhat as a skaiter does, until it come directly under the body of the top as before. It thus appears that the very fact of the top inclining, causes the point to shift its place, and not to rest until it come again directly under the centre of the top. It is remarkable, that, even in philosophical treatises of authority, the standing of a top is still vaguely attributed to *centrifugal force*; and some persons believe that a top spinning in a weighing-scale would be found lighter than when at rest; and others most erroneously hold that the centrifugal force of the whirling, which, of course, acts directly away from the axis, and quite equally in all directions, yet becomes, when the top inclines, greater upwards than downwards, so as to counteract the gravity of the top. The way in which centrifugal force helps to maintain the spinning of a top, is, that, when the body inclines, or begins to fall in one direction, the motion in that direction continues until the point describing its curve has forced itself under the body again.

By reason of centrifugal force, also, it is easier to do feats of horsemanship in a small ring, as at our theatres, than if the animal were running on a straight road. We see the man and horse always inclining inwards, to counteract centrifugal force; and if the rider tend to fall inwards, he has merely to quicken the pace; if to fall outwards, he has to slacken it, and all is right again.

A ball of soft clay, with a spindle fixed through its centre, if made to turn quickly, soon ceases to be a perfect ball. It bulges out in the middle, where the centrifugal force is great, and becomes flattened towards the ends, or where the spindle issues.

This change of form is exactly what has happened to the ball—our earth. It has bulged out seventeen miles at the equator, in consequence of its daily rotation, and is flattened at the poles in a corresponding degree. A mass of lead that weighs one thousand pounds at our pole, weighs about five pounds less at the equator, by reason of the centrifugal force. This is the most remarkable and important manifestation of this law, and the manner of proving it will be afterwards described.

In the planets Jupiter and Saturn, of which the rotation is much quicker than of our earth, the middle or equator bulges out still more, even so as to offend an eye which expects a perfect sphere.

If the rotation of our earth were seventeen times faster than it is, the bodies or matter at the equator would have centrifugal force equal to their gravity, and a little more velocity would cause them to fly off altogether, or to rise and form a ring round the earth like that which surrounds Saturn. Saturn's double ring seems to have been formed in this way, and is now supported chiefly by the centrifugal force of the parts. Were it to crumble to pieces, the pieces might still revolve as so many little satellites. The true satellites are only more distant masses sustained in the same manner. And our earth, and the other primary planets, have the same relation to the sun that these satellites have to Saturn; all being sustained by an admirable balance between centrifugal force and gravity.

Amongst the numerous subjects connected with mechanical philosophy, the *centre of gravity* is one of the most important. But an explanation of it having already been given in the number of this work upon Mechanics, it is unnecessary to repeat what was there stated.

ON THE AXIS.

The line round which a body having rotatory motion revolves, is called an axis. In this case every point of the body must move in a circle whose centre lies in the axis, and whose radius is the distance of the point from the axis. Whilst the body revolves, the axis itself is sometimes moveable, and not unfrequently in a state of motion. We have an example of this upon a grand scale in the revolutions of the earth and planets; one on a humbler scale in the spinning of a top. We are, however, to investigate only those cases in which the axis is immoveable. Instances of this description are innumerable. Wheel-work of every kind, the moving parts of watches and clocks, turning lathes, mill-work, doors and lids on hinges, are all obvious examples. In some cases, as in most of the wheels of watches and clocks, &c., the body always turns in the same direction. In others, such as in pendulums of clocks, balance-wheels of chronometers, &c., the motion is alternate or reciprocal, its direction being at intervals reversed. When the alternation is constant and regular, it is called *oscillation* or *vibration*, as in pendulums and balance-wheels.

Bodies moveable on an axle of rotation are submitted to different kinds of forces. They are generally distinguished by the duration of their action into instantaneous and continued forces. If the body which sustains an action of the former kind be quiescent and free, it will move in the direction in which the impulse is given with a uniform motion. If, however, the force impressed upon it be incapable of setting it in motion, then it receives a shock, the effect of which is called *percussion*. A continued force produces a continued effect. If the body be free and previously quiescent, this effect is a continual increase of velocity. If the body be so restrained that the applied force cannot put it in motion, the effect is a continued pressure on the points or lines which sustain it.

A solid body which is moveable upon a fixed axis, is susceptible of no motion, except one of rotation upon the axis. If it be submitted to the action of instantaneous forces, one or other of the following effects must ensue: 1. The axis may resist the forces, and prevent any motion. 2. The axis may modify the effect of the forces sustaining a corresponding percussion, and the body receiving a motion of rotation. 3. The forces applied may be such as would cause the body to spin round the axis even were it not fixed, in which case the body will receive a motion of rotation, but the axis will suffer no percussion.

What has been just observed of the effect of instantaneous forces is likewise applicable to continued ones. 1. The axis may entirely resist the effect of such forces, in which case it will suffer a pressure which may be estimated by the rules for the composition of force. 2. It may modify the effect of the applied forces, in which case it must also sustain a pressure, and the body must receive a motion of rotation which is subject to constant variation, owing to the incessant action of the forces. 3. The forces may be such as would communicate to the body the same rotatory motion if the axis were not fixed. In this case the forces will produce no pressure on the axis.

A simple and elementary exposition of the mechanical properties of a fixed axis is a matter of considerable difficulty, and cannot be fully entered into here. The complete mathematical developement of the theory long puzzled the most acute geometers, and it was only at a comparatively recent period that it was fairly analysed. A body moves round its axis in two ways: 1. By having pivots at two points, which rest in sockets, so that, when the body is moved, it must revolve round the right line, joining the pivots as an axis; 2. A thin cylindrical rod may pass through the body, on which it may turn in the same manner as a wheel upon its axle. When force is applied to produce rotation, its power is estimated, not by the force alone, but by multiplying the force by the distance of its direction from the axis. The product is called the *moment* of the force round the axis. The distance of the direction of a force from the axis is sometimes called the *leverage* of the force. The *moment* of a force is, therefore, found by multiplying the force by its leverage, and the energy of a given force to turn a body round an axis is proportional to the leverage of that force.

When a body revolves on a fixed axis, the parts of its mass are whirled in circles round the axis, and have, accordingly, centrifugal forces proportional to their distances from the axis. If the component parts of the mass were not united together by cohesive forces of energies greater than these centrifugal forces, they would be separated, and fly off from the axis; but their cohesion prevents this, and causes the effects of the different centrifugal forces, which affect the different parts of the mass, to be transmitted so as to modify each other, and finally to produce one or more forces mechanically equivalent to the whole, and which are exerted upon the axis, and resisted by it. Dr Lardner explains these effects as follows:—

"It is obvious that any number of equal parts of the mass, which are uniformly arranged in a circle round the axis, have equal centrifugal forces acting from the centre of the circle in every direction. These mutually neutralise each other, and therefore exert no force on the axis. The same may be said of all parts of the mass which are regularly and equally distributed on every side of the axis.

Also, if equal masses be placed at equal distances on opposite sides of the axis, their centrifugal forces will destroy each other. Hence it appears that the pressure which the axis of rotation sustains from the centrifugal forces of the revolving mass, arises from the unequal distribution of the matter around it.

From this reasoning it will be easily perceived, that, in the following examples, the axis of rotation will sustain no pressure.

A globe revolving on any of its diameters, the density being the same at equal distances from the centre.

A spheroid or a cylinder revolving on its axis, the density being equal at equal distances from the axis.

A cube revolving on an axis which passes through the centre of two opposite bases, being of uniform density.

A circular plate of uniform thickness and density revolving on one of its diameters as an axis.

In all these examples, it will be observed that the axis of rotation passes through the centre of gravity. The general theorem, of which they are only particular instances, is, "if a body revolve on a principal axis, passing through the centre of gravity, the axis will sustain no pressure from the centrifugal force of the revolving mass." This is a property in which the principal axes through the centre of gravity are unique. There is no other axis on which a body could revolve without pressure.

But we cannot enter further into this interesting subject.

ON THE PENDULUM.

If a body be placed upon a horizontal axis, which does not pass through its centre of gravity, it will remain in permanent equilibrium only when the centre of gravity is immediately below the axis. When this point is removed to any other situation, the body will oscillate or move from side to side, until the resistance of the air, together with friction, brings it to rest. Such a body is a pendulum. The swinging motion which it receives is called *oscillation* or *vibration*. A common pendulum consists of a ball suspended by a rod from a fixed point, and made to spring backwards and forwards, or to vibrate under this point.

Galileo having observed the hanging chandeliers of lofty ceilings to continue vibrating long and with singular uniformity, after any accidental cause of disturbance, was led to investigate the laws of the phenomenon; and out of what, in some shape or other, had been before men's eyes, but uselessly, from the beginning of the world, his powerful genius extracted the most important results. Independently of the light which the theory of the pendulum has thrown on various branches of physics, the instrument itself, with a few wheels attached, to record its vibrations, has now become the perfect time-keeper, regulating many of the affairs of men. The pendulum is strictly an object of mathematical study; but we shall attempt to give a general idea of its important characteristics in common language.

1. The *times of the vibrations* of a pendulum are very nearly equal, whether it be moving much or little; that is to say, whether the arc described by it be large or small. This remarkable property is what makes it a time-keeper. The reason that a large vibration is performed in the same time as a small one; in other words, that the pendulum always moves faster in proportion as its journey is longer—is, that in proportion as the arc described is more extended, the steeper are its beginning and ending, and the more rapidly, therefore, the pendulum falls down at first, sweeps along the intermediate space, and stops at last. It is evident, for instance, that the portion of the arc most distant from the centre of gravity is much more steep than that which is nearest it. A pendulum made to vibrate in the curve called a *cycloid*, which, in the central part, very nearly coincides with a circular arc, but towards the extremities rises a little more steeply, has its beats perfectly *isochronous*, or in equal times, under all circumstances. This remarkable law was one of the earliest discoveries of Galileo.

A common clock is merely a pendulum, with wheelwork attached to it, to record the number of the vibrations, and with a weight or spring having force enough to counteract the retarding effects of friction and the resistance of the air. The wheels show how many swings or beats of the pendulum have taken place, because at every beat a tooth of the last wheel is allowed to pass. Now, if this wheel has sixty teeth, as is common, it will just turn round once for sixty beats of the pendulum, or seconds; and a hand fixed on its axis projecting through the dial-plate, will be the second hand of the clock. The other wheels are so connected with this first, and the numbers of teeth on them so proportioned, that one turns sixty times slower than the first, to fit its axis to carry a minute hand, and another by moving twelve times slower still, is fitted to carry an hour hand.

2. The *length of a pendulum* influences the time of its vibration. Long pendulums vibrate more slowly than short ones, because, in corresponding arcs or paths, the bob or ball of the long pendulum has a greater journey to perform, without having a steeper line of descent. The ball of the long pendulum may be considered as having rolled twice as far down a given slope as the ball of the short pendulum. Now, as a body falls four times as far, either directly or on any uniform slope, in two seconds as in one, a pendulum must be four times as long, to beat once in two seconds, as to beat every second. A pendulum of a little more than thirty-nine inches beats seconds; one of four times that length is required to beat double seconds, and one of one-fourth the length to beat half seconds. As the smallest change in the length of a pendulum alters the rate of going of the clock, a pendulum which beats seconds constitutes an easily found and correct standard of measure. To counteract the dilatation or contraction of pendulums from the changing heat of the seasons, various ingenious contrivances have been employed. One of the best of these is a *gridiron pendulum*, as it is called, from consisting of various rods of metal. It renders the different dilatability by heat of two metals composing it, the cause of unchanged length in the whole.—*Arnott.*

An idea of it may be thus formed. Suppose a rod three feet in length; the first and the last foot to be steel, and the middle one to be brass; then let the rod be bent so that the brass portion of it be placed on each side of the steel ends, one of which to be attached to the point of suspension, and the other to the metallic bob or ball. Brass expands with heat twice as much as steel; and the instrument is so contrived that the different dilatability of the two metals is made to compensate each other, and thus keep the pendulum always of the same length. There is another, and a most ingenious one, the invention of Mr George Graham, called the *mercurial pendulum*. In this one the metal mercury, which is always fluid at ordinary temperatures, is used instead of a metallic ball. Suppose a long hollow tube, which contains at the bottom an inch of mercury. Now, when the pendulum is exposed to an increase of temperature, the tube is lengthened, and of course the clock would move slow; but the quicksilver has also been expanded or raised in the tube, and thus has raised the centre of oscillation; thereby really shortening the pendulum, and that to the exact amount of the expansion of the tube. By this ingenious contrivance the pendulum is made to remain unchanged, which has been proved by the test of experiment.

In investigating the laws which regulate the times of vibration, two elements are to be determined: first, the exact time of a single vibration; and, second, the exact distance of the centre of oscillation from the point of suspension. The former is determined by ascertaining the number of oscillations which a pendulum makes in an hour, by means of a good chronometer. The entire time which the pendulum swings being divided by the number of oscillations made during that time, the exact time of one oscillation will be obtained. The distance of the centre of oscillation from the point of suspension is a matter of easy calculation. The time of vibration of one pendulum of known length being thus obtained, the following problems are easily solved: "First, to find the length of a pendulum which shall vibrate in a given time; and, second, to find the time of vibration of a pendulum of a given length." The former is thus obtained. The time of vibration of the known pendulum is to the time of vibration of the required pendulum, as the square root of the length of the known pendulum is to the square root of the length of the required pendulum. This length is therefore ascertainable by the ordinary rules of arithmetic. The latter problem may be solved as follows:—The length of the known pendulum is to the length of the proposed pendulum, as the square of the time of vibration of the known pendulum is to the square of the time of the proposed pendulum. The latter is therefore found by arithmetic.

As the rate of a pendulum has a known relation to the intensity of the earth's attraction, we are enabled by this instrument not only to detect certain variations in that attraction in various parts of the earth, but also to discover the actual amount of the attraction at any given place.

To compare the force of gravity in different parts of the earth, it is only necessary to swing the same pendulum in the places under consideration, and to observe the rapidity of its vibrations. The proportion of the force of gravity in the several places will be that of the squares of the velocity of the vibration. Observations to this effect have been made at several places, by Biot, Kater, Sabine, and others.

The earth being a mass of matter of a form nearly spherical, revolving with considerable velocity on an axis, its component parts are affected by a centrifugal force; in virtue of which, they have a tendency to fly off in a direction perpendicular to the axis. This tendency increases in the same proportion as the distance of any part from the axis increases; and, consequently, those parts of the earth which are nearer the equator, are more strongly affected by this influence than those near the pole. It has been already explained that the figure of the earth is affected by this cause, and that it has acquired a spheroidal form. The centrifugal force, acting in opposition to the earth's attraction, diminishes its affects; and, consequently, where this force is more efficient, a pendulum will vibrate more slowly. By these means the rate of vibration of a pendulum becomes an indication of the amount of the centrifugal force. But this latter varies in proportion to the distance of the place from the earth's axis; and thus the rate of a pendulum indicates the relation of the distances of different parts of the earth's surface from its axis. The figure of the earth may be thus ascertained, and that which theory assigns to it, it may be practically proved to have.

This, however, is not the only method by which the figure of the earth may be determined. The meridians being sections of the earth through its axis, if their figure were exactly determined, that of the earth would be known. Measurements of arcs of meridians on a large scale have been executed, and are still being made in various parts of the earth, with a view to determine the curvature of a meridian at different latitudes. This method is independent of every hypothesis concerning the density and internal structure of the earth, and is considered by some to be susceptible of more accuracy than that which depends on the observations of pendulums.

With respect to the other parts of Mechanical Philosophy, the most important of them have been discussed already in the number on Mechanics. Upon the laws of mechanics, the construction of machinery, so important for the comfort of mankind, depends. A machine is an instrument by which force or motion may be transmitted and modified as to its quantity and direction. The most simple machines are the mechanic powers; and their various combinations give rise to those beautiful and intricate pieces of mechanism which have given man so unlimited a sovereignty over uninformed matter.

The other sciences, besides Mechanics, which are included under Natural Philosophy, such as Hydrostatics, Optics, &c., both on account of their interest and importance, will be afterwards treated of at large in the present work.

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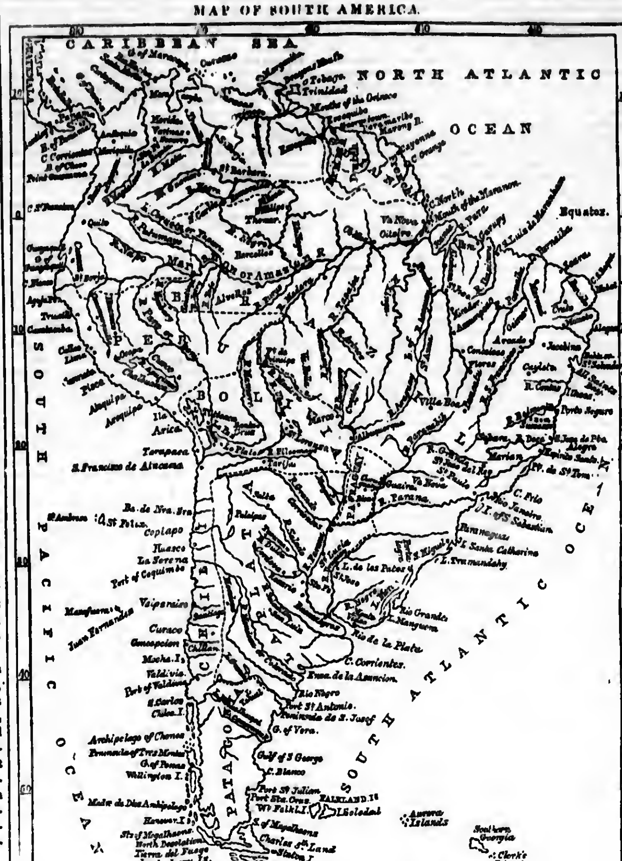
SOUTH AMERICA.

To give a brief, and at the same time lucid, history of this immense portion of the globe, is a task attended with no small difficulty. The innumerable and unprecedented revolutions which have taken place in almost every province of this great territory, especially during the last quarter of a century, attended as these have been by changes equally of the laws, rulers, and geographical limits of each, render it difficult to assign the positive condition of either in any of these respects, at the present moment; and it is more than probable that, even while we are writing, some one or other of them may be undergoing a complete remodelling in all its relations. In some of them, the form of government has been changed three times within these twelve years; in others, civil war has scarcely ever ceased; in all of them we have seen one party chasing another from power with fearful rapidity, the victors murdering or proscribing the vanquished. Of the hundred most conspicuous politicians who have taken the lead in the various states, within the short period mentioned, we doubt if ten have escaped death, excepting those who have sought refuge in foreign countries. The military chiefs, as they served all parties in turn, have probably fared rather better. The number of revolutions occurring severally in the states—we mean of changes in which one party displaced another by violence, without any reference to constitutional forms—has certainly not been less on an average than one every two years, giving an aggregate of thirty in twelve years! As for insurrections, there must have been at least twice as many, since, on a fair calculation, not more than one half of them succeeded; but, in point of fact, the larger states have scarcely enjoyed one month's internal peace. Of the bloody war with Spain, which lasted sixteen years, it was fondly hoped that the evils and sufferings flowing from it would soon be effaced by the benignant influence of freedom and unfettered industry. But at this moment, so far as we can judge, each state is no nearer a permanent settlement, and has no better prospect of peace, order, and security, than on the day when it drove the last Spanish royalist from its shores.

From what we have said, our readers will at once allow the difficulties attending our task. We have, however, been careful in collecting the very latest information on every point, and we believe, that, with the aid of the accompanying map, the reader will be enabled to acquire a pretty correct idea of the present condition of the South American Continent. But for the reasons above stated, as well as from our having, in a late Information (on the West Indies), given a short sketch of the character and history of the aborigines, we will confine our account of the past history of the country within as brief limits as possible.

MAP OF SOUTH AMERICA.



BOUNDARIES AND DIVISIONS.

South America extends from the Isthmus of Panama, or Darien—which connects it with the northern portion of the American continent—on the north, to the Straits of Magellan, on the south; or, more properly speaking, perhaps, to Cape Horn, although the latter be disjoined from the mainland. It is triangular in form, and is washed by the Atlantic on the north-east, and by the Pacific Ocean on the south and west. Its length from north to south is calculated at about 4600 miles, and its greatest breadth at 3200; covering an area of upwards of 6,500,000 square English miles, three-fourths of which lie within the region of the tropics, and the other fourth in the temperate zone. This immense tract of country may be divided into nine great departments; viz. Colombia, Paraguay, Banda Oriental, Brazil, Peru, Bolivia, Guiana, Chili, and Buenos Ayres (or the united provinces of La Plata). These various portions, however, although they may be described as having been at one time unique provinces, have for the most part been long and often broken up into smaller ones, which will come to be noticed afterwards, in treating of them separately. The whole continent, again, may be said to be separated into two portions by the hand of nature, which has raised that huge chain of mountains, or *cordilleras*—the Andes—which run from the Straits of Magellan to the Isthmus of Darien, parallel to the shores of the Pacific. Nature may also be said to have separated it into five distinct physical regions:—1. The low flat country lying between the foot of the Andes and the Pacific Ocean, averaging from 30 to 150 miles in breadth. 2. The valley of the Orinoco, enclosed by the Andes and their branches, consisting of huge plains, or *steppes*, called by the natives *llanos*. The heat is so intense in these plains during the summer, that the ground is split into great rents or fissures. 3. The basin of the Amazon (or Maranon), which embraces nearly a third of the whole continent, or two millions of square miles, and the soil of which is every where overrun with vegetation. 4. The great plain of the Plata and its tributaries, consisting of numerous varieties of soil and climate. 5. The elevated country of Brazil, very woody towards the Atlantic, and opening into fertile plains in the interior. We shall speak more fully of the climate and productions of these regions, when we come to discuss those subjects separately.

DISCOVERY AND HISTORY.

There seems little doubt that Columbus, during his second voyage of discovery in the tropical seas, in 1493, had seen the continent of South America; and that it was it which, not conjecturing the existence of an ocean to the south, he mistook for a portion of India, and for this reason assigned the name of the *West Indies* to the various islands he discovered in the Caribbean Sea. According to Mr Southey, it was Vicente Yanez Pinzon, a Spaniard, and a distinguished associate of Columbus, who first, in the year 1500, discovered the coast of Brazil. It does not appear, however, that Pinzon paused to investigate the coast or interior, but instantly returned to report the intelligence to the court of Spain. Scarcely had he departed, when a Portuguese navigator, named Pedro Alvarez de Cabral, while on an expedition to discover a passage to India by Cape Horn, stood so far to the west that he unexpectedly found himself on the coast of Brazil; and after running along this unknown land, he anchored in the fine bay now called after him "Cabralia." Here he landed, and took possession in the name of his sovereign. A messenger was instantly dispatched in one of the vessels to Portugal with the intelligence, and King Emanuel forthwith sent out three other ships under the celebrated Americo Vespucci (whose name was, with so much injustice to the merits of Columbus, afterwards bestowed on the whole of the New World), who, after his return, was again sent back in 1504, when the first settlement was made. This was not effected without fatal opposition, as three of the crew, who were sent ashore to converse with the natives who lined the beach, were instantly murdered, roasted, and eaten, before the eyes of their comrades. This circumstance, together with the idea entertained that the country was only productive of wood, parrots, and monkeys, deterred the Portuguese from making any other serious attempt to establish a colony until 1549. In that year, an expedition was sent out under Thomas de Souca, to which some Jesuits were attached, who managed so well in conciliating the natives, that the latter gave them no farther disturbance; and the city of St Salvador (Bahia) was then founded, which, up to 1771, continued to be the capital of Brazil.

In the meantime, the whole of the north-east coast had been explored, and numerous little settlements effected by various adventurers from Spain and Portugal, which were then the only maritime nations that distinguished themselves in this way. The wealth of the country in gold and precious stones was soon discovered; and as the real value of them was unknown to the natives, their visitors or invaders were enabled to load themselves with riches. Up to the year 15[illegible], however, the knowledge of the Pacific Ocean had remained unknown to these adventurers, and, consequently, all the rich countries which lie along its shores. In that year, a Spaniard, named Vasco Nunez de Balboa, having attached to him a troop of 150 of his countrymen, founded a colony in the Isthmus of Darien, where a simple Indian, perceiving the fondness of the Spaniards for gold, offered to show them a country where that metal was used for the meanest vessels. He accordingly led them into the interior, whence they got a sight of the Great Pacific Ocean, and of the wealthy and populous city of Peru. Balboa did not venture to proceed, but returned to Darien, where he found a new governor, Pedrarius, had got appointed in his place, who, instigated by avarice and jealousy, put him to death. Although the existence of the rich countries to the west of the Andes had thus become known, no one was daring enough to attempt a hostile expedition against the warlike tribes which obstructed the way to them by land, and the navigable routes by Cape Horn and the Straits of Magellan had not then been discovered. The connection between the Atlantic and Pacific was at last found out in 1520, by Magellan, or Magelhaens, a Portuguese navigator, by the discovery of the straits now named after him. This event was of course the signal for new and ardent adventurers, but all failed in their attempts to reach this new world of promise, until the year 1525, when the famous, or rather infamous, Francis Pizarro, having associated himself with two others, fitted out an expedition for the purpose. Having proceeded first to Darien, they sailed thence, in November 1525, with about eighty men and four horses. Owing to ignorance of navigation, they suffered severe loss in coasting along, but Pizarro persevered; and having sufficiently satisfied himself respecting the immense wealth of the cities and soil, he returned to Spain for reinforcements. The presents he brought to the king at once procured him these, with a commission as governor and captain-general of the new-found territories, and the right of appropriating to himself a large share of the profits of the expedition. He accordingly sailed with three ships, carrying 185 soldiers, thirty-seven horses, several pieces of ordnance, ammunition, stores, &c. On landing, they found a civil war raging, of which Pizarro did not fail to take advantage, and his conduct will render his name for ever a byword of treachery, rapacity, and cruelty. Having extorted immense sums, under promise of assistance, from the reigning Inca, Atahualpa, a day was appointed for delivering up the treasure in a large square surrounded by a high wall, into which Pizarro had introduced his artillery and soldiers. When the good Inca had entered, and the square was filled with his followers to the number, it is said, of 7000 or 8000, Pizarro opened his artillery upon them, and slaughtered every man, with the exception of the Inca, who was reserved for further use. Pizarro offered to release him upon his paying an enormous ransom, being, it is said, no less than a whole house filled with gold. By spoiling the temples, and other means, the ransom was soon made up, and no sooner delivered, than the unfortunate captive was put to death—being allowed to choose strangulation, instead of burning, as a reward for becoming a Christian! The news of their success brought a great accession of strength from Europe to the invaders; and Pizarro, in order to consolidate his empire, founded, in 1535, the city of Lima, intending it as the future capital of his dominions. The joint chiefs of the expedition, alarmed at his proceedings, attempted to resist, but he soon subdued them, and ordered Almagro, an old man in his 75th year, who had been his companion in his first expedition, to be strangled. The son of the victim, however, organised a conspiracy four years afterwards, broke into the palace at Lima, and succeeded in destroying the monster. It is needless to trace this part of our subject farther in this place, as it will afterwards fall to be treated of under the head of Peru.

The province of Buenos Ayres was first coasted along by Americo Vespucci in the year 1501, but he was driven off that latitude by tempestuous weather. In 1516, the entrance of the great river La Plata was first discovered by Juan Diaz de Solis, who communicated his own name to the stream. Fearful of venturing too far up the river in his little squadron of three ships, as the navigation seemed both dangerous and difficult, he sailed along its northern shore in his long-boat, and seeing some savages on the beach, who by their gestures and signs seemed to invite him on shore, he imprudently landed with a few men, when the whole were instantly killed and devoured by the Indians, before their companions' faces. A party of the Portuguese, settled in Brazil, afterwards attempted an overland march to the new territory, but these were also all massacred on the banks of the Paraguay. At last Charles V. sent Sebastian Cabot, in 1526, to sail round the then recently discovered Straits of Magellan; but that commander having anchored in the La Plata, then called Rio de Solis, he received such flattering accounts of the riches and beauty of the country, that he abandoned his original purpose, and proceeded up the river. In ascending, he and his officers ran into mistakes respecting the main stream, amidst the immense number of large tributaries that poured into it. In proceeding up the Paraguay, he was attacked by the natives, who killed twenty-five of his men, and compelled him to return. Having, however, obtained some gold and silver from the Indians in barter, he transmitted it to the emperor, who highly approved of Cabot's conduct, and sent out another armament of nearly 3000 men under Mendoza. So fierce and obstinate, however, was the resistance of the natives, that this expedition likewise failed to establish a peaceable or safe settlement. A continual struggle was in this way kept up, till, in 1586, a number of Jesuits went out to convert the savage Indians; and such was the effect of their labours, proceeding fearlessly throughout every part of the interior, that they succeeded in paving the way to an ultimate reconciliation, making thousands of converts, forming them into industrious communities called *reductions*, and, in sober fact, actually reducing them to the condition of civilised societies. These worthy men, however, got little thanks for their labours from the Spanish settlers, who accused them to the home government of stirring up the natives to sedition; but the proofs of their beneficial labours were too strong to be confuted.

The history of Chili furnishes one of those exceptions to the dogma which assigns to civilisation alone, intelligence, patriotism, and other virtues of a high moral standing. Looking to their civil, domestic, and political institutions, it is clear they possess a far higher degree of independence and energy of character than any of the other aboriginal natives of America. To keep even a partial possession of Chili cost the Spaniards more blood and treasure than all their other settlements put together. One portion of the natives, indeed—the Araucanians—who refused to entertain any terms whatever with the great conquerors, have maintained their independence unimpaired for upwards of three hundred years, and now live under a government of their own, which, singular to say, is highly aristocratic, but at the same time affording perfect security to the liberty of the people. Previous to the conquest of Peru by the Spaniards, some of the northern parts of Chili were subject to the Incas, who of course surrendered to the conquerors their authority over these provinces. The Chilians at first were disposed to acknowledge the supremacy of the Spaniards, but the oppressive conduct of the latter soon roused them to resistance, and they quickly expelled the invaders. Pizarro afterwards sent General Valdivia against them, who succeeded in conciliating the northern portions of the nation, and he founded the city of Santiago in 1541. He then proceeded against the southern portion, where he founded the city of Conception, but was attacked by the Araucanians, who drove them from their territories. The cities of Villanca, Valdivia, Imperial, and other towns founded from time to time by the Spaniards, were regularly assaulted and taken by this brave people, who continued their resistance until their invaders were glad to sue for peace. The Dutch sent over an armament with the professed object of assisting to expel the Spaniards, but the Chilians soon saw the selfishness of their motives, and turned them adrift. The treaty of peace concluded betwixt the Spaniards and Chilians, lasted till the year 1655, when hostilities again broke out, and lasted for ten years; but the Araucanians were indomitable, and a second peace was concluded, which remained uninterrupted until 1770, when the Araucanians again took up arms upon an attempt being made to compel them to live in towns and villages. At length peace was restored upon one condition—that the Araucanians should henceforth have a resident minister at Santiago—a provision which sufficiently shows their power and importance. By this time the other parts of Chili had acknowledged the supremacy of the Spaniards, and all parts of the nation appears to have remained undisturbed until the general revolutionary movements in 1810—of which more hereafter.

At the time that the Spaniards and Portuguese were thus gradually possessing themselves of the great South American continent, neither France nor England had begun to display a similar spirit of enterprise; and when the spirit of colonising at length manifested itself, their views were directed rather to the northern portion of the same continent. The only purpose, indeed, for which the English maritime adventurers of the age of Elizabeth visited the South Seas, was plunder; and these—embracing the names of men which have been recorded as the brightest ornaments of our naval annals—were loaded with honours and rewards just in proportion to the extent of their robberies.

It is a curious fact, that, amongst the first adventurers to the southern continent from Britain, was an expedition which proceeded from the port of Leith. The place of settlement was the Isthmus of Darien, and, had the enterprise not been opposed and ruined by the mean and selfish policy of a few narrow-minded monopolists, it would have proved one of the most useful and important to Great Britain that ever was projected. Of the rise, progress, and catastrophe of this well-planned but ill-fated undertaking, Sir John Dalrymple, in his Memoirs of Great Britain, has given a most interesting, and indeed affecting, account. A Mr Paterson, a Scots clergyman, was the projector; the celebrated Fletcher of Salton patronised his plan; through his influence the Scots ministry adopted it, and in a short time nearly a million sterling was collected in England, Scotland, and Holland—of which L.400,000 was subscribed in Scotland alone, *being one-half of the cash then in the country*. Two expeditions, amounting together to 2500 men, successively sailed from Leith for the projected settlement; but "the jealousy of trade," says Sir John, "which has done more mischief to England than all other causes put together, created an alarm in England, and both houses concurred in an address to the king against the establishment, as detrimental to the interests of the East India Company." The consequence was, that the English, Dutch, and Americans, were prohibited by King William III. from all correspondence with the colony; the second expedition sailed; but when they arrived, they found that the whole of their predecessors were gone—either dead from starvation, or, as it afterwards turned out, or having left the colony in despair. Their successors shared the same fate. Cut off from all supplies, interdicted all communication with the West Indies or British America, and besieged by the Spaniards both by sea and land, this ill-fated colony was obliged to capitulate to the enemy.

Having now given a short sketch of the original history of the principal South American colonies, we shall next proceed to detail briefly the means by which the downfall of the Spanish power was effected in America; for it would be as impossible as unnecessary to attempt to trace the history of the various settlements from their establishment down to modern times. The horrible cruelties of the Spaniards—the continual and ineffectual efforts of the oppressed to cast off their yoke—the well-known history of the descents of the Buccaneers—these are the materials which would supply an account of the intermediate space. The particulars of the changes effected by the revolution in each colony shall, however, be given afterwards, separately, under their various heads. We are compelled to this partial repetition by the circumstance of the revolution having broken out simultaneously in all the Spanish settlements, while those of other nations, which had previously been wrested from the Spaniards, remained perfectly tranquil.

Previous to the revolution, the Spanish possessions in South America* formed five distinct governments, all constructed on the same plan, and independent of each other. Three of these were vice-royalties; viz. Peru, La Plata, and New Grenada (the latter being afterwards one of the three component states of Colombia); and two were captain-generalships, Chili and Venezuela (the latter being also afterwards merged in the republic of Colombia). The government was vested in the viceroy or captain-general, who was held to represent the king, with all the prerogatives attached to that capacity. The royal *audiencas*, or supreme courts, consisting of Spaniards nominated by the crown, enjoyed extensive judicial powers—as also did the municipalities and corporations:—but perhaps the clergy possessed more influence than any. Every body, however, possessed some privileges but the poor Indians, who were in no respect better than beasts of burden; for, although laws were made by the home government from time to time for their protection, they were never acted upon; and as the only object of the government was to raise a large revenue from the colonists (whom they taxed to the uttermost), no notice was ever taken of this disregard of the laws. The Creole or American-born Spaniards were excluded from all public offices, from the highest to the lowest, all of which were bestowed on the natives of Spain. These functionaries, whose sole object was to make money, acted the part of true despots towards the other classes; plundering, taxing, and exacting, without the slightest regard to mercy or justice. Men rose to affluence in offices without salaries, and the priests rivalled the laymen in the art of extracting money from the natives. In a word, the Creoles were little better to be envied than the miserable Indians. That this system should have continued for upwards of three hundred

* Their other possessions were Mexico or New Spain, Yucatan, and Guatemala (both now in the Mexican confederacy), and Cuba in the West Indies. With these, however, we have nothing at present to do.

years, can only be accounted for by the means adopted to keep the minds of the natives in darkness and ignorance. All books of general knowledge or information were prohibited from being imported; schools of every kind discouraged; while the priests filled the minds of the natives with the most childish superstitions and religious terrors. Nay, few could obtain leave to visit foreign countries.

Such was the state of things in Spanish America, when Ferdinand "the beloved" was dethroned and imprisoned by Bonaparte, and orders arrived in the colonies to ensure submission to the new dynasty of the conqueror's brother Joseph, who had succeeded to the crown. The functionaries and priests would have been very willing to purchase a continuance of their means of plunder on such terms, but the oppressed classes thought this would be a suitable time for procuring some remission of their miseries. Juntas were formed in almost all the states during 1809, and in 1810 the first insurrection broke out in Mexico. It would be impossible to give any consecutive outline of the various military operations. Besides, we will have to advert to them shortly in noticing the various states. Suffice it to say, that after a bloody struggle, protracted till the year 1826, the Spanish monarchy lost every foot of ground in the western world, if we except the islands of Cuba and Porto-Rico, which she still retains.

The atrocities perpetrated by the Spanish royalists during these wars are perhaps without a parallel in the annals of the human race, and point out that people as being infinitely inferior in all that characterises a Christian or civilised community among the nations of Europe. Men were massacred in cold blood, frequently by hundreds and thousands at a time; treachery, perfidy, and contempt for the most solemn oaths, were universally practised. Neither European nor Indian was spared in their thirst for blood and plunder; and it has been calculated that no less than a *million of human beings* were destroyed by them in the course of sixteen years!

COLOMBIA.

That division of South America known by the name of Colombia (after the celebrated discoverer), comprised, under the Spanish domination (as it now again does), three distinct States or governments, called by the names of the Vice-royalty of New Grenada, the Captain-generalship of Caraccas, and the Presidency of Quito. It is bounded on the east by the Atlantic Ocean; on the north it extends over part of the Isthmus of Darien, but it is scarcely yet known how far; on the west it is bounded by the Pacific Ocean; and on the south by the river Tumbez. The whole extent of territory is comprised between lat. 12° 30′ N. and 60° S., and extends over a surface of 1,100,000 square miles. The western part contains the loftiest ridges of the Andes, while the eastern stretches out into immense plains, intersected by gigantic rivers. In the vallies of the Andes, raised 10,000 feet above the level of the sea, the population is chiefly concentrated. The principal chain of the Andes is that of Caraccas, running along the north coast, with summits of from 12,000 to 14,000 feet high. The principal rivers of Colombia are the Magdalena, the Amazon (or Maranon), and the Orinoco. In Venezuela, the year is completely divided by the rainy and the dry seasons; the former commencing in November and ending in April. Gold, platina, silver, cinnabar, copper, mercury, iron, and coal, are among the mineral riches of Colombia. The principal articles of export are cocoa, indigo, tobacco, coffee, hides, and cattle. The imports comprehend manufactured goods of every description. The contraband trade is carried on to a great extent by the Dutch and English, owing to the facilities afforded by the Orinoco and its tributaries. The ports of La Guayra, Rio del Hacha, Santa Martha, Carthagena, Chagres, Porto Cabello, Panama, and Guyaquil, are those most frequented by foreigners. Besides these, the chief cities are Bogota, Caraccas, Quito, Cumana, Cucuta, New Valencia, St Thomas, Barcelona, Maracaibo, and Merida. The population, according to the report of 1827, amounted to the enormous quantity of 2,857,347, and consists of whites, Indians, mestizoes, negroes, and mulattoes. The creoles, or whites, have in general some mixed blood in their veins. All the Indians have been declared free since the revolution; and the government decided that the children of all slaves born after that period shall be free. A great many of the Indians in the interior still remain unsubdued, and in a savage state. The Romish is the declared religion of the state, but all others are tolerated, and the Inquisition has been abolished. There are four universities—at Quito, Bogota, Caraccas, and Merida. Provision has also been made for other seminaries and primary schools, but the unsettled state of the country allows but little to be effected in the way of education. Jury trial has been introduced into Colombia, for offences against the press, and in commercial matters.

Colombia will ever retain a prominent place in history, as having been the chief scene of the efforts of the immortal Simon Bolivar, who may well be styled the Washington of his country. He was born of noble parents, in the city of Caraccas, in July 1783. After receiving the elements of a liberal education at home, he was sent to Madrid to complete his studies. He then travelled through Germany and France, and returning to Madrid, married a rich and noble lady, with whom he embarked for Caraccas, intending to spend his future life in domestic peace and retirement upon his large estate. His lady having soon died, he again sailed for Europe; and on his return through the United States, became imbued with the principles of liberty, and immediately embarked in the schemes of the patriots at Venezuela. Previous to this, there had been two attempts at revolution in Colombia—once in 1797, and again in 1806; and although repressed, the doctrines of freedom had been disseminated far and wide. Upon the general movement in 1809, from the causes already explained, he was amongst its chief promoters, and received a colonel's commission from the Supreme Junta at Caraccas. From the period of the Venezuelan declaration of independence in 1811, accordingly, he took the most prominent lead in all their military operations; but we can only notice his future career in connection with the general current of events. A liberal constitution being established, affairs went on smoothly until the great earthquake in 1812 (to be noticed elsewhere), when a great change took place in public opinion, from the influence of the clergy on the superstitions of the people, who were made to believe that the dreadful casualty was in consequence of their adoption of the new order of things. Monteverde, a royalist general, taking advantage of the situation of affairs, marched against Caraccas, and soon effected its resubjugation, Bolivar himself escaping to Curacoa. In 1813, he returned; and being entrusted with an army by the confederation of Grenada, he again effected the liberation of Venezuela. Finding the necessity of entrusting their affairs to the guidance of some one energetic mind, the Venezuelans named him dictator; and by his exertions, a union between the republics of Grenada and Venezuela was for the first time effected in 1819, Quito being at this time under the dominion of the Spaniards. This was the first confederation styled the *Republic of Colombia*. At the congress which ensued, a republican constitution was established, Bolivar being elected president, and Santander vice-president. The former immediately afterwards returned to the seat of war; and after two years' campaign, the details of which it is impossible to give here, succeeded in completely overthrowing the Spanish power in Colombia. He then marched to effect the liberation of Peru—for the proceedings of which campaign see that head. Colombia remained tranquil and prosperous from 1823 to 1826, under the presidency of Santander in Bolivar's absence, when its misfortunes again commenced, and to which there has been hitherto no cessation. General Paez, who, next to Bolivar, had been the principal leader during the revolution, was a man of Indian extraction, and in his youth was a *llanero*, or cowherd. Possessing a daring and energetic disposition, he managed, at the period of the revolution, to raise a regiment of *llaneros*, and performed such essential services to the patriots, that Bolivar soon gave him a high command. Paez, however, was a man of a brutal, dissolute, and reckless disposition, and during Bolivar's absence in Peru, committed some excesses, which induced the senate to summon him to appear before them. Upon this, Paez placed himself at the head of his troops, and became the nucleus of a strong party disaffected to the central government. Things were in this state when Bolivar returned, in 1827, from Peru. In order to accomplish a reunion, he requested a personal interview with Paez at an inn near Caraccas; and the particulars of this meeting, as described by an eye-witness, Captain Chamier, R.N., in his excellent novel, the "Life of a Sailor," is worthy of a place here, as illustrating the character of one of the greatest men of modern times:—"Bolivar arrived in the vicinity of the inn at the appointed time, attended only by Colonel Wilson (son of Sir Robert Wilson) and one or two domestics. It was found, however, that Paez was not true to his engagement. It was an hour of intense anxiety to all but Bolivar, who alone could have been much injured by the perfidy of Paez, who had so often broken his faith, and had so frequently involved his country in civil discord. The Liberator, however, bore his usual equanimity of countenance, and, mounting his mule, descended into the valley. On turning a sudden angle, his surprise was great at beholding a plain covered with tents, and bearing the appearance of a hostile force encamped. As Bolivar neared his *friend*, he perceived the soldiers forming in two files, and flanking the road along which he was to pass; when his faithful aid-de-camp hinted that some perfidy might be intended; and as they advanced along the road, observed that the line of soldiers closed up in their rear. Bolivar, on being told this, had the presence of mind not even to turn round to watch the manœuvre, but steadily pursued his course. Bolivar soon saw Paez standing with some of his general officers, and directing his mule to the place, quietly dismounted, and folding the treacherous chief in his arms, exclaimed aloud, 'By this behaviour, and this submission to the government, you have saved your country!' The army immediately shouted, 'Viva Bolivar!' The mountains re-echoed the cheer; and Paez, overcome by his feelings, reclined on the breast of the president. It was immediately agreed that both should together make a kind of triumphal entry into Caraccas"—which took place accordingly.

Paez's example, however, was the occasion of disorders breaking out in other parts of the republic, entirely disunited in purpose or object, when Bolivar, at a general convention, promulgated his Bolivian code of government, the principles of which were in accordance with that of Britain—for he was confessedly anti-republican in his opinions—and which he had persuaded the Peruvians to adopt. The result, after great opposition, ended in his being chosen perpetual dictator, which office he accepted, although his character has suffered considerably by the measure. So violent was the indignation of the republican party, that an attempt was made to assassinate him, which, however, failed. In 1828, war broke out between Colombia and Peru, in consequence of Bolivar's alleged attempt to get himself also elected president or dictator of the latter state; but peace was concluded in the following year. Before the end of 1829, however, every town, province, and village of Venezuela had declared for a republican government, under the auspices of Paez. Bolivar, in short, became as nothing in Colombia, and he foolishly kept up civil discord by his presence, which was the occasion of repeated revolts and great bloodshed. Another commander and president was ultimately appointed in his place, when, worn out by grief and agitation, this great man expired at the village of San Pedro, near Santa Martha, on December 17, 1830.

After the death of Bolivar, the three component states of Colombia—Venezuela, Grenada, and Quito—peaceably agreed again to become independent of each other, severally recurring to the old republican form of government. Paez was elected president of Venezuela, which office, according to the latest accounts, he continues to hold with considerable popularity. Santander was chosen president of New Grenada; and General Flores of Quito (or, as sometimes now called, Equator or Equador). Whether these three states may ever again unite, remains to be seen.

BUENOS AYRES, OR THE UNITED PROVINCES OF LA PLATA.

The united provinces of La Plata are bounded on the west by Chili and Peru; on the east by Brazil and the Atlantic; on the south by Chili; and on the north by Bolivia, Paraguay, and Banda Oriental. The superficies of the united provinces comprised an area of 1,696,000 square miles, and was divided into fourteen provinces by the Spanish government in 1778, at the time Buenos Ayres was erected into a vice-royalty. The population of the entire vice-royalty, according to the report of special commissioners appointed for that purpose in 1818, amounted to 2,573,000. As the vice-royalty of Buenos Ayres at the time of its erection included the rich provinces of Upper Peru, the commerce of the La Plata rose into great importance, several Spanish ports being then allowed to trade with them; but it again sunk, never to revive, during the war between Spain and England, in 1797. In 1806, Buenos Ayres was taken by a small English expedition, under Admiral Popham and General Beresford; but the inhabitants, recovering from their surprise, soon afterwards drove their assailants from the town. In the following year, General Whitelocke arrived with reinforcements; the troops were quietly permitted to enter the town, when they were repulsed with tremendous slaughter, and ultimately compelled to evacuate the La Plata. There were no fortifications at the time the city was attacked by the British troops, and it was indebted for its strength solely to the peculiar structure of its buildings. In 1809, Buenos Ayres was the first to declare itself independent of the Spanish government, and the revolution was effected without bloodshed. The other provinces joined Buenos Ayres unanimously, and were completely triumphant. Up to 1819, various forms of government were successively tried and abandoned (the sittings of the legislators having been transferred to Buenos Ayres); when a constitution, founded on that of the United States, was established; and although the provinces were torn by dissensions, the general revenue increased. It was in 1825, upon a treaty of peace, commerce, and navigation, being concluded with Great Britain, that these provinces (then nine in number) assumed the name of the United Provinces of La Plata. The functions of the government were discharged by a constituent congress, the executive power being entrusted to the provincial government of Buenos Ayres. About this time the united provinces were involved in a long and devastating war with Brazil, concerning the possession of the intervening territory, Banda Oriental (of which see the separate head), which continued until 1828, when it was mutually agreed to erect it into an independent state. In the same year the able president of the congress, Rivadavia, whose talents alone had preserved the unity of the federation, resigned. This was the signal for general disorganisation, and each of the provinces again became independent. Each province now governs itself, having customhouses on their frontiers, with the anomalous exception that Buenos Ayres is still entrusted with the diplomatic function of arranging their relations with foreign powers.

The province of Buenos Ayres itself comprised in 1822 an area of not more than 1518 square leagues; but since then, an immense addition has been made out of the adjacent Indian territories, partly by force, and partly by conciliation. This recent acquisition comprises by far the finest land in the province. The whole territory is an almost uniformly level plain of great fertility, watered by a few rivers of moderate size, the largest being almost nowhere above four feet deep. There are almost no natural trees in the province, but there are numerous plantations or rather orchards of peach trees, which the natives cultivate for fire-wood—the fruit being applied to feeding the swine and poultry. Immense forests of thistles spring up at certain seasons of the year, of ten and twelve feet in height. Deer is plentiful in the wilder parts, but little prized where there is so much fine beef. The climate is extremely salubrious. The city of Buenos Ayres is situated on the southern margin of the river Plata, where the latter is formed by the confluence of the Parana, Uruguay, and Negro rivers. It is thus, as it were, the key to all the internal navigation. The length of the Plata from its formation to the ocean is upwards of seven hundred miles. The city occupies a large extent of ground, being about two miles long, and a mile and a half broad, all the streets crossing at right angles. There are a Jesuit university, an Episcopal church, and about fifteen other churches. The prosperity of Buenos Ayres and the other provinces is greatly impeded by the defective navigation of the river Plata, which is filled with shoals and sandbanks, and therefore dangerous to large vessels, otherwise the city of Buenos Ayres would become one of the largest emporiums of commerce in the world. The rivers Parana and Uruguay are each navigable for vessels of from two to three hundred tons, fifteen hundred miles into the interior; the former running through Paraguay into the centre of Bolivia.

Speaking generally, the so-termed united provinces of La Plata may be reckoned, from their natural riches and advantages, as one of the most important divisions of South America. In 1830, even in their disunited condition, the exports amounted to nearly two millions. One of the distinguishing characteristics of La Plata, are the vast plains called *pampas*, one portion of which extends from the banks of the Paraguay, westward to the frontiers of Los Charcas, and northward to the mountains of Chiquitos—another immense plain, three hundred miles in length from east to west, and fifteen hundred from north to south, as far as the interior of Patagonia, nine hundred miles of which appertained to the vice-royalty. These plains present one uniform expanse of waving grass, uninterrupted by either wood or eminence, although in some places parched and barren, and perfectly uninhabited, unless by innumerable herds of wild oxen, horses, ostriches, and other animals. Over these pampas lies the only route by land from Buenos Ayres to Chili, which journey was formerly performed by large companies, as the plains were infested by hordes of roving Indians, who went there to hunt, catch wild horses, and plunder. From the absence of all permanent landmarks, the travellers over these immense plains shaped their course by the compass, and their caravans were in reality moveable houses, solid and defensible. Of late years, regular post-houses have been established along the whole line of road betwixt Santiago (capital of Chili) and Buenos Ayres—a distance of nearly 1400 miles—and a regular communication is kept up betwixt the two provinces by means of couriers, who perform their journies with uncommon speed.

PARAGUAY.

The republic of Paraguay, formerly one of the united provinces of the vice-royalty of Buenos Ayres, is situated between the rivers Parana (on the east and south), and Paraguay (on the west). It is divided by a mountainous ridge from Brazil on the north. It comprises an area of about 50,000 square miles, with a population of about 250,000, seven-tenths of which are Creoles. At the revolution in 1810, the Buenos Ayreans sent a body of troops into Paraguay to subdue the Spanish authorities; but the people rose in arms, and after repelling them, quietly deposed the governor themselves, and proclaimed Paraguay a republic, under two consuls, Francia and Yegros. Soon after, the former caused himself to be elected dictator for three years, and at the end of that time procured his nomination for life. In 1827, he obtained an acknowledgment of the independence of Paraguay from Don Pedro, then emperor of Brazil. This extraordinary man is a native of Paraguay, and studied for the church, in which profession he actually took out his diploma as doctor of theology in the university of Cordova del Tucuman. He afterwards changed his views, and studied law, which he practised for some years, distinguished by his extraordinary learning, ability, and integrity. On the breaking out of the rebellion, a man of his talents could not be wanted; and being the only individual of learning and ability in the province, he may be said to have managed the whole affairs of that crisis himself. In fact, his practice was, whenever he was opposed by the rest of the junta, to retire into the country, when they were glad to recall him upon his own terms. The ascendancy he thus acquired he has since maintained in his dignity as perpetual dictator, and is certainly one of the most extraordinary despots on record. "He is sober, abstinent, and unostentatious, economical of the public money, and disinterested; but stern and capricious, employing the arm of absolute power to correct the vices and increase the industry of his subjects. He lives among the people with the simplicity and familiarity of a patriarch, and yet is a tyrant in spirit, and carries his tyranny into the most ordinary acts of private life. He directs one man how to build his house, another how to till his ground, a third how to fabricate the articles he manufactures; he fixes the price of commodities, and enforces all his orders with the most summary and rigorous penalties. Idleness is punished as a crime. He keeps a small army to support his authority and guard his frontiers, and will neither permit any stranger to enter the country, nor any of his subjects to leave it. Being dissatisfied with the meanness and irregularity of his capital—the small town of Assumption—he compelled the inhabitants to pull down their houses and rebuild them on a new plan. He prohibited nocturnal church processions as sources of profligacy, expelled the monks, abolished the Inquisition, and diminished the number of festivals."* Having completely "subdued, even to his very quality," the minds of his subjects, Dr Francia has latterly relaxed much in his austerity, and is as much respected as he was formerly feared. Several remarkable instances have occurred of his stern exclusion, or rather of his detention, of intruders. MM. Renger and Longchamp, two Swiss physicians, who fell into his power, were detained six years; and Bonpland, the companion of Humboldt, having incautiously ventured within the magic limits in 1822, was not liberated till 1831. It is not surprising, in these circumstances, that little or nothing should be known of the government or territories of this jealous despot.

The climate of Paraguay is mild and healthy, although moist, being low and level. All sorts of tropical fruits, corn, vines, sugar-cane, rice, maize, tobacco, indigo, and a number of valuable medicinal plants, abound in profusion. There is a particular plant peculiar to Paraguay, called *yerba*, and, when decocted, *mattee*, which greatly resembles the tea of China, and is by many preferred to the latter. It is universally used in South America. Of late years, it has been begun to be cultivated in Brazil with great success. Immense herds of cattle roam over the vast plains, whose hides and tallow form the principal article of their commerce.

BANDA ORIENTAL.

This comparatively small state, which occasioned such a long and bloody contention between the united provinces and the Brazilian government, is situated between the river Uruguay and the Atlantic from south to north, and between the rivers Plata and Parana from east to west. From its position, between the Spanish and Portuguese settlements, it soon became an object of contention; but it would be a waste of time to follow the course of the struggle. Suffice it to say, that after seas of blood and mines of treasure had been expended, in a war of more than half a century's duration, during which the disputed territory, by being the common battle-field, was devastated by both, the contending parties at last drew stakes, and it was erected into an independent state in 1829. Its extent is calculated at about 80,000 souls, almost all of whom are white. The capital, Monte Video, containing 10,000 inhabitants, holds a most important position, being situated at the very mouth of the river La Plata, on its northern bank.

CHILI.

Chili is bounded on the north by La Plata, on the east and south by Patagonia, from which it is separated by the Andes, and on the west by the Pacific Ocean, along the shores of which it stretches from 25° to 44° of south latitude. It is 1300 miles long, and from 30 to 120 broad. The ground slopes gradually up from the ocean to the Andes, but is intersected by their projecting branches, some of which run almost down to the sea-shore. Chili is at present one of the least valuable of all the South American possessions, the greater part of it being barren and uncultivated, owing to the want of streams. The two most northern of the thirteen provinces into which it is divided are almost deserts; but those in the south are equal in beauty and fertility to any other part of South America; and amid splendid woodlands, the finest crops of wheat, barley, rye, and other species of grain, are raised with scarcely any trouble to the cultivator beyond scattering the seed. Cotton, sugar-cane, vines, &c., are also extensively cultivated. The country is perfectly free of all noxious reptiles, the climate salubrious, and the weather serene. The want of navigable rivers is unfavourable to commerce; and although there are many rich mines of gold, silver, and copper, in the northern provinces, the sterility of the country around them prevents most of them from being wrought.

Chili, like the other Spanish possessions, assumed its independence in 1810, when the supreme authority was vested in an elective magistrate, called a "Supreme Director," with a senate of nine members, who held their offices for six years. But in 1827, the directorship was changed for a presidency, in imitation of the United States. The Roman Catholic religion is the established one in Chili. There are said to be nearly 10,000 monks and nuns in the country, and the religious institutions formerly possessed nearly one-third of the landed property of the state. Since the revolution, however, the influence of the monks has been gradually decaying, and their revenues and privileges abridged. Chiloe, an island in the Pacific, off the coast of Chili, was the last place of South America where the Spanish flag was displayed. It was captured in January 1826. It will be recollected that the success of the revolutionists was much indebted to the gallant exertions of Lord Cochrane, who commanded the Chilian squadron from 1818 to 1823. But it would go much beyond our limits to enter into any detail of the arduous and patriotic struggles of the Chilians. Of the warlike tribe of Araucanians, who have maintained the independence of every other nation or tribe so long, whether against force or persuasion, and whose indomitable resolution has led some geographers to divide the state into *Spanish Chili* and *Independent Chili*, we have already spoken at considerable length.

The total population of Chili is estimated at 1,200,000. The principal cities and towns are Santiago, or St Jago, the capital, containing 70,000 inhabitants, and distant about ninety miles from the principal sea-port, Valparaiso, which latter city contains 20,000. Besides these are Conception, or Penco, Coquimbo, Quillota, Peteron Guasco, Copiapo, and many others of inferior note. The revenue in 1824 was 1,636,000 dollars, while the expenditure was above 2,000,000. But this was during the hottest period of the war. The exports from Britain to Chili, in 1829, amounted to L.1,182,000, while the imports were only L.58,000 official value. Chili is entirely destitute of native manufactures.

The *Chilian Archipelago* is separated from the shores of Chili by a narrow and dangerous strait. There are here a cluster of islands about eighty in number, one-fourth of which are inhabited, and contain upwards of 20,000 inhabitants. They are a primitive race, of simple manners. These islands are all small, rocky, and sterile; some of them, however, are covered with unwholesome forests. There is also another cluster of thirty-five islands lying more to the south, and between 44° and 47° of south latitude, called the Archipelago of Chonos. These are still inhabited by savage Indians.

About 300 miles west of Chili, and in south latitude 33° 40', lie the two islands of *Juan Fernandes*. One of these, *Masafuero*, being only twelve miles long and six broad, is the scene immortalised by De Foe, who founded his incomparable tale of Robinson Crusoe on the singular fate of Alexander Selkirk, who, being *marooned*, or left desolate, on this island by his shipmates, was found four years afterwards by Captain Woods Rodgers. It is still uninhabited, although beautiful and inviting in appearance. The other, called *Shore Island*, is possessed by a few Spaniards.

PERU (LOWER).

History, poetry, and romance, have contributed to invest Peru with an interest which attaches to no other part of the southern world. Its inexhaustible mines of gold and jewels—the splendour of its ancient Incas—the stories of its wrongs from its first invaders—all have contributed to render it a land of "mystery and of beauty." But although the imagination may still delight to dwell on "the tales of the days of old," all of the romantic is now departed from Peru. It has been stripped of its richest provinces, and reduced to a very inferior scale in the list of the South American republics.

In our preliminary historical outline, we brought down our notice of Peru to the death of Pizarro. We have no room here to dwell on the succeeding annals, or detail the barbarities of the Spaniards, and the various efforts of the peaceful and unwarlike Peruvians to shake off their yoke. The extent of the ancient empire of Peru has been calculated at 500,000 square miles; at present it does not amount to the one-half. In 1718, the northern province of Quito was dismembered from it, and attached to the vice-royalty of New Grenada; and in 1778, the district of Potosi, and several others of the richest provinces, were annexed to the vice-royalty of Buenos Ayres. It is now called *Lower Peru*, in contradistinction to the latter disjoined provinces, which are termed *Upper Peru*, since formed into an independent state, and named *Bolivia*. Lower or modern Peru is a continuation, to the west, of Chili, bounded by Brazil on the north, and on the south by the Pacific Ocean, and stretching, like Chili, between the latter and the Andes. The western part is a mere desert of sands, 1700 miles long, and from 7 to 50 in breadth, intersected by innumerable streams, many of which, although some of them are 80 miles long, never reach the ocean, but are absorbed in the leafless and lifeless deserts, or drained off to irrigate the cultivated lands—for here rain never falls. This desert tract is also intersected by deep and dark ravines, where, as traditions tell, the descendants of the ancient Peruvians have lived concealed since the days of the Incas. The eastern parts of Peru, or highlands lying near the Andes, have a rich and deep soil, and raise all sorts of tropical crops, fruits, and vegetables in abundance, but, from their inland situation, are almost beyond the reach of commerce—for, like Chili, Peru has no navigable rivers. The greatest advantage possessed by Peru is in its abundance of the precious metals. Gold, silver, platina, tin, copper, lead, quicksilver, are in abundance, together with precious stones, salt, alum, saltpetre, coal, sulphur, &c. The wealth of Peru, in fact, has been entirely owing to its mines, as the general sterility of the soil has prevented much attention to agriculture. The revenue of Peru, in 1826, was set down in an official statement at L.1,400,000; but this is supposed to be exaggerated. The population is estimated at upwards of 1,500,000, of which the Indians outnumber the other castes three times over. Lima, the capital, which was formerly the grand *entrepôt* for the trade of all the west coast of South America, contains a population of between 60,000 and 70,000. All the trade is carried on at Callao, which, although six miles distant, is the port of Lima. The official value of the

* Encyclopædia Britannica—Art. *America*.

different articles of British produce and manufacture exported to Peru in 1829, amounted to L.376,552, besides L.13,076 of foreign and colonial merchandise. The imports from Peru into Britain during the same year was L.69,839.

The government of Peru is now a republic, but before obtaining which, it had to contend as much with friends as enemies. The Peruvians set up the standard of revolt, like the rest of their countrymen, in 1809; but the power of Spain kept all serious movements in check until the year 1821, when the Chilians sent a force under General San Martin, who succeeded in capturing Lima, and was soon afterwards declared protector of the new republic, with supreme power, civil and military. San Martin then drew up a constitution upon the most free principles; but the new views of the people ran into the extreme of democracy, and his plan being disapproved of, San Martin retired. Meanwhile, the Spanish generals, who had retreated to the highlands, again commenced operations, when, in 1823, Bolivar came to the assistance of the Peruvians. He was received at Lima as a sort of demigod, and received the title of *El Libertador*, with supreme military power. We have not room to follow the progress of the war here; suffice it to say, that in the year 1826 the war was ended by the reduction by famine of Callao, into which the Spanish general, Rodil, had thrown himself. Under the head Colombia we have noticed the dissatisfaction occasioned by Bolivar attempting to force upon that province a code constructed according to his own peculiar views of government. In Peru, where he had managed to impose it, it occasioned no less; and the general disaffection, and suspicion of the *libertador's* conduct, among the patriots of Peru, terminated in the revolution of January 1827, in which Bolivar's own troops, which he had left in Peru, cooperated. The Bolivian constitution was abolished, and that of 1823 adopted. In 1826, a new constitution was formed, which was to be in force till 1833. About the same time, Bolivia, then newly erected into an independent state by Bolivar, under his favourite constitution, becoming likewise disgusted with it, requested the aid of the Peruvians to shake off the yoke. A Peruvian army was immediately dispatched; Bolivar's favourite general, Sucre, who had been appointed president for life, was deposed, and Bolivia declared free. Bolivar forthwith published a declaration of war against Peru; but the Peruvians anticipated any hostile measures on his part by marching an army into Colombia, where, however, they were entirely routed by Sucre. The hostilities with Colombia were terminated in 1829, by treaty; and Bolivar and his plans of government having now fallen into disgrace with all parties, the Peruvians were at liberty to choose what constitution they thought proper. What the exact nature of the present one is, it is impossible to tell, from the repeated changes introduced; but it is decidedly republican in principle, having an elective president at the head of it. The Romish is the established religion of Peru; but the power of the priests is kept greatly in check, and all interference with the liberal education of the people prevented. The remembrance of the ancient heathen worship is still preserved by an honorary institution, called the "Order of the Sun." There was formerly only one temple dedicated to the great luminary, being in the city of Cusco, which is the inland capital of Peru. The riches of this temple are said to have been immense. The walls were encrusted with gold, as also the figure of the sun, of great magnitude. On each side were thrones of gold, on which were placed in a sitting posture the bodies of the deceased Incas. In another part of the temple was a large statue of the moon in silver, seated on a silver throne, and the bodies of the deceased queens seated on each side on similar thrones. But it would be endless, and not a little tantalising, to enumerate the boundless riches of this wonderful place, all of which were seized by the Spaniards.

Earthquakes are frequent in Peru. The city of Lima has been three times almost entirely destroyed by these visitations—in 1687, 1746, and 1828; but of these we will speak under a separate head. Besides Lima and Cusco, the next largest town is the maritime port of Arequipa, which has been six times destroyed by eruptions from a neighbouring mountain, and yet possessed a population of 40,000 previous to the revolution. There are also a great many other towns of minor importance.

Slavery was abolished for ever in Peru by San Martin, upon its declaration of independence, after the year 1815.

BOLIVIA, OR UPPER PERU.

This republic, as has already been repeatedly stated, was formerly a province of Peru, was detached from that state and annexed to the vice-royalty of Buenos Ayres in 1778, and finally erected into an independent state, by a declaration of the citizens, in 1825, receiving its modern name in honour of the *libertador*, Bolivar. As we have had occasion to speak so often of this part of the revolutionary struggle, we reckon it unnecessary again to enter upon it. It has been acknowledged by the ablest political writers, that the Bolivian constitution was founded upon the strictest principles of justice and liberty, providing for the liberty of the subject and the enjoyment of civil rights; and if Bolivar had, after promulgating it and seeing it put in operation, retired from public life, his reputation as a patriot and a statesman would have been handed down as one of the brightest in history. But, unhappily, circumstances occurred to throw suspicion on his motives, and, consequently, to bring unpopularity on his measures; and he expired after beholding all the schemes which he had dedicated his life to effect, prove abortive.

Upon the Bolivian code being adopted by a congress of the people's representatives, and sworn to unanimously by the people themselves, General Sucre, who, under Bolivar, had been the great means of achieving their independence against the desperate efforts made by Spain to retain this rich portion of their possessions, was chosen president for life, and for two years the state remained peaceable and contented, and the country increased in prosperity. Upon the movements taking place, however, against Bolivar's proceedings in Colombia and Peru, Bolivia caught the infection, and the people easily found a pretext for murmuring and discontent in the circumstance of Sucre retaining (but which had been originally sanctioned) a body of 5000 Colombian troops in Bolivia. In order to remove this cause of discontent, Sucre determined to send off the whole to Colombia, and requested the Peruvians to allow the soldiers to pass through their territories to the port of Arica, that they might be shipped off. Strange to say, this was refused by the Peruvian general, Gamerra, who thus would not permit the brave men, who had marched over the Andes to achieve the liberty of Peru, to return peaceably to their homes, unless they submitted to be disarmed. While occupied with this affair on the borders of the province, revolt broke out in the capital, Chuquisaca; and when Sucre returned with the view to quell it by persuasion, he was shot through the body and made prisoner. Upon this intelligence, Gamarra, under pretence of advancing to protect him, marched into Bolivia. Sucre was ultimately set at liberty, but it was only to resign formally the presidency, on the 16th August 1828, when General Santa Cruz was elected his successor. Since then, the republic has been in a complete state of turmoil and change. Colonel Blanco, in the absence of Santa Cruz, usurped the supreme authority, but, in a few months, was dispatched by assassination. Gamarra next seized on the president's chair, but has been ejected by Santa Cruz, who, according to the latest intelligence, continues to hold it, but amid great jealousy and suspicion of his ultimate ambitious views.

Bolivia is bounded on the north by Peru and Brazil, on the east by Brazil, on the south by the Buenos Ayrean provinces and Chili, and on the west by the Pacific Ocean and Peru. It comprehends a space of 480,000 square miles, and the population is estimated at 1,200,000, of whom probably two-thirds are Indians. This republic includes five of the provinces which were formerly under the Buenos Ayrean viceroyalty, but has been divided by the new government into six departments, viz. Potosi, Chuquisaca, La Paz, Santa Cruz, Cochabamba, and Oruro. The greater part of Bolivia is situated in a very high elevation, but towards the east it stretches down in extensive plains towards Brazil. The climate, therefore, is extremely various. On the high parts, snowstorms and hurricanes frequently prevail, and the plains, from the rigour of the weather, are destitute of vegetation. The climate of Potosi, at an average elevation of 13,400 feet, is so changeable, that it frequently exhibits in one day all the vicissitudes of the four seasons of the year. Thence descending through the regions of Oruro, at an elevation of 12,400 feet, La Paz at 12,100, Chuquisaca at 9300, Cochabamba at 8400, down to the plains of Majos and Chiquitos, all the known degrees of temperature, from extreme cold to extreme heat, are experienced. To compensate for the rigour of these elevated regions, nature has enriched it with the most valuable mines of gold and silver, which, with other precious metals, form the only articles of Bolivian commerce—(see *Mines*). The mountain of Illumini, in La Paz, which is supposed to contain rich veins of gold ore, is 24,000 feet above the level of the sea, and is only inferior to Sorata, in the same district, which has been determined by survey to be 25,400 feet. These are the giants of the Andes. From the great difficulty of working the mines, and the expense of extracting the ore, the greater part of the gold of Bolivia is obtained from the *lavadcros*, or gold washings in the beds of rivulets, where it is found in the shape of grains. The most productive of these *lavadcros* are those of Tipuani, in the province of Larecaja. Silver, however, is the great staple metallic production of Bolivia; and the famous mountain of Potosi is ranked next in importance to the mines of Guanaxuata in Mexico or New Spain. On account of the inconsiderable nature of the rivers flowing from Bolivia to the Pacific, and the badness of the roads, it is impossible this country can enjoy much commerce with the Pacific; but towards the east, several large streams communicate with the large navigable rivers that flow into the Atlantic Ocean. The river Paro, or Beni, which rises near Cochabamba, and the Guapey, which rises near Cochabamba, after a long sweep, unite with the Mamor., and, flowing to the north-east, mingle with the waters of the Maranon or Amazon. The Piecomayo, again, which rises near Potosi and Chuquisaca, and the Vermejo, which rises in the valley of Tareja, flow to the south-east, and mingle with the Paraguay, which empties itself into the Rio de La Plata. All these rivers are navigable almost to their source, and, with steam navigation, would open up a direct communication between these rich districts and the nations of Europe.

The table land of Titicaca is the most elevated table land in the globe, with the exception of Thibet; but while the latter only presents pastures and flocks of sheep, the latter exhibits towns and populous cities, and is covered with fine crops of wheat, barley, rye, &c. The lake of Titicaca is 12,700 feet above the level of the sea, and is twenty times the size of the lake of Geneva. It contains several islands, the largest of which, named Titicaca, is the place whence Manco Cupac, and his wife Manco Oello Huaco, came forth to found the empire of the Incas, and spread civilisation, industry, and good government through the nations. A magnificent and gorgeous temple of the sun was afterwards erected here, the whole ornaments and wealth of which were thrown into the lake, to prevent their falling into the hands of the Spaniards. During the revolutionary war, alas! it was used as a prison for those whose forefathers had worshipped in it.

PATAGONIA.

Little is known of this vast region, which has not been colonised by any European nation, and the greatest part of which has never been explored. It is the most southerly district of South America, and stretches from the Straits of Magellan to La Plata and Chili; a direct distance of 1100 miles, being bounded on the east by the Atlantic, and on the west by the Pacific Ocean. The country is thinly peopled, and inhabited by two nations of savages—the Moluches, or Warriors, and the Puelches, or Easterns. The former have a decided affinity to the Araucanians in Chili, and doubtless belonged originally to the same nation. The Puelches are the people known to voyagers under the name of Patagonians. Both are a wandering race, living by hunting, fishing, and the other means of subsistence among savage nations. They sometimes make incursions on the settlements of the colonists, to whom they are formidable from their courage and numbers. The accounts of the early voyagers respecting the huge stature of the Patagonians, are doubtless absurd; but it is certain, that, in general, they are above the average size of the human species. "They are a large bodied people," says Falconer the Jesuit, who resided forty years in South America; "but I never heard of that gigantic race which others have mentioned, though I have seen persons of all the tribes of southern Indians."

There is a remarkable circumstance connected with the climate of Patagonia, viz., that, even in its most sterile regions, all the most delicate of the tropical birds are to be found. Captain King observed parrots and humming-birds on the wing during a snow-shower, and saw the latter twittering about, and sipping the sweets of the fuchsia and other flowers, while the thermometer was at the freezing point. This would appear incredible, but for some other observations of the same gentleman on the nature of the climate. While employed in his observatory during the night, the thermometer frequently fell to the freezing point, without his feeling any sensation of chillness. Another peculiarity is the extraordinary warmth of the sea near the surface, compared with the state of the atmosphere; a difference of thirty degrees being frequently found.

To the east of Patagonia, lie the two Falkland Islands, the possession of which at one time, although perfectly worthless and uninhabitable, nearly occasioned a war between England and Spain. They are now held by the former. Still farther south, are the South Shetland Isles, containing not a vestige of vegetation, and covered with eternal snows. To the north-east of these is a large island, Georgia, which may be termed the throne of the southern winter, presenting nothing but rocks of ice and mountains of snow.

BRAZIL.

Brazil is by far the largest and most important state in the new world. The climate is more generally salubrious and agreeable than any other tropical country, and every part of the soil is rich, fertile, and exuberant of vegetation. It is in a manner encircled by Banda Oriental, Paraguay, Bolivia, Peru, Colombia, and Guiana; bounded on the east and north-east by the Atlantic, and possessing the immense range of coast from beyond the Rio Grande South (about half way between Rio Janeiro and La Plata) and the Amazon. The territory within these limits has been estimated at 2,000,000 of square miles. Of the amount of population it is hardly possible to speak, as no returns have been made from some of the provinces; but it is conjectured that it cannot be much under 5,000,000. The territory of Brazil, indeed, is nearly as large as Europe.

Brazil was governed in much the same way as the Spanish colonies, until the year 1800, when King Joam VI. fled from Portugal to escape the clutches of Bonaparte, who had taken a fancy to his dominions. He was warmly received by the Brazilians; nor was their joy misplaced, for he immediately set about freeing the territory from all the marks of colonial dependence. The press was made free, newspapers established, and the ports thrown open to the traders of every nation; and every thing done to promote education and industry. In 1815, also, Brazil was created an independent state, although annexed to the crown of Portugal. In 1817, some democratic insurrections broke out in Pernambuco; and although suppressed, discontent still continued, until in 1821 it was announced that the Portuguese constitution was to be conferred on Brazil. Before this, however, King Joam had sailed for Portugal, promising at his departure increased pay to all his officers and soldiers. But when he was gone, it was found he had carried off every farthing that was in the treasury, having also raised immense sums by means of treasury bills. The public indignation at this discovery, together with the suspicion that he intended again to reduce Brazil to the condition of a vice-royalty, occasioned a general call for his son Don Pedro, who had been left as regent, to assume the head of the government as an independent state. This he readily complied with: in 1822 he was proclaimed emperor; and in 1825, his title and the independence of Brazil were acknowledged by his father. Then followed the war with Buenos Ayres respecting the Banda Oriental, which, at its termination in 1828, left the country destitute of all currency but paper. This excited much discontent. About the same time, the abolition of the Portuguese constitution by Miguel excited the suspicions of the Brazilians that that event was only the prelude to a similar occurrence in Brazil; nor did the language and deportment of Pedro tend at all to allay their fears. In April 1830, the nation had become divided into constitutionalists (Brazilians) and absolutists (Portuguese); but an attempt having failed to induce the troops to declare the emperor absolute, he to all appearance joined the constitutionalists. His measures and conduct, however, continued so equivocal, that, in March 1831, manifestations of popular excitement broke out. The extreme rigour he exercised on this occasion, and his subsequent vacillation, increased and incensed his enemies more and more; and in the April following, disturbances broke out in which many persons were killed. Pedro immediately announced a change of ministry; the public remonstrated against this, but he remained resolute; an insurrection, in which the troops joined, was the consequence; and next morning Pedro abdicated in favour of his infant son, Pedro II., and embarked from Rio Janeiro, on board an English ship of war, carrying with him an immense treasure in diamonds and jewels. The infant emperor was at first much beloved by the Brazilians, but continued civil dissensions seem to render it doubtful if his reign will be a long one. His father's conduct has gone far to shake the public faith in the benefit of a monarchical government.

The comparative importance of Brazil among the South American states, as a commercial nation, as well as the deteriorating influence which civil discord has had upon her commerce, may be pretty accurately guessed by the variations in her trade with Great Britain. In 1829, all Spanish America, including Mexico, with its twenty millions of inhabitants, took goods from this country only to the amount of L.3,286,000, while Brazil alone, with five millions of people, one half of them negroes, imported British goods to the amount of L.6,100,000! This is *official* value, and affords a correct measure of quantity, though not of price. In the year 1831, the official value of the imports of British goods at Brazil was reduced to L.4,300,000, while several of the other states, by becoming settled, have been increasing. Brazil is rich in mineral treasures, especially in gold and diamonds. Gold is found in the beds of almost all the rivers that rise in the interior of Brazil, and almost all the towns were founded by adventurers for gold.

There is no silver found in Brazil, all the dollars in circulation coming from the Spanish mines; but there are several great mines of iron and nitre. Next to the gold, however, diamonds form the staple of Brazilian mineral riches. They were first accidentally discovered about 1730, having previously been supposed peculiar to the eastern countries.

Salt is extremely abundant in Brazil, and is an indispensable requisite not only in the food of man, but of cattle, sheep, poultry, and other animals. Even this article, however, has not escaped the rapacious gripe of the crown, which farms it out. From this cause, salt is so uncommonly dear, that the quantity necessary to salt an ox frequently costs more than the ox itself. The whole commerce of Portugal, indeed, loses from this cause, and is deprived of what it would gain from abundance of salt fish, meat, bacon, butter, and cheese, which would otherwise form articles of trade.

The chief cities in Brazil are Rio Janeiro (the capital), situated on the banks—not of the river, as is generally supposed, for river there is none, but—of the bay of that name. The population is estimated at nearly 200,000 inhabitants. The harbour is one of the finest in the world. The entrance to it is a narrow opening in a ledge of rocks, about half a mile wide, at the mouth of which is an island, upon which a strong fort is erected. After passing through this strait, the mariner finds himself in a magnificent bay 100 miles in compass, and encircled by lofty mountains. Vessels of all dimensions may enter and anchor in perfect security. The city is on the north-east side of the bay; the streets are narrow, and the whole appearance of the city somewhat mean. It is, however, gradually improving, by the erection of public and private buildings. The greatest portion of the mercantile inhabitants are Portuguese. The continual commotions have all along been distinguished by that criminal feature of the Portuguese character, assassination. An English gentleman, who resided there for some time after the abdication and departure of Don Pedro, mentioned that it was usual to find five or six dead bodies every morning in the streets; a circumstance which seemed to excite neither horror nor surprise among the citizens.

Bahia, or St Salvador, the ancient capital, is situated on the east side of the magnificent bay of All-Saints, which extends a whole degree from north to west, branching inland in every direction, and capable of holding all the shipping in the world. It is in fact a little archipelago, studded with islets. The population was formerly about 100,000, but has greatly decreased since the transference of the court to Rio Janeiro. From its centrical situation, the commerce is very extensive. Pernambuco is the next city in size and importance, and is increasing so rapidly, that new houses are built wherever space can be found; while the commerce is increasing in proportion. It is perhaps the handsomest city in Brazil, with broad paved streets, fine houses, an Episcopal palace, handsome churches, convents, hospitals, theatre, &c. The population is about 20,000. Besides these, are Villa Rica, Para, Rio Negro, and about two dozen others of lesser importance.

One peculiar trait of the Brazilian character is the sentiment of equality which pervades all ranks—a feature of disposition hardly to be expected under such a government. The white servant converses with his master on the most equal footing; and instead of promptly obeying his orders, discusses their propriety. This sentiment of equality operates with peculiar advantage to the slaves. The latter are well fed, well clad, and treated mildly. They are allowed two days in the week to themselves besides Sunday; and the general tendency of the laws is in favour of manumission. If the sum of L.5 is offered at the baptismal font, the master is forced to manumit the child.

GUIANA.

This territory is divided into British, Dutch, and French Guiana. It is situated north of Brazil, between Cape North and Essequibo, inclusive. Having, in our late Information on the West Indies, given a complete account of British Guiana, the most important of the three settlements, we feel it unnecessary to recapitulate the details here.

The settlement of Cayenne, or French Guiana, was first formed about 1630, by a colony from Caen, in Normandy, after which it is called. It did not succeed. From that period down to the peace of 1814, it passed alternately into the hands of the Dutch, British, Portuguese, and French, but was then finally restored to France. There are two settlements, one on the mainland, another on the island of the same name, separated from the former by the river Cayenne. The mainland is low and marshy, and the Indians in the surrounding territories are so troublesome, that the settlers attend to little else than the rearing of cattle. It is on the island that all the articles of merchandise are raised, consisting of coffee, sugar, cotton, cocoa, indigo, Cayenne pepper, &c. The island is 18 miles long and 10 broad. At the north point is the town of Cayenne, the capital of the colony, with a fine convenient harbour, and containing about 200 houses. The population of the whole colony does not exceed 17,000, of whom only 1000 are whites; and altogether it is a settlement of very little importance.

Dutch Guiana, until 1814, comprehended Surinam, Berbice, Demerara, and Essequibo; but the three latter being then transferred to Britain, the former is at present the only possession of the Dutch. It is about 210 miles long along the coast, and as much broad. The soil is low, rich, and fertile, and produces sugar, rum, cotton, and coffee, for exportation. In 1831, the imports of Surinam into the United Kingdom amounted only to L.899, while there were no exports in return. In 1815, the population was calculated at 49,000, of whom 2000 were whites, 3000 free coloured persons, 31,000 slaves, and 13,000 free Indians and Maroons. Paramaribo is the capital, situated on the river of that name, with a population of 5000.

GENERAL CHARACTERISTICS—POPULATION, CHARACTER, RELIGION, CUSTOMS, &c.

The question respecting the origin of the native population of both continents of America, seems to have been settled by the discovery of Bhering's Straits, and there is now scarcely a doubt entertained of their descent being Asiatic. We have seen that there are throughout most parts of the interior of South America innumerable hordes of these Indians still living in a savage and primitive state. Of the general features of these people it would be in vain to attempt an enumeration here, being divided into thousands of small tribes, or *nations*, as they call themselves, all distinguished by their own peculiar characteristics. Many of them, such as the Chilians and Peruvians—and of the former, the Araucanians more especially—were certainly marked, from the earliest period of their discovery by Europeans, by many of the finest and noblest traits of human nature while in an unenlightened state—hospitable, faithful, social, peaceful, and affectionate; while those in other parts of the immense continent were conspicuous, as many of them indeed still are, for all the cruel, deceitful, bloody, and barbarous features displayed by the most savage nations.

Whatever may be advanced against, and however condemnatory our own opinions may be of, the ritual of the Romish church, the experience of history would seem to show that it is of all others the best fitted, perhaps, to captivate a people involved in the errors, and addicted to the superstitious observances, of heathenism, from the strong power which it exercises over the imagination. We find, accordingly, it was through the influence of the Jesuits that a compromise or friendly understanding was first effected between the American Indians and their conquerors. This union has continued to grow gradually firmer from the sexual intercourse of their descendants, and by which the physical characteristics of the two races have been amalgamated in the present brown or rather olive-coloured population, who now constitute the great body of the Christianised inhabitants of South America. The events of the last half century, too, have contributed powerfully to annihilate that invidious distinction of *castes*, which in other European colonies has always been the constant source of mutual jealousy, envy, and heart-burning—displaying themselves in discontent and insurrection on the one hand, and oppression on the other. This gradual extinction of the observance of *caste* has naturally generated a more benevolent sympathy towards the unfortunate African negroes than is any where else exhibited; and, accordingly, it was one of the first objects of the patriots who threw off the Spanish yoke, to grant them their freedom. In some provinces—as those, for example, of Columbia—immediate emancipation was declared; in others, more gradually. In some parts, as in the Brazils and Guiana, slavery still exists; but the spirit of all the various governments is favourable to manumission, and universal freedom seems to be a matter neither improbable nor distant. The uniform establishment of the Roman Catholic religion throughout all the states, has also no doubt contributed much to produce a community of feeling and sentiment among all classes of the population, all being alike—negro as well as white—members of the church. The events of the revolution were naturally accompanied with marks of unpopularity towards all the original institutions introduced by the Spaniards, religious as well as civil; but in the matter of religion, the odium seems to have fallen not on the church, but on its professors. This was more especially the case in the commercial cities, where latitude of opinion generally first manifests itself in all nations, in almost all of which as complete an overturn and spoliation took place among the rich and indolent establishments of monks and friars, as during the period of the reformation in Scotland.

Generally speaking, the natives of South America are a much more active and industrious race of men than the creoles of other tropical countries. The Spanish custom of the *siesta*, or noon-sleep, is universally prevalent; but both before and after that period of repose, they are actively engaged either in transacting business, or in giving and receiving visits, attending public exhibitions, promenading, making short journies of pleasure, &c. As amongst the whites in the West Indies, universal hospitality prevails, every man's house being a home to the traveller; and this is the more necessary from the scarcity and bad provisions of the inns. The manners of the inn-keepers and their servants resemble those in the United States, where both sit down at table, and converse familiarly with their customers. The staple dish throughout South America, both at inns and in private houses, is the *olla*, consisting of boiled or stewed beef, covered with *friolas* and other vegetables. In these places of refreshment, too, travellers of all ranks and characters dine at the same board, and take their siesta in the same room, upon mats spread down for the purpose. Travellers of respectability generally endeavour, however, to stop at the houses of proprietors near the way-side, who live in a style of wealthy ease and luxury. Captain Hall gives the following description of the interior of a Chilian country house:—"We dismounted at the door, and were shown into a bleak comfortless room, with a mud floor, a rude unfinished roof, and lighted by a solitary black tallow candle, all of which made us feel instinctively sure of a cold reception. In this, however, we were much mistaken, for the master of the house no sooner saw who we were, than he begged us to walk into his sala or drawing-room, a very different apartment from the first, for, as we entered, we could scarcely stand the glare of light from a dozen wax candles. The floor was covered with a rich carpet, the roof and cornices were neatly finished, and the walls ornamented with mirrors and pictures. At the upper end of the room stood a grand piano-forte, by Broadwood, and, at the tea-table, near it, the lady of the house and her daughters received us most kindly. We soon became acquainted; and while one of the young ladies went out to gather some flowers for us, another opened the piano-forte, at our request, and played very good-naturedly, while we sat chatting with the old people, who entreated us to stay the night."

The Spanish amusement of bull-baiting is pursued with great avidity by the South Americans, although in a different manner from their ancestors of the Old World. Captain Hall describes the bull-baits at Valparaiso as extremely childish exhibitions, where the animals are merely teased by flags and blunt spears until irritated: at Lima, again, the animals are put to death with every circumstance of barbarous cruelty. But perhaps a more demoralising and pernicious amusement of the South Americans, even than these revolting exhibitions, is the besetting vice of gambling, in which all classes in the towns indulge to a fearful extent. In the streets, groups of natives are to be seen playing for their last farthing, and gambling away the whole substance and even clothes of themselves and families with the most complete indifference. The national game is one of cards, called *Monté*. The method of catching the wild cattle that rove in immense herds over the *pampas*, is a practice altogether peculiar to the South Americans, and for the following lively description of it we are again indebted to Captain Hall:—"The instrument used is called a lasso, from the Spanish *lazo*, signifying slip-knot or noose, and the operation of using it is called lassoing. It consists of a rope made of strips of untanned hide, varying in length from fifteen to twenty yards, and is about as thick as the little finger. It has a noose or running-knot at one end, the other extremity being fastened by an eye and button to a ring in a strong hide-belt or surcingle, bound tightly round the horse. The coil is grasped by the horseman's left hand, while the noose, which is held in the right, trails along the ground, except when in use, and then it is whirled round the head with considerable velocity, during which, by a peculiar turn of the wrist, it is made to assume a circular form; so that, when delivered from the hand, the noose preserves itself open till it falls over the object at which it has been aimed. The unerring precision with which the lasso is thrown is perfectly astonishing, and to one who sees it for the first time, has a very magical appearance. Even when standing still, it is by no means an easy thing to throw the lasso; but the difficulty is vastly increased when it comes to be used on horseback and at a gallop, and when, in addition, the rider has to pass over uneven ground, and to leap hedges and ditches in his course; yet such is the dexterity of the guasos, that they are not only sure of catching the animal they are in chase of, but can fix, or, as they term it, place their lasso on any particular part they please."

Captain Hall gives a similar account of the capturing of wild horses with the lasso; but we are assured by a gentleman lately returned from South America, where he was long resident, that a wild horse is rarely—almost never—taken with that instrument, but with what is called, in the language of the Gaucho, "las bolas," or balls—a most formidable weapon in the hands of him who knows how to use it. It consists of three thongs or cords of hide, each more than a yard long. The "boleador," or he who is going to fling the balls, takes one ball in his hand, and swinging the others rapidly round his head, throws "las bolas" with all his might, and unerring certainty, round the hind legs of his victim, which immediately comes to the ground. The horse, before being mounted, is tied several times for hours to a stake, and his spirit subdued by hunger, when he is mounted, and galloped, and gradually broken in. It is nonsense (says our informant) to talk of immediately riding a wild horse. He is not serviceable till he has been about a month in training.

Spanish is of course the language spoken in all the independent states of South America. At Panama, however, Captain Hall was surprised to hear the whole inhabitants, white, brown, and black, talking good English. This arises from the constant commercial intercourse kept up with Jamaica across the isthmus.

GENERAL ASPECT—CLIMATE, &C.

Every thing in South America is upon a grand scale. The mountains, the rivers, the forests, the plains—every feature of nature, in short, is characterised by magnificence and sublimity, and calculated to excite alternately admiration and terror. In one point are seen mountain-summits above the clouds, white with snows that never melt, while their bases rear the banana and pine-apple. In other places are to be seen ever-living volcanos, throwing out flames, smoke, ashes, and stones. Then again are vast and dark forests, which never yet rung to the woodman's axe, where vegetation prevails in its most gigantic forms. "In the interior of the new continent," says Humboldt, "we almost accustomed ourselves to regard men as not being essential to the order of nature. The earth is loaded with plants, and nothing impedes their developement. An immense layer of free mould manifests the uninterrupted action of organic powers. The crocodiles and the boas are masters of the river; the jaguar, the *pecoari*, the *dante*, and the monkeys, traverse the forest without fear and without danger; there they dwell as in an ancient inheritance. This aspect of animated nature, in which man is nothing, has something in it strange and sad. To this we reconcile ourselves with difficulty on the ocean, and amid the sands of Africa; though in these scenes, where nothing recalls to mind our fields, our woods, and our streams, we are less astonished at the vast solitude through which we pass. Here, in a fertile country, adorned with eternal verdure, we seek in vain the traces of the power of man; we seem to be transported into a world different from that which gave us birth."

The Andes derive their name from the Peruvian word *anti*, signifying copper. They stretch, as we have said, throughout the entire length of South America and the Isthmus of Darien, and are indeed supposed by some to belong to the same huge chain which runs through North America, even to the Polar Sea. The southern Andes vary very much in breadth. Near Potosi and lake Titicaca (in Bolivia) the chain is 180 miles broad. The loftiest are near Quito, under the equator, and which, until the Himalaya, in Thibet, was pronounced the highest by some late travellers, were always accounted the loftiest in the globe. The Sierra Nevada de Merida has a height of 14,000 feet; the Silla de Caraccas, 13,890; Chimborazo (in Quito) has generally been reckoned 24,000 feet in height; and there are several others of nearly 20,000. When Humboldt crossed over the Andes, he passed through a deep forest, which took him about twelve days to traverse, during all which time, not the slightest trace of man was to be seen. The pass over the ridge was not more than from one to two feet broad, and resembled a hollow gallery open to the sky. The Quebradas are immense rents, dividing the mass of the Andes, and breaking the continuity of the chain which they traverse. Mountains of great size might be swallowed up in those almost fathomless ravines, at the bottom of which only the terrified traveller can judge of the awful magnificence of the mountains.

A country embracing so many degrees of latitude and elevation, possesses of course equally diversified degrees of climate. "The three zones of temperature which originate in America," says Malte Brun, "and form the enormous difference of level between the various regions, cannot by any means be compared with the zones which result from a difference of latitude. The agreeable, the salutary vicissitudes of the seasons, are wanting in those regions that are here distinguished by the denominations of *frigid, temperate, hot* or *torrid*. In the frigid zone it is not the intensity but the continuance of the cold—the absence of all vivid heat—the constant humidity of a foggy atmosphere—that arrest the growth of the great vegetable productions, and, in man, perpetuate those diseases that arise from checked perspiration. The hot zone of these places does not experience excessive heat; but it is a continuance of the heat, together with exhalations from a marshy soil, and the miasmata of an immense mass of vegetable putrifaction, added to the effects of an extreme humidity, that produces fevers of a more or less destructive nature, and spreads through the whole animal and vegetable world the agitation of an exuberant but deranged vital principle. The temperate zone, by possessing only a moderate and constant warmth, like that of a hothouse, excludes from its limits both the animals and vegetables that delight in the extremes of heat and cold, and produces its own peculiar plants, which can neither grow above its limits, nor descend below them. Its temperature, which does not brace the constitution of its constant inhabitants, acts like spring on the diseases of the hot regions, and like summer on those of the frozen regions. Accordingly, a mere journey from the summit of the Andes to the level of the sea, or *vice versa*, proves an important medical agent, which is sufficient to produce the most astonishing changes in the human body. But living constantly in either one or the other of these zones, must enervate both the mind and the body by its monotonous tranquillity. The summer, the spring, and the winter, are here seated on three distinct thrones, which they never quit, and are constantly surrounded by the attributes of their power. Vegetation presents a greater number of gradations, of which it becomes necessary to point out the principal.

In the region of the palms, next the sea, the natives cultivate the banana, jatrophe, maize, and cocoa. Europeans have introduced the sugar-cane and indigo plant. After passing the level of 3100 feet, all these plants become rare, and only prosper in particular situations. It is thus that the sugar-cane grows even at the height of 7500 feet. Coffee and cotton extend across both of these regions. The cultivation of wheat commences at 3000 feet; but its growth is not completely established lower than 1500 feet above this line. Barley is the most vigorous, from a height of 4800 to 6000 feet. One year with another, it produces 25 or 30 grains for 1. Above 5400 feet the fruit of the banana does not easily ripen; but the plant is still met with, although in a feeble condition, 2400 feet higher. The region comprehended between 4920 and 5160 feet is also the one which principally abounds with the cocoa, or *Erythoxylum Peruvianum*, a few leaves of which, mixed with quicklime, support the Peruvian Indian in his longest journeys through the Cordillera. It is at the elevation of 6000 and 9000 feet that the *Chenopodium quinoa* and the various grains of Europe are principally cultivated—a circumstance which is greatly favoured by the extensive plateaus that exist in the Cordillera of the Andes, the soil of which being smooth, and requiring little labour, resembles the bottom of ancient lakes. At the height of 9600 or 10,200 feet, frost and hail often destroy the crops of wheat. Indian corn is scarcely any longer cultivated above the elevation of 7200 feet; 1000 feet higher and the potato is produced; but it ceases at 12,600 feet. At about 10,200 feet barley no longer grows, and rye only is sown, although even this grain suffers from a want of heat. Above 11,040 feet all culture and gardening cease; and man dwells in the midst of numerous flocks of lamas, sheep, and oxen, which, wandering from each other, are sometimes lost in the region of perpetual snow."

RIVERS.

In no one respect is South America more distinguished than in the number and magnitude of her rivers, some of which might with propriety be described as *running oceans*. Of these the Amazon, or Maranon, claims the first rank. For a space of 21°, in a direct meridional distance, not a single stream descends the eastern side of the Andes, but what contributes to swell the ocean-flood of this river, which, for length of course and volume of water, has no parallel in the world. The main trunk is composed of three principal streams, viz. the Apurimac, the Beni, and the Tunguragua. Having said this, we must refer the reader to the map for a description of its onward course to the ocean, as to give an account of it in words, and of the various huge tributaries which roll their waters into it in its progress, would occupy fully one of our present sheets. It is only very lately that the source and course of this river have been laid down with any thing like accuracy, owing to the mistakes into which previous voyagers fell respecting the actual main stream. The total navigable course of the Maranon is calculated at upwards of 3000 miles in a direct line; and if allowance be made for its sinuosities and windings, it cannot be less than 5000. Ships of 500 tons burden might ascend it for 4500 miles, while many of its tributaries are equally navigable almost to their source. More than one-half, indeed, of this vast continent might enjoy a maritime shore from these numberless streams, any of which would spread commerce and civilisation through a widely-extended empire. The territory watered by the chief stream and its branches is at least equal in extent to continental Europe, and the double of that watered by the Missouri and its tributaries, comprehending 2,500,000 square miles, upon the most moderate calculation. There are no sandbanks, nor shelving rocks, nor ice at any time of the year, to impede navigation; and so strong an easterly wind blows constantly from the Atlantic, as to carry up vessels against the tide. Yet, notwithstanding all these advantages, the mighty Maranon rolls on its course through regions unknown to industry or civilisation. Throughout its whole course it is studded with large and fertile islands, from five, ten, twenty, to a hundred leagues in circumference. From its leaving the Andes to the sea, the vast country washed by its waters contains neither veins of stone, minerals, nor metals of any sort. The streams, however, are stored with an infinite variety of fish of the most delicious kinds.

The La Plata, Plate, or Silver River, is next in magnitude to the Amazon. It is composed of three principal streams, the Parana, the Paraguay, and the Uruguay, and receives all the waters that flow from the eastern declivity of the Chilian Andes, and from the southern, south-western, and western faces of the Brazilian mountains. The three principal streams, with their tributaries, offer facilities for inland navigation little inferior to the Amazon itself. The estuary of the La Plata is broader than the British Channel.

The Orinoco is the third largest river in South America, and far inferior to the two above mentioned. Through a direct course of about 1200 British miles, it drains all the streams that water the Caraccas and New Grenada, with the exception of the coast rivers. It was only about fifty years ago that there was discovered a communication between this river and the Amazon, by means of the Rio Negro. Humboldt, who has since explored those rivers, has accurately laid down the previous courses and junction of the Rio Negro and the Orinoco. When united, they form what is called the Cassiquiare, down which Humboldt and his companion Bonpland passed. There are several cataracts and rapids on the Orinoco, described by Humboldt as splendid in the extreme.

MINES AND MINERALS.

Having under the various heads alluded to the mines and minerals peculiar to each district, we reckon it unnecessary to do more here than to show at one view the quantity of the precious metals which have been extracted from the mines of Spanish America and Brazil. The estimate is by Humboldt, from the registries of the various mints, and making allowance for the contraband traffic:—

Spanish America.	*Dollars.*	*Pounds Sterling.*
Produce of the Mexican mines, to 1803,	2,107,270,511	L.474,135,866 0 0
Produce of the mines of New Grenada, to 1803,	275,000,000	61,875,000 0 0
Produce of the mines of Chili, to 1803,	138,000,000	31,050,000 0 0
Produce of the Peruvian mines, to 1803,	891,350,593	200,555,684 0 0
Produce of the mines of Potosi (Bolivia) to 1803,	1,476,372,174	332,183,739 7 6
Total produce, registered and unregistered, of Spanish America,	4,888,001,200	L.1,099,800,269 7 6
Portuguese America.		
Produce of the Brazilian mines from 1756 to 1803, registered & unregistered,	855,000,000	L.192,375,000 0 0
Total produce of the American mines, to 1803 and 1800,	5,743,001,200	L.1,292,175,269 7 6

So much has the mineral produce of the Mexican mines diminished, consequent on the long-continued and destructive intestine warfare which so long afflicted that unfortunate country, that it does not now exceed 10,000,000 dollars, instead of L.27,000,000, as in 1805. From 1811 to 1826, the collective produce was only 166,297,400 dollars. The coinage of the Mexican mint, for 1827 and 1829, amounted to 5,700,053, and that of the four provincial mints, for these same years, 6,001,747 dollars. Total produce in eighteen years, from 1811 to 1828, 179,999,990 dollars, or 10,000,000 annually. The Chilian mines, which produced annually 2,060,000 dollars, registered and contraband prior to the revolution, and which even in 1817 produced a coinage of 1,101,283 dollars at the mint of St Jago, fell in 1824 to 193,000 dollars, or only one-sixth of the coinage of 1817. The mines of New Grenada, which produced, at an average, 3,000,000 dollars annually, fell to 1,270,000 dollars in 1822; so that the whole mineral produce of the American mines, whether Spanish or Portuguese, is not now one-fourth of what it was at the commencement of the present century, and before the late revolutions in Spanish America.

We have neither space nor inclination for comment on the extraordinary mining projects started in England about the year 1825-6. We may only state shortly, that, by the year 1827, there were no less than seven English companies employed in seeking for harvests of gold in different parts of Mexico, with nearly L.3,000,000 of British capital invested in different ways. Respecting the insane proceedings of some of these companies, it is simple charity to refrain from expatiating; of the whole, only one or two are now in existence; and of these we need only remark, that, when each dollar costs a doubloon, they can hardly be expected to be in a very thriving condition.

Gold is contained generally in a loose marl-like stratum of rounded quartzose pebbles, and adventitious matter called *cascalhao*, which rests upon granite, and is covered by earthy matter of variable thickness. The gold is sometimes found covered by the soil at the depth of twenty feet; while at others, on many of the hills, where water can be procured for washing, particles of gold appear in the soil, at little greater depth than the roots of the grass. After the process of washing (see *Mines*), the particles of gold are brought to the nearest mint, where a fifth part is taken for the crown; the remainder is afterwards formed into an ingot, which being sent to an assay-master, he ascertains its weight and measure, and stamps it, when it is delivered to the owner for circulation. The operation of smelting does not occupy ten minutes; and those who deliver into the mint any quantity of gold dust, will have it returned to them for circulation in less than an hour. The peculiar stamp on the various ingots marks the difference of their value.

Captain Hall gives the following account of the native mode of conducting their mining operations:—"There are two principal persons concerned in almost every mine, the proprietor and the habilitador. The first, who is also the actual miner, lives at his hacienda or farm, generally in the neighbourhood, and attends to the details of working and smelting the ore. The habilitador resides at some one of the three principal seaport towns, Coquimbo, Guasco, or Copiapo; he is the mining capitalist, and his character is that of a diligent, saving man of business, very different in habits from the miner, who is generally an extravagant and improvident person. The word habilitador may be translated enabler, as it is by means of his capital that the miner is enabled to proceed with his work. The proprietor of a mine usually farms his own ground on the banks of one of the rare streams which traverse this desolate country. His hacienda, or farm, supplies vegetables, and sometimes stock, for the subsistence of the miners. The smelting-house is also built on his hacienda, and the ore is brought to his door on mules. These farmers rarely undertake to work a mine with their own unassisted capital; they are seldom, indeed, sufficiently wealthy; and when they are so, it is not found, in the long-run, so advantageous a method as sharing the transaction with an habilitador, who takes charge of the commercial part of the business. Sometimes, however, the owner makes the attempt to work his mine single-handed, in which he usually fails."

We will likewise extract the following account of the process of washing by a mill:—"The mill consists of an upright shaft, or spindle, the lower end of which is fixed to a horizontal water-wheel, working in a sunk water-course, and giving a rotatory motion to the spindle, which passes through the centre of a large circular trough on the ground. In this trough a millstone is carried round upon its edge, on a horizontal axis projecting from the spindle. Small pieces of the ore are thrown into the trough, kept full of water by a constant small stream; and when the machine is put in motion, the stone goes rapidly round, crushing and grinding the ore under the water. As soon as the whole is reduced, by this process of trituration, to a fine mud, quicksilver is added, and an amalgam is soon formed, by its union with the detached particles of gold. This process is said to be quickened by the agitation of the water, and the friction of the millstone. The water is allowed to trickle off by a nick cut in the edge of the trough, and is received in long wooden channels, covered with coarse cloths, the folds and irregular parts of which catch any stray portions of gold, or of the amalgam, which the agitation of the water may have thrown out of the trough. When all the gold is supposed to be combined with the quicksilver, the water is drawn off, and the amalgam being exposed to heat in vessels adapted to the purpose, the quicksilver is distilled off, and the gold remains behind in a pure state."

The process of procuring diamonds may rather be termed washing than mining. They are found in the beds of rivers among the mud, which is placed in a range of troughs into which a stream of water is introduced. At equal distances are placed chairs for the overseers, and, after they are seated, the negroes enter the troughs, each with a rake of peculiar construction. The water being let in, the *cascalhao* or mud is spread abroad, and raked until the water runs quite clear. The stones are then carefully examined. When a negro finds one, he stands up and claps his hands, holding the diamond between his finger and thumb, whereupon an officer receives it from him, and deposits it in a bowl, suspended from the centre of the structure, half-full of water, whence, at the close of the day, the diamonds are taken out and weighed, and their weight registered. When a negro is so fortunate as to find a diamond 17½ carats weight, much ceremony takes place; he is crowned with a wreath of flowers, and carried in procession to the administrator, who gives him his freedom by paying the price to his owner. The finders of inferior stones are proportionally rewarded. These diamond-works are monopolised by the crown. Various precautions are used to prevent the negroes from embezzling the diamonds. To prevent them from setting aside some of them in the trough, and afterwards carrying them off, they are frequently changed into each other's troughs during the process of washing. If suspected of swallowing a diamond, they are put into a strong room, and powerful purgatives administered. The temptation to smuggle diamonds is much greater than that presented by gold, from the monopoly of the crown, and there are regulations of corresponding strictness and severity. For the security of the revenue, the country has been subjected to a most oppressive system of police; and the offender found guilty of illicit trade is subjected to imprisonment for life, or transported to the African colonies. The whole sum produced to government by the diamond monopoly (exclusive of expenses) averages about L.148,150 sterling. The diamonds are purchased by British and Dutch lapidaries, who cut and bring them into a state proper for sale. The diamonds of Brazil are not of so fine a water as those of Golconda. Little black garnets are often found in the diamond district.

Of late years the rage for gold and diamonds has been greatly abating, and the natives, luckily for themselves, have been directing more attention to agriculture. Indeed, it has all along been remarked, that the agricultural part of the population have been better fed, better clad, and more cheerful and contented, than these hunters after mineral wealth. This cause, doubtless, has co-operated with the interruptions arising from civil discord, in the great reduction which, since the beginning of the present century, has taken place in the quantity of gold produced in Brazil, which does not amount to one-twentieth of what it formerly did.

ANIMAL KINGDOM.

The multitude and diversity of its zoological riches is of a piece with the other magnificent characteristics of South America. Except at noon, when all living creatures in the torrid zone seek shade and repose, and when a solemn silence is diffused over the scene, illumined by the dazzling beams of the sun, every hour of the day calls into action another race of animals. The morning is ushered in by the howling of the monkeys, the high and deep notes of the tree-frogs and toads, the monotonous chirp of the grasshoppers and locusts. When the rising sun has dispelled the mists which preceded it, all creatures rejoice in the return of day. The gayest butterflies, rivalling in splendour the colours of the rainbow, especially numerous *Hesperiæ*, flutter from flower to flower, or seek their food on the roads, or collected in separate companies, on the sunny sandbanks of the cool streams. Agile lizards, remarkable for their form, size, and brilliant colours, dark-coloured poisonous or harmless serpents, which exceed in splendour the enamel of the flowers, glide out from between the leaves, the hollows of trees, and holes in the ground, and, creeping up the stems, bask in the sun, and lie in wait for insects or birds. Squirrels, troops of gregarious monkeys, issue inquisitively from the interior of the woods to the plantations, and leap, whistling and chattering, from tree to tree. Birds, of the most singular forms, and of the most superb plumage, flutter singly, or in companies, through the fragrant bushes. The green, blue, or red parrots, assemble on the tops of the trees, or flying towards the plantations and island, fill the air with their screams. The toucan, sitting on the extreme branches, rattles with his large hollow bill, and in loud plaintive notes calls for rain. The busy orioles creep out of their long, pendent, bag-shaped nests, to visit the orange trees, and their sentinels announce with a loud screaming cry, the approach of man. Above all these strange voices, the metallic tones of the *uraponga* sound from the highest trees, resembling the strokes of the hammer on the anvil, which, appearing nearer or more remote according to the position of the songster, fill the wanderer with astonishment. While thus every living creature, by its actions and voice, greets the splendour of the day, the delicate humming-birds, rivalling in beauty and lustre, diamonds, emeralds, and sapphires, hover round the brightest flowers. When the sun goes down, most of the animals retire to rest. Myriads of luminous beetles now begin to fly about like *ignes fatui*, and the blood-sucking bats hover like phantoms in the profound darkness of the night. These bats, or vampires as they are generally called, are enormous animals, measuring sometimes six feet from tip to tip of each wing. The body is small, resembling very nearly the British bat. They generally fix upon horses, and keep the animal in a comfortable sleep by fanning him with their wings during the time they suck his blood. It is reckoned that the pain of the bite must be very trifling, as the victim sleeps on regardless of the puncture; in the morning the animal is found streaming with blood, and weak from its loss. Human beings have repeatedly fallen victims to these revolting animals; and Captain Chamier tells an anecdote of a beautiful young lady of Carthagena, who, having an intrigue, left the casement of her apartment open for the admission of her lover during the night. Before dawn, her duenna, alarmed by some cause or other, entered the room; the rays of the moon fell on the bed, and there, fixed on the bosom of the cold and inanimate form, was a large and savage vampire, the dusky darkness of its wings, as they cooled the air, contrasting strongly with the marble whiteness of the form below, while the blood, which the greedy mouth was unable to contain, ran in a rapid stream along the corpse. She was dead, the vampire-bite having opened an artery.

Among the quadruped beasts of prey, the jaguar, or tiger, is the most formidable, being of enormous size. They generally frequent the impenetrable jungles that skirt the banks of the larger streams; and Humboldt, who explored the Orinoco and many of its tributaries, had many narrow escapes from them. The natives, however, attack them fearlessly, receiving them, when they spring, upon the point of a pike; a manœuvre in which they seldom fail. A small species of lion is also common; but the jaguar is decidedly the king of the forest in South America.

EARTHQUAKES.

These fearful visitations are, beyond all example, frequent in South America; and there is not a town, city, or village, in the immense continent, but has suffered more or less at various times. One of the most destructive in modern times was that which occurred at Caraccas in 1812, when about 20,000 people in the city and surrounding district (10,000 of whom belonged to the city alone) were destroyed. The principal part of the people who were swallowed up by the rending of the earth, or buried beneath the ruins occasioned by the shock, were at prayers when the fearful destruction occurred. Every church, protected either by St Francis or St Nicholas, fell to the ground; the belfry of the cathedral alone withstood the concussion; but, as if sensible of the calamity, and alarmed at the work of desolation which threatened the general extinction of the inhabitants, and aware that some record should remain to inform the historian of the hour and minute when the shock occurred, the clock stopped at seven minutes past four, at the very instant when the first rumbling noise was heard, and still remains with its hands pointed to the hour, as a fearful memorial of the past, and an awful warning of the future. The superstitious reverence paid to this clock grants it an eternal repose; and this and the ruins of the former palace are the only sights that strangers are shown as worthy of observation.

COMMERCE OF SOUTH AMERICA.

It is impossible for us to give any probable estimate of the present state of South American commerce. The capabilities of this vast continent for a trading intercourse with foreign nations are perfectly incalculable as to value and extent. Having, therefore, briefly stated, in our notice of the various provinces, the principal articles of import and export from each, we will here give the published official report of the entire commerce between South America and Great Britain, for the year ending January 1831, and from it a guess must be made at the entire traffic of the former with foreign nations:—

OFFICIAL REPORT of the ENTIRE COMMERCE between SOUTH AMERICA and GREAT BRITAIN, for the year ending January 1831.

	Official value of Imports into the United Kingdom.			Official value of Exports from the United Kingdom. British & Irish produce & manufactures.			Official value of Exports from the United Kingdom. Foreign and Colonial merchandise.			Declared value of British and Irish produce & manufactures exported from the United Kingdom.		
	£	s.	d.	£	s.	d.	£	s.	d.	£	s.	d.
Brazil	1,530,557	19	5	4,270,743	18	1	45,457	19	7	2,452,103	3	11
States of Rio de la Plata	583,946	12	7	1,067,884	1	0	12,679	11	3	632,171	15	8
Peru	85,254	14	10	513,894	14	11	15,569	13	2	368,469	6	11
Colombia (i.e. Grenada, Venezuela, and Quito.)	52,869	13	8	427,718	2	0	5,854	1	2	216,731	8	10
Chili	25,074	17	10	835,566	0	8	23,094	6	6	540,686	1	11
Guiana: Demerara and Essequibo	1,627,060	19	6	419,363	8	11	31,878	3	5	426,316	3	8
Guiana: Berbice	370,985	6	8	66,556	11	4	6,883	14	3	69,442	0	6
Guiana: Cayenne	10,843	15	9	11,221	9	8	39	7	8	11,486	0	0
Guiana: Surinam	898	19	5	—			—			—		
Total £	4,287,492	19	4	7,612,953	6	7	141,456	16	10	4,717,366	1	5

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DUTIES OF LIFE—SECOND SERIES.

OUR previous article upon this subject embraced the Duties which one owes to himself as a rational Being. The present is not less important in its character, being intended to point out those moral duties which we are required to perform with respect to our various public and domestic relations.* We begin with our

DUTIES AS SUBJECTS.

EVERY civilised nation is governed by some species of authority, for the purpose of preserving order in society. Some governments are good, others are bad; but it does not fall within our province to point out where the ruling authority is injurious, or where it is most advantageous to the people. According to a law of universal application, every independent nation is understood to have the undoubted right to model its government according to its own fancy, genius, or necessities, provided that, in the execution of its plans, it does not wantonly injure its neighbours. Directing our attention to our own country, with which we have here alone to do, we find, as soon as reason dawns upon us in youth, that we are members of a great and enlightened community. We find ourselves subject to laws which were framed long before we were born, and that we must act in a manner not to please our own caprice, but according to the arrangements which have been instituted for the benefit of society at large. But if we thus discover that we are trammelled by certain legal restrictions, not very agreeable perhaps to the wildness of our untamed nature, we likewise find that we possess a great many compensating privileges. While yet opening our eyes to the light, we enter into the enjoyment of all the transcendant privileges of British subjects, and come within the powerful protection of the laws as fully as the oldest and most honoured in the land. It will be perceived that this is a boon of incalculable value. For us, armies have fought and bled; for us, in past times, hosts of martyrs and patriots have contended; for us, the wisest statesmen and legislators have transacted negociations securing civil liberty; for us, the people who have gone before us have established a variety of the most excellent, the most beneficent, institutions. All these things we enjoy without having been put to the smallest trouble. All that we are called on to give in return, as soon as emancipated from the ignorance of childhood, is *obedience to the laws*.

A cheerful obedience to the laws is, therefore, our chief public duty. Possibly some of our laws, from having been framed for a former state of society, or in order to meet particular exigencies, may not now be very judicious in their provisions; yet that forms no solid reason why we should break through them. It is always safer to obey a bad law than to oppose it by violence. Unhappily for some nations, they seem to have no accurate idea of the value of obedience to the laws. When they find themselves aggrieved by oppressive state measures, they are exceedingly apt to break into tumults, and take up arms against the officers of their governments. This is a very short-sighted policy, as the history of all nations proves; for the people are always sure to suffer far more by the coercive measures adopted to restrain them than they would have done by submitting to the evil they originally complained of. It is the boast and glory of Britain—and long may it be so—that its people know how to respect the laws, even while they consider them to be injurious, and how to correct them by quiet and orderly procedure. In this lies the important secret of their national greatness, their wealth, their public liberty. The advantages arising out of a scrupulous obedience to the laws, consist, in the first place, of social order and quietude, by which the rights of property are respected, commerce and trade permitted to flourish, and the sacred inviolability of the person preserved. The results of turbulence and civil commotion are, poverty, ruin to property, insecurity of the person, destruction of commerce and trade, and at length, military oppression and barbarism. Every intelligent man, therefore, in this country, yields not only a bare submission, but a becoming respect to the laws, as well as to the various institutions established by their authority.

Perfect obedience both to the letter and the spirit of the laws, does not, however, imply that we should not examine whether they are in every respect answerable to the present condition of society, nor keep us from resorting to legal means to have them corrected, or altogether rescinded. The constitution points out how this is to be done. It is illegal to conspire secretly to overthrow the law. All measures calculated to improve our social condition must be conducted openly and honourably. The means put into our hands by the constitution for improving the law are very powerful, if wielded with discretion. The people have the appointment of the men who constitute the most influential branch of the legislature; if they do not appoint individuals who will meet their views with regard to correcting or abolishing laws, they have themselves to blame: the constitution confers upon them a liberty of choice. It besides gives them the right to present petitions to the legislature, either individually or in bodies, praying in respectful terms for the amendment or abolition of any law which is deemed oppressive or antiquated. This right gives a vast addition to the power of the people. It is of much greater value than one would at first be inclined to suppose, and is infinitely preferable to the use of violence. The right of petition implies the right of meeting publicly to discuss the propriety of petitioning. This practice of meeting together excites the public mind to renewed efforts in the cause it undertakes. The speeches of the orators are circulated and commented upon by the newspapers all over the country. One meeting gives rise to others, men's minds are enlightened and warmed, and the public opinion acquires a degree of moral force, any resistance to which would be useless. It is not without reason, therefore, that the people of this country set so high a value on the right to assemble for the discussion of public affairs, and place it in the first rank of their constitutional prerogatives.

Besides yielding obedience to the existing laws, we are under a collateral obligation to be loyal to the sovereign who rules over us. Loyalty is hence another of our chief public duties. There is some difference of opinion with regard to what extent loyalty ought to be carried. It appears to us that this is a simple matter. A power to protect the nation from foreign insult, and to preserve the internal peace of the country, *must be lodged somewhere*. It is found to be most convenient to lodge it in the hands of one person, under proper restrictions. In Great Britain, as has been seen in our history of that country, it has been placed in the possession of a hereditary prince or king. This person is entitled our ruler or sovereign; we are termed his subjects. Loyalty signifies a fidelity and willingness in serving the king, so that he may be enabled both to protect the nation from outward harm, and to preserve order in society, through the agency of the laws, or, failing them, through the application of force. Seeing that the sovereign is prevented by the constitution from infringing upon the rights of the subject, through the exercise of his power, it is discovered that loyalty is rewarded in the comfort we enjoy; or, to use another expression, self-interest alone, if no nobler sentiment interfere, would lead us to afford assistance to the king in the execution of his high and important trust. This assistance is demonstrated, not only by personal service, if necessary, but by respect. Loyalty may be greatly enhanced by esteem for the private virtues and conduct of the sovereign. When so influenced, it is certainly both an amiable and commendable feeling, and can never, but in ill-regulated minds, degenerate into servile prostration.

In the United States of America, in which the executive is lodged in an elective president, the people call themselves citizens, not subjects; and what we mean by loyalty to the sovereign, they term duty to the commonwealth. It is obvious that there is extremely little essential difference, *practically*, between these phrases, whatever there may be in *feeling*. The subjects of Great Britain are as free as any people in the civilised world; much freer, indeed, than the inhabitants of France, who disclaim the appellation of *subjects*. These explanations are perhaps useful in admonishing us to beware how we vex ourselves about mere words and sounds. Our duty clearly consists in appreciating the numerous blessings we enjoy in our public and private relations, by whatever name these relations may be called. We are each individually fractional parts of a great nation, whose honour we are called on to sustain through good and bad report. Let us remember that individual virtue can alone promote social happiness, and that social happiness and peace form the basis of political independence. No man can be a good and respectable subject or citizen who is a bad son, a bad husband, a bad father, or a bad master. The nation is but a composition of a great many families, knit together by kindred sentiments and mutual wants; and how can it be great, or worthy of esteem, if its component parts exhibit in their constitution the worst of vices?

Loyalty to the sovereign leads to a subordinate but important duty. It induces us to respect inferior constituted authorities. All judges, magistrates, or other civil functionaries, stand in the light of representatives of the sovereign. The king cannot be every where at once, and he deputes these individuals to attend to the wants of his subjects, and to keep good order in society. To show contempt for any court of justice, or for any magistrate, is, therefore, equivalent to showing contempt for the king himself, as well as for the laws, and is justly punishable. To show our respect both for the laws and the sovereign, we must respect the decisions of judges and magistrates, and support their due execution by our personal influence. Nevertheless, it is in every one's power, when they feel themselves aggrieved by these decisions, to appeal to higher authorities for redress; such being the only means allowable by the constitution, in opposing the legal power of the established courts of civil and criminal jurisprudence.

A becoming obedience to the laws, and a generous respect for the supreme and inferior constituted authorities, produces the agreeable result of good order and peace in society. Every one is not acquainted with the different ramifications of the common and statute law; indeed it would be impossible for us to acquire a correct knowledge of these things unless we devoted a lifetime to the study. This difficulty in acquiring a knowledge of the laws, has sometimes given rise to a low sort of jeering at our excellent constitution, and it has been represented as cruel to compel an obedience to laws which few can have an opportunity of learning. But this is a fallacy into which we hope our young readers will not fall. The administration of the common law, such as that which applies to inheritance, debtor and creditor, and civil rights generally, rests with a body of educated men, or lawyers, whose services may at all times be commanded. Besides, we may, if we please, purchase digests of these laws for our private amusement and instruction. The

* The former article was an entire abstract from the Moral Class-Book of Mr William Sullivan, a work published at Boston, in the United States. The present is partly original, and partly selected from the same production. Excellent as Mr Sullivan's book is, it is singularly deficient in the inculcation of some of the principal public duties of life, and is in many parts adapted only for the perusal of American readers. The heads in the present article, Duties as Subjects, as Electors, as Jurors, as Masters and Servants, Conduct at Public Meetings, Making a Will, Misfortunes and Evils, Inequality of Rank, Duties which the People of one Country owe to those of another, Duty of Trusting to ourselves, Religious Obligations, and Conclusion, are the composition of one of the Editors, as also a number of passages in other places. It is humbly trusted that both numbers will be found to form the most complete as well as the most applicable body of admonition on the moral duties ever given to the public; and that parents and teachers of youth will find it available in their purposes of intellectual cultivation.

other description of law which is made applicable to the preservation of the peace of society, any one can understand, if he have the ability to know right from wrong. We surely all know that it is illegal and criminal to steal, to rob, to murder, to break into our neighbours' houses, or to attack their persons by violence. It can require no reading of acts of Parliament to understand this. Common sense here serves us instead of legal knowledge.* Our duty in this matter is very easily defined. We must ever bear in mind that one of the principal acts of duty which the constitution enforces, is the abstaining from meddling violently with the persons and property of our fellow-subjects. In this well-regulated realm, the person of every man, woman, and child, is inviolable from private attack. It is a crime almost punishable with the highest penalty of the law to strike any one, either from an idea that they have injured us, or through the influence of passion and prejudice. If we consider that we have been injured, we must apply to the law or the magisterial authorities for redress. We are only permitted to use physical force when in absolute danger of losing our lives or property by violence, there being then no time to apply to the law for protection. It would be gratifying if these regulations were more generally attended to than they seem to be. There are many young men, who, from what they are pleased to term a love of fun, but which can be no other sentiment than a love of mischief, or gross ignorance, assail the persons of individuals of both sexes, to their great discomfort, and sometimes serious injury. Now, it is clearly illegal to do so, and is generally punished by the infliction of severe penalties by the civil magistrate, though seldom marked with that ignominy which it deserves. Inasmuch as it is held that ignorance of the law does not excuse its infraction, so is it reckoned an invalid apology for the commission of crime to say that you were under the influence of intoxication at the time. Drunkenness is very properly esteemed an aggravation, not a palliation, of the offence.

CONDUCT AT PUBLIC MEETINGS.

The right of meeting together publicly to discuss matters connected with our social condition, being so invaluable a prerogative, it is right and fitting that all young men entering into the busy scenes of life should make themselves well acquainted with the rules which have been established by general consent for the proper conducting of such assemblages.

According to usage, a public meeting is not constituted until a person be appointed to preside, or to "take the chair." Without this ceremony, the meeting is a tumultuary assembly, or a mob. The first movement is, therefore, the appointment of a chairman. This functionary, on taking his seat, is for the time supreme in the meeting. His chief duty is the preservation of order. He allows only one to speak at a time, giving the preference to him who has first caught his eye in the act of rising, and giving every speaker a fair hearing. Another of his chief duties is the preventing of speakers from wandering from the subject under discussion; and if they do, he must remind them to keep to the point. In the execution of these and other duties, he claims the support of the meeting, and all are bound to yield to his reasonable dictates, and help to maintain his authority. In proportion to the firmness, yet mildness of manner, of the chairman, so is the meeting well or ill conducted.

At some public meetings there is no set plan of operations, and a general discussion on the subjects which are brought forward takes place; but at all meetings for specific important objects, there is a previous arrangement among a certain number of individuals to bring forward particular points to be spoken upon. In this case speakers are prepared, and the business assumes the form of the proposal and carrying of a set of resolutions, or motions. The following is the routine of procedure: The chairman having stated the object for which the meeting has been called, an individual steps forward and proposes a resolution for the adoption of the meeting. Whether he enforces the propriety of carrying such a resolution by a speech on its merits, or simply propounds the matter, he must be *seconded* by another individual (with or without a speech), otherwise the meeting cannot entertain his resolution for a moment. If duly seconded, then the motion is fairly tabled. It is before the meeting. After a resolution is proposed and seconded, it is the duty of the chairman to ask the meeting if it be carried or not; if agreed to by a general acclamation, or by an obvious majority, he pronounces the word "carried," which settles the point, and the business proceeds by the bringing forward of the other resolutions in the same manner. It is unusual for any member of a meeting to oppose the passing of a resolution, unless he have a better to offer in its stead. If he have, and if he wishes "to take the sense of the meeting" on the subject, he has a right to be heard. Yet this can only be permitted, provided the meeting has been called in general terms. For instance, if the inhabitants of a town or district generally be called, in order to *consider* of the propriety of such and such measures, in that case every one is entitled to give his opinion, and to oppose the formal resolutions brought forward. But if the meeting be described by advertisement to consist of those inhabitants or others only who agree in the propriety of such and such measures, then no one is entitled to intrude himself on the deliberations who professes opinions contrary to the spirit and end of the meeting. An inattention to this exceedingly delicate point often creates serious heartburnings and disturbances; and, on that account, committees who call public meetings ought to be very particular in the terms of their announcements.

As much regularity is necessary in respect of opposition to motions as in their proposal and carrying. The counter motion of an opponent is called an amendment, which, to be available, must also be seconded. If not seconded, it drops, but the opposer may place his protest on record; that is to say, if the discussion be in a corporation or other meeting, where books of the minutes or transactions are kept. On being seconded and discussed by those who wish to speak upon the subject, the matter is brought to the vote by the chairman, but not until both the mover and amender have replied, if they please to do so. After they have spoken, not another word can be uttered, and the vote is taken, a majority carrying. If the votes be equal in number, the casting vote of the chairman carries. There is another way of suppressing a resolution, which is by "moving the previous question." This signifies, to return to the point at which the business of the meeting stood previous to the tabling of the motion; or means, in other words, to do nothing on the subject. But this must also be seconded, and put to the vote in opposition either to the motion or amendment, or to both. The routine is generally to place it in opposition to both; if carried, the matter is settled; if not carried, the order is next to place the motion and amendment against each other, and vote.

Such is an outline of the mode of procedure at public meetings, and it is particularly desirable that attention should be shown to the preservation of regularity. At all public meetings there is a strong tendency "to go out of order." By this expression it is meant that speakers are under a constant liability to wander from the point under discussion. They are apt to digress into other subjects, and confuse their auditors; and these getting impatient, are equally apt to interrupt them, so that a single irrelevant observation may lead to hours of idle debate or colloquy, or "speaking to order," as it is termed, and thus the harmony of the assembly be destroyed. Those who attend such meetings should therefore have a regard for the following regulations:—If they speak, they should keep closely to the subject in hand. If they be listeners, they should preserve a strict silence. It is ungentlemanly, not to say disorderly, to utter any sound or make any observation on what a speaker is saying. The speaker must on no account be interrupted, so long as he keeps to order; and if not in order, it is the chairman's duty to check him. It is likewise disorderly to speak more than once, except in replying before the vote is put, or except it be the rule of the assembly to permit it. Sometimes persons who have spoken rise again to speak as to "a matter of form." This is allowable, but in speaking as to form, the merits of the case should not be introduced. On this, however, as on every other point, there is a perpetual tendency to go out of order, and hence the absolute necessity for appointing a chairman well acquainted with the forms of public deliberation, and who has the strength of mind to insist on order being preserved.

At all our public assemblages, a certain degree of courtesy is used both among speakers and listeners. On an individual rising to speak, he addresses himself politely to the chairman, and the chairman in return politely mentions the name of the speaker; by which means the audience is made acquainted with the gentleman who is about to address them. When the discussions of the meeting are over, the chairman closes the business with a few observations, and then dissolves the assembly by leaving the chair.—When any dispute arises in the course of the business of the meeting upon points of form, it is customary to appeal to the usages of the House of Commons for an example to be followed.

DUTIES AS ELECTORS.

There are duties of another nature which we may be called on to perform in our character of citizens. We are invested with the high and solemn trust of electing our representatives in Parliament, as well as representatives in our municipal institutions. In the execution of our duty as electors, we are bound to divest ourselves of all factious or personal considerations. We have certainly to consult our own good in making a choice of a representative, but it is only as flowing from the good of the whole community. We must hence act entirely without passion or prejudice. Let us examine the previous habits of life, public conduct, and avowed sentiments, of candidates, and calmly consider whether they are such as we can approve of, or as being consistent with the general welfare of the people. We should also recollect that we exercise the trust of electors for many who do not possess that privilege. A large proportion of the community consists of women and children, persons in a humble condition, the sick, and the helpless. These look to us for protection from wrong, and it is our duty to afford it to them. If we, therefore, act with levity and imprudence in appointing men, who, from their conduct and character, are unfitted to exercise the important function of public representatives, we in more ways than one commit a crime against society, and are unworthy of possessing the valuable prerogatives with which the constitution has invested us.

In our capacity as citizens, we are frequently called upon to elect representatives in different municipal bodies; such as civic managers of the city in which we reside, managers of local trusts—general, political, and religious. There is often much heat at such elections: a petty factious spirit frequently governs the choice which is made: sometimes the meanest passions of our nature are exhibited during the contest. The observations we have made on our duties as electors generally apply here with peculiar force. As those who present themselves as candidates live amongst us, we can never find any difficulty in estimating their character and qualifications. But we must take care not to be borne away by private feelings; we must not give our vote simply because the candidate is an acquaintance. A consideration for *what is best for the public interest* should in every case govern us; and we should not be afraid to let these our sentiments be known, for they can give no honourable man offence. In all cases of elections of members of civic corporations, and such like bodies, the chief merit in electors, after that of good and respectable character, is soundness of judgment, and after that, activity of habits. The power of fine speaking, or eloquence, is not required in such a functionary, and should be esteemed very lightly. That which is required is a power of thinking coolly, an integrity of purpose, and a willingness and ability in taking a share of the burdensome duties to be performed. Our qualifications as electors, perhaps, render us liable to be ourselves elected. In the event, therefore, of being called forward by our fellow-citizens to fill the honourable situation of their representative, it is our duty to sacrifice perhaps our own feelings and a portion of our time in the public service, provided we conscientiously consider ourselves qualified for the task, and that our health and private circumstances permit it. The principal question we have to put to ourselves, when we are so brought forward, is, "Have we sufficient time to spare to attend the various meetings—to sit and deliberate in the numerous committees—to have our minds frequently occupied with public affairs?" If we deceive ourselves in answering this important question, we wrong society, and give ourselves cause for much after-disquietude. Is it, or not, the proper way for every one who is worthy of this trust, calmly, deliberately, and, to the best of his knowledge and belief, to do those acts which will best preserve for his own use the beautiful fabric of his political institutions? If he perceives and rejoices in the good which he and others derive from it, will he not best perform his duties to those who come after him, to use it, and not abuse it, that they may have the like good? Little suggestions of selfishness, rivalry, and petty local interests, and, most of all, perverted and mischievous ambition, are the blocks over which citizens stumble and fall, in the otherwise luminous and clear path in which they are permitted to move.

DUTIES AS JURORS.

The laws under which we live give us the invaluable privilege of trial by jury; in other words, we are tried for the commission of offences by a body of men chosen indiscriminately, as nearly as convenient, from the class of society in which we have moved. By such a considerate regulation there can be little risk of individual oppression, provided those who compose juries do their duty. It is therefore incumbent on citizens who are liable to serve in juries, to make themselves acquainted with what is understood to be their duty when so called upon. It requires no learning to fulfil the character of a juror. It requires no more than a coolness of thinking, and a mind above being carried away by prejudices or feelings. The juror is to remember that it is the jury which is the judge in the case, not the judges who sit on the bench. Keeping this in view, it is one of the chief qualities requisite in a jury to maintain its proper dignity and honour inviolate, nevertheless with all courtesy, and to act with firmness in the execution of its important function. Besides deliberating dispassionately on the evidence presented, it is the duty of the juror to be totally regardless of every consideration but that of strict justice. He is neither to regard the rank of life of the culprit, nor of the injured party. In a court of jurisprudence all men sink to an equality. It is also the duty of the juror, after forming his conscientious opinion, not to be coerced, or flattered, or spoken into a different opinion. He is invested with a solemn trust, and that trust he must preserve with scrupulous care, as consonant with the dearest interests of society.

DUTIES AS NEIGHBOURS.

Besides the duties which we have to perform as members of a great nation, we have duties of a similar nature to perform as inhabitants of a town, district, or neighbourhood, and in relation to which we sometimes receive the appellation of citizens. Every person belongs to a neighbourhood, which is both local and social. Even those who have removed into new countries, and who dwell in solitary abodes, do not lose the sentiment of neighbourhood. The nearest person to them is a neighbour, though separated by long distance. And when this sentiment

* At the same time, we willingly allow that there is room for great improvement in the dissemination of a knowledge of the statute law, particularly that of a recent date. It is likely that some plan will soon be carried into execution to remedy this defect.

cannot be preserved in fact, it may be in thought, and by that means it usually is so. Perhaps the last impressions that leave the heart of one who has wandered into far distant regions, are those made in his early days, in his native home. In general, as every one lives in a neighbourhood more or less dense, he can promote his own happiness, and that of those around him, by observing a becoming moral conduct. He has a right to enjoy life, and to use all things which he has, to that end; but he has not a right to any enjoyment which necessarily disturbs that of others. Peace, tranquillity, and security within one's own walls, is the main purpose of life. No one has a right to interfere in these things but by order of the public law. A neighbour, therefore, who so conducts himself, and those means of pleasure which he commands, as to vex, harass, and disturb those who are necessarily within sight, hearing, &c., commits an offence against morality. It often happens to be the pleasure of one who dwells in a dense neighbourhood, to keep one or more animals, whose habitual noises disturb those who necessarily dwell within hearing, in the hours allotted to repose, and frequently when persons are visited by sickness, and when any noise is distressing. Now, whatever the rigid law of the land may say in such cases, the law of morality says that the suffering party has an unquestionable right to remove his trouble, if the proprietor of the cause of such nuisance will not, on request, remove it himself. A more peaceable way would be, to have it removed by order of the public magistrate. Many of such petty nuisances ought to be removable on summary verbal application, and not in the slow, written, and printed process, in which the movements of ordinary law are commonly made.

The moral duties of neighbourhood extend to all things which minister to the common comfort, convenience, and security. Each one of a neighbourhood is bound to make his own dwelling-place as agreeable and pleasant to those around him as he reasonably can. Each one is morally held to uphold and sustain a good name for his own little community. He is, therefore, to join, with a liberal and manly feeling, in all the improvements which tend to please and adorn. Such things, even if they occasion some expenditure, are sources of self-satisfaction; and one comes at last to take an honourable pride in hearing his street, his village, his town, or city, commended by observers.

There is another sort of neighbourhood which is founded in social intercourse, and in the interchange of visiting and hospitality. As the world now is, this is commonly regulated by artificial and somewhat unnatural rules. It is often ostentatious, luxurious, and destitute of all feelings and thought in which well-trained moral minds can take pleasure. A profuse and voluptuous entertainment, comprising food little adapted to promote health and vigour, and in quantity sufficient for ten times the number, that rather look at than consume it, is an unsatisfying way of being happy in social intercourse. There are modes of maintaining such intercourse, which are innocent, pleasing, and dutiful. Mankind are fitted for such. The interchange of friendly visits, for conversation, music, and rational amusement, with such things as may be used without suffering or impairing health, is that kind of neighbourhood (in such relations) which is permitted and enjoined. We have, however, little reason to think that intimacies of this sort are likely to meet with such consideration as would induce the further extension of them.

Every person, in general, is a member of some kind of society or association. Some persons belong to many. These are intended for some useful purpose. Every one who is such member has some duties to perform. He owes some proper part of his time, some proper contributions, to the common object, and has an interest in the prosperity of the design. All these institutions do some good, and some of them eminent good, in helping on the great purpose of social life, which is general improvement. Of this nature are public charities, educational institutions, libraries, agricultural societies, and those for suppressing intemperance and immorality. No well-disposed citizen can conscientiously abstain from giving his aid and support to such objects. It is each one's duty to try to leave the world a little better than he found it. No one can say these are matters which do not concern him. Suppose every one should say so, and had said so from the beginning, society would still be made up of barbarians. Every good that is done in any community affects directly or indirectly every member of it. The law of example, of imitation, of doing as others do, has a most pervading and astonishing influence. Every community is like a full vessel of water; no one drop in it can be moved without affecting every other drop.

DUTIES IN OUR DOMESTIC RELATIONS.

Marriage.—This institution is agreeable to a law of nature, and is an ordinance of the Creator. There are profligates who have doubted this; but they have exhibited no reason on their side. It is obvious that man is not only a gregarious, but a pairing animal. Marriage is consistent with the finest of his feelings—the most noble of his faculties. It began when man began. It is ordered to perpetuate the succession of the human family. It is ordered for the whole duration of adult age. It is man's peculiar privilege in this: it connects him with generations which are gone, with that which is passing away, and with those which are to come. The memory and the ashes of the dead are precious to him, and no other animal has that sentiment. He alone contemplates that his own memory will be held in honour, and that the place of his earthly quiet will be sacred. He only is enabled to conceive that moral and physical wrong will bear his own stamp in the character and in the frame of those that follow him; he only knows that a good name may be an honourable inheritance. These are the sentiments which spring from the beneficent gift of marriage. However much one may misunderstand or abuse this gift, nature, ever faithful to her trust, forces these sentiments on the heart.

Marriage is recognised as a contract of a binding nature in all civilised nations. By some it is considered, from its solemnity, to be of a sacred character; by others it is deemed only a civil bond of connexion. All, however, agree in holding it to be an irrevocable contract. The laws of the land, those of nature, and the divine law, disclose the sentiments, the feelings, and the awful sense of duty with which this undertaking should be regarded. Yet it is frequently entered into from motives highly reprehensible, and sometimes with shocking thoughtlessness. It is from such causes that we see that this sacred union, which should be the true source of the highest human happiness, becomes that inexhaustible fountain from which both parties are daily and hourly compelled to drink, and from the same cup, the bitterest waters.

In a great number of instances, marriage is contracted with exceedingly little regard to the qualities of the mind on either side, particularly on the side of the man. If one could penetrate the ear of enamoured youth, some good might come from such suggestions as these:—Do you know what will come of that engagement which you are about to make? Are you about to tie yourself by hands, absolutely indissoluble while you live, to a mortal who has feelings, wishes, wants, hopes, and fears, which must become your's, and a part of your very self; or which you must resist, control, or contend with? Do you know that pain, suffering, and sorrow, originating in either, must be borne by both? Are you aware that whatsoever of error, folly, or crime, may be chargeable to either of you, or to any who may spring from your contract, will be your common burthen and shame; and that from these you can relieve yourself nowhere but in the grave? Or, do you know that this attractive being will be your kind friend; your counsellor; the welcome soother of your cares and anxieties; the generous and charitable judge of your infirmities; the inspirer of honourable ambition; your fellow-labourer in joint interests; the ornament of your life; the gracious, considerate, faithful, gentle companion, who will make your own virtuous home the place to which you refer all earthly happiness? Who that is "in love" has leisure or inclination to think of such *trifles* as these?

There is no reason why the passion of love should be wrapped up in mystery, nor any, why the mind should be stained in considering its nature. It would prevent much and complicated misery in the world, if all young persons understood it truly. There are in every human being seeds, each one of which may be made to germinate, and may be so cultivated as to produce the most odious vices, or the most serene and heavenly virtues. There is in every human heart a fund of kindness, tenderness, and affection, which makes itself known to be there in due time. It demands to be applied. This is the trying and perilous moment in youthful life. There is some one, somewhere, who will take that fund, and give its full equivalent. The external senses and the heart are in search of that one. Happy will it be for the searcher, if he will take reason as a monitor to keep the senses and heart in order. But reason is commonly regarded, not as a kind and faithful friend whose duty it is to whisper, "begin nothing of which you have not well considered the end," but as a withered scowling matron, who, being utterly dead to the impulse of youth, denies that there ought to be any. If there has been no preparation for this eventful period; if the mind has not been enriched with the teachings of rational prudence; if the eye has not been taught to distinguish between the real and the fictitious; if the ear has not learned to discriminate the meaning of sounds; if life as a whole, if the consequences of irrevocable deeds be not thought of, there is peril; and the pure drop from the fountain may flow into any sea but that of happiness. In seeking for that being who is to be a companion during life, one grievous failing must be avoided. Young men frequently amuse themselves by playing with the feelings of young women. They visit them often, they walk with them, they pay them divers attentions, and, after giving them an idea that they are attached to them, they either leave them, or, what is worse, never come to an explanation of their sentiments. This is to act the character of a *dangler*, a character truly infamous. Young men cannot be too cautious in the attentions which they bestow on unmarried females, who on their part should be equally guarded in not encouraging the addresses of any individuals whom they would not choose to marry.

According to the present state of society, one of the influential counteracting elements to marriage is, or ought to be, a high degree of prudence. No one ought to marry who cannot foresee that he will be able to support the additional expenses of a wife and family, and at the same time fulfil his other necessary obligations. By good management, those additional charges are not great, but they amount to something, and he is worse than an infidel who does not provide against them. We are of belief that every industrious, active, and sober man, will find no serious obstacle in this respect. It is from idleness, love of company, and intemperance, not from simple expenditure on family necessaries and comforts, that ruin and poverty in the married life are produced. The dread of encountering the expenses of a family, though acting as a salutary check on imprudent marriages, is frequently productive of many gross vices, tending to the injury both of individuals and of society. Celibacy, especially when circumstances would permit marriage, is not respectable; it is considered akin to vagrancy. He who marries and settles down as a householder, meets with the approbation of the world. Why is this? it may be asked. Because in marrying we give a guarantee to society for our good behaviour. It is not to be doubted that a young, well-educated, industrious couple, who are sincerely and affectionately attached, on a sober examination and conviction of each other's worth and suitability to each other, may be happy with means far short of the fashionable standard. Presuming that such a couple are wise enough to take life for the real and substantial good that it can produce—and as a whole, it would do them great injustice to suppose that they could not find that good in a small, simple, cheerful, tranquil mansion—it would be doing the friends of such a couple the like injustice to suppose that they could not visit them, and be satisfied to see them happy through such means. We may add, that such a state of things conforms to the laws of nature. If such a couple desire a more enlarged state of things, they will *earn* it by frugality and industry. What one has earned is sweet to him; and he who sees something before him which he may strive for and attain to, is impelled by the same laws to honourable exertion.

In whatsoever circumstances, and with whatever motives marriages occur, the parties *are married*; and the question which they have to propose and solve, is, in what way they can secure to themselves the greatest good during their union? In general, the duties of married life are very well understood and observed in this country. We do not assume to teach on this subject. We venture no more than to mention some causes of unhappiness, taking the risk whether they are worth notice or not. They will be arranged under such heads as may arise, without any solicitude as to particular order.

Gentleness.—It is believed that the absence of this excellent virtue is a common cause of unhappiness in families. The members of a family who think civility or politeness due to every one out of it, sometimes think neither of them necessary in their own intercourse with each other. It would be much better for them to reverse this opinion. If family connections are bound together by the strongest ties of common interest; if they are, as they may be, dear to each other; if politeness and civility are good things for any body, they must be good things among such persons.

Gentleness is manifested in many ways—by making no unnecessary and troublesome noises; by kind looks; by being mindful of each other's accommodation and convenience; by avoiding the expression of harsh contradictory opinions; by forbearing to wound self-love even in trifles; by avoiding loud and irritating tones of voice. The tongue is a great mischief-maker in families; and when it makes itself known by a harassing voice, it is a constant disturber of domestic peace. A strong-toned, harsh, disrespectful remark or reply, will produce its fellow from its auditor. Certainly there is nothing which sweetens domestic intercourse more than a kind, gentle, and affectionate tone of voice. Let any one test the worth of this virtue (for it deserves to be called such), by examining who among his friends and acquaintance have it or have it not. Let him inquire into the pleasure or displeasure which he has from their presence, and satisfy himself how much depends on mere tone of voice. This is a sort of index which shows to an habitual observer in what manner a stranger, who is seen for the first time, has been educated. It frequently discloses to what purpose he has been educated; and is, like the eye, a window in the heart.

Trifles.—There are a great many trifles in this life, when considered as a whole. It is a common failing to magnify them into serious matters. It would be, perhaps, descending rather too much to particularise them. They may relate to dress, food, visitings, insignificant purchases, management of children, treatment of, and remarks upon, domestics; and a multitude of little matters on which difference of opinion arises. Now, it is not of the least possible consequence, in the long-run, whether the matter be disposed of in one way or another, if no moral duty be broken. To-morrow, or soon, it will be so thought of. Yet a sudden observation, in an ungentle voice, will produce an irritating reply, and this a severe rejoinder. This ungentleness has a mournful effect on the character of children when exhibited in parents. It deprives brothers and sisters of a happiness which kind nature intended for them. It is wholly useless, and worse than useless, in asserting authority. It can only be classed among those sad mistakes which tend to make this a miserable world. How can any two rational beings, who must live in familiar intercourse while they do live, so misapprehend the purposes of life as habitually to torment each other on insignificant trifles? If any one of the household should be unhappily betrayed into an unbecoming expression, silence best becomes those who hear it.

HUSBAND.

It must be assumed that the parties to a marriage act according to their own will and pleasure in entering into it; and that they expect to promote their own welfare by such measures. They were, or might have been informed, of each other's suitability. Both knew, or might have known, that new circumstances and unexpected events might change or destroy qualities, and bring dormant or newly acquired ones into operation. Both agree, each with the other, to bear and forbear, and to make the best of the matter, however it might prove to be. Each one solemnly promised that the contract should be kept, if it reasonably could be, although the other might fail to perform. Let us suppose, then, that there were no mistakes in the beginning as to the qualities and conduct of the wife; and that she is, in all respects, and under all circumstances, such an one as has been before suggested. Can it be reconciled to the law which commands one to promote his own good, to perform the duties voluntarily assumed, to exercise a power over this dependent female, which not only deprives her of the expected benefits of connubial life, but which makes her a daily and hourly sufferer? How can any one who calls himself a man, and who claims to be considered and treated as such by other men, habitually prove himself not to be a man, but a brute, towards a defenceless, unoffending woman? If one could look into every family, how many voluntary scenes of misery would be disclosed? We assume now that the woman is in no fault, and that she strives continually to accommodate herself to her condition, and to bear in silence, and to do her best to console and soothe, and make of home what it should be. Might not one, in such case, say to the husband, are not you your own cruel enemy? Do you not make to yourself the misery which you complain of, as being incident to this state of being? If you have troubles and vindictive feelings towards any who have wronged or oppressed you abroad, have you any sense of right and justice, or any conformity to the law which commands you to do as you would be done by, in making your innocent wife the victim of your morose and angry feelings? Did you not solemnly promise her, that if she would devote her life to you, that you would support, cherish, and faithfully reward her affection? Do you avail yourself of the secrecy of domestic life, and of the certainty that prudence, and regard for you, and for your offspring, will keep all causes of complaint within your own walls, to play the tyrant towards one whose tongue must be silent, until she charges you as a criminal in a court of justice? Has she done you any wrong? Has she upbraided you that your social hours are spent away from her, and that your earnings are not brought home to be used for the common comfort, but dissipated in follies? When you have come into her presence, from she knows not what company, with an unsteady step, a giddy and throbbing head, and a bewildered brain, has she not sought to hide your and her own shame? Has she reproached you for these breaches of your solemn promises in any way but with tears—tears, not shed for herself, but for you and for your children?

WIFE.

It must depend in this case, as in that of a husband, whether a contract shall be made. As it is the proper course for the other sex to propose, and for this to accept or reject, a female should have opportunity to know the character and temper of a suitor, before she consents to make him master of her welfare for life. If this serious negociation were treated with the sincerity and frankness which it so much better deserves than any other that can be named, the proper knowledge would be had. The true state of the case is this: A man proposes to a woman to surrender herself and her expectations of happiness to him as long as she lives. The decorum enjoined upon her sex has shut her out from the inquiries and knowledge on which, if she have any pretension to prudence and good sense, her answer must depend. It may be very unfortunate for both parties, whether her answer be yes, or no, under such circumstances. It would better conform to reason for the female to reply that she cannot answer, and that it will be wiser for both of them to consider the matter, and to take time to form a candid and just opinion. Any sensible man would feel a respect for such a woman; and if the final answer did not accord with his wishes, still the female has done him no wrong.

Those who are wives and mothers have taken on themselves a very serious responsibility. That kind Providence which never sleeps and never errs, has enabled unperverted woman to feel her connubial and maternal duties; and if she have good sense enough to know how that feeling should be directed and used, she will not err. Her condition is often a trying one; but happily, in general, in this country, though painstaking and busy, it is not an unhappy one, and frequently far otherwise. When it is a trying one, her task is to find out how she can do herself and those connected with her the greatest good. It may depend on many circumstances how she is to effect that object of which she must judge. It is easy to show how she will not effect it. No husband who errs is ever corrected by the sharp and upbraiding tongue of a wife. She may make him hate her, without making him any better. She is the last person in the world from whom he will endure, unretorted, the language of reproach. She bound herself by her original contract to hold and bind him by gentleness, kindness, and forbearance. These are her armour. They are the only one which she can ever use with any hope of victory. This may be proved by a short illustration. A couple had lived long in happy alliance. The husband, misled by evil associates, yet fully sensible of domestic duties, spent his afternoons at a gaming table. It was his custom to return to his family at a certain hour in the evening, and to find his wife at the table awaiting his coming. Divided between the duty which he owed to her, and the habit of gaming, the time of his return grew later and later; he always found her at the tea-table clad in smiles, and welcoming his return. The hour was more and more prolonged into night, till it became midnight; but she was still at the table ready to receive him. No word of complaint escaped her. Subdued at length, he burst into tears, declared his follies, and renounced them. The next day, and always after, he joined his family circle at the accustomed hour. Let us suppose that this wife had addressed to her husband that language which came at last, through her kindness and good sense, from his own heart, what would have been her condition, his own, and that of their children?

There is one in the world who feels for him who is sad a keener pang than he feels for himself; there is one to whom reflected joy is better than that which comes direct; there is one who rejoices in another's honour more than in any which is her own; there is one on whom another's transcendant excellence sheds no beam but that of delight; there is one who hides another's infirmities more faithfully than her own; there is one who loses all sense of *self* in the sentiment of kindness, tenderness, and devotion to another. That one is HER—the WIFE—the tender companion of man.

CHILDREN.

The place which children may hold in society depends essentially on the character and conduct of the mother. In this busy nation, a husband is commonly too much occupied in his own concerns to devote his thoughts and time to any systematic course of discipline. The sum of duty, comprising manners, cleanliness, associates, time out of school, amusements, morals, religious impressions, example, precept, temper, gentleness, depends mainly on the mother. She commonly feels the weight of her responsibility, and is willing faithfully to acquit herself of it. But she deserves every possible encouragement from her husband. The husband, too, often thwarts her purposes by interposing his own contradictory views. If he think he can do any good by his better knowledge, the medium of influence is through the mother. If he can kindly convince her of some better mode, he will best promote the common welfare by that course. The bringing up of children is a fearful responsibility. So great is it, that many parents feel, that, if they were not involved in it, and could have foreknown what it is, they never would have assumed it. But this distrust and dissatisfaction is, in part, from their own errors. Have they ever seriously thought how this duty should be performed? What books have they read? With whom have they conversed? What have they learned as to the best means of promoting the true interests of their offspring? If they have done nothing to inform themselves, how can they be instructors to others? Not only are parents bound to know what is right, but they are bound to know how to use knowledge in a right manner. One rule to-day, and a discordant one to-morrow; harshness and severity at one time, and the most weak and injurious indulgence at another, are poor qualities for instructors. There must be in these matters, as in every thing else, a best way. It may be found somewhere in or extracted from these principles. Children have as good a right to be happy as their seniors. Their happiness consists in having and doing what will make them intellectually capable, morally correct and amiable, and physically pure and strong. These ends will be obtained by a systematic regularity, mildly and kindly, but certainly, enforced. Love, respect, and obedience, are its consequences. A child will soon learn what it can have and do, and what it cannot; and it will soon know that it cannot ask again for what has been, on due consideration, refused. The excellence of society has its root in infancy, and that excellence is confided to the care of mothers.

The duties of parents do not cease till their children are removed from under their charge on arriving at man and womanhood. They have a serious trust in the education of their children. Besides setting them a good example, they must instruct them privately to the best of their abilities, and likewise send them to proper schools. The scholastic education they give them ought to be suitable to their means, and their powers of introducing their children into the world. For a poor man to toil, and deprive his family of comforts, in order to highly educate one son, perhaps, is utter folly. His duty is clearly to give his sons such an education as he can afford, and to the extent which will enable them to fill respectably the station in life in which they are to move. It would be well if fathers of families would endeavour to give their sons a taste for reading. If they do so, and put them in a right bias, they may depend on them acquiring a great deal more useful knowledge after they leave school than they could possibly have learned there. Nearly all the men who have distinguished themselves in the world are found to have acquired their knowledge through private desultory study after leaving their classes, and many, in their autobiographies, trace their good fortune to the taste for reading given them by their parents.

DISAPPOINTMENTS AND SORROWS OF PARENTS.

It is not to be wondered at that parents, who have, as they think, done all that parents should do to make their children worthy, are afflicted, when their labour and exertion do not produce the intended effect. Their reasonable hopes are disappointed, their best feelings are tortured. An idle, ungrateful, dissolute son, is such a complicated cause of suffering, as may, if any thing may, lead one to murmur at the order of things. It may be admitted that such a parent is very likely to break out with complaints against the world. This suffering, however keen and biting it may be, is not a natural, but a moral evil. There is a moral wrong somewhere. Is it in the parent himself? Has he watched the beginning of error, and drawn his child off from the descending plane? But, perhaps, the downward course has been long begun upon, and that art and deceit have made such progress that the child has been able to elude parental inquiry. This can hardly happen with a watchful parent while his child is under his own roof. Perhaps the downward course has been begun upon when a child is at a distant school, college, or in a place of business, preparing for manhood. If a parent has placed a child where he cannot superintend him, or with those who do not undertake to do this, or who will not if they do, the parent is not excused because others are in fault. A child who is sent away from home, is, as the world now is, always sent into some hazard. The hazard is, when least, that the preceptor, guardian, and master, may be deceived. The seductions may be such as to plunge a boy into ruin, even before those who see him daily, and who mean to do their duty, have the least intimation of it. There must be error, then, somewhere. Probably it is in society itself.

In all large cities, towns, and even in villages, there are some persons who live and thrive, in whole or in part, by aiding young persons to ruin themselves, and to make life itself a burthen to parents. These persons are well skilled in the arts of seduction. They cannot go and put their hands into a father's or a master's pocket, and take thence what they covet. But they know how to put other hands there. They know what appetites to awaken, what desires to create, and how to cultivate them, and make them deep-rooted and firm, so that no wind of conscience can blow them over. They know what the fruits will be to them. Those who have been by such means withdrawn from the paths of innocence and virtue, and who have succeeded in stifling the cries of conscience, strive to add to their degraded number. They place temptations before the unsuspecting, and lead them on; and thus one plausible young villain is enough to seduce and to poison a whole generation.

This mournful course of seduction, profligacy, and crime, is called by some persons the natural evils of society. Such persons are poorly instructed. They are as clearly mere moral evils as murder is a crime; but they can only be eradicated by strict municipal regulations, and by the moral surveillance of the well-informed.

BROTHERS AND SISTERS.

These relations make a very great mistake as to the real good of life, in not cultivating a cordial and affectionate friendship with each other. In early life they are apt to be in each other's way, and to have irreconcilable wants; thus they very soon fall into alienations. They cannot, however, shake off the laws of nature. They must have an interest in each other whether they will or not, and it will essentially promote their mutual welfare to have a kind and gracious one. The common causes of their differences are exceedingly insignificant, and often are contemptible. They will see the day when they will so think of them. The time presses hard upon them when they will need counsel, support, and some one to care for them in a manner which none but brothers and sisters can do. When all has gone on well from the cradle upwards, among such relatives, they become to each other not only the most useful friends, but the most agreeable companions. They are the natural confidants when it would be folly to trust any one whose sympathy and solicitude may change. Brothers and sisters who are thus bound together by affection, sometimes hazard the connection by volunteering friendly, but very unwelcome, commentaries and advice. This is a very delicate matter. Giving unasked advice on any occasion requires very great discretion. If one sees that his brother is blundering, there are many modes of so approaching him, as to lead him to find that he needs advice, and of putting him in search of it. If there be a right understanding, he will go where he is sure of having the best and the sincerest. To assume a dictatorial authority over a brother and sister, is to inflict a wound on self-love which cannot be forgiven. We have already noticed the value of civility and politeness between such near connections; and we add, that sincerity and truth are nowhere more profitable and necessary. "Familiarity breeds contempt" is a true saying, and is very apt to find an application of its truth not only in the intercourse of brothers and sisters, but in that among more distant relations. We beg to warn all classes of relations who frequently meet together, against using too much familiarity, against using too little ceremony, against taking liberties with each other. Let them preserve towards one another the most respectful yet friendly terms, if they wish to avoid falling into differences. Let them remember that the quarrels of relations are almost irreconcilable, and that, even when forgiven and in a great measure forgotten, they leave very disagreeable feelings among all parties.

DUTIES OF MASTERS AND SERVANTS.

From the earliest ages down to the present time, there have been different classes of society. As elsewhere explained, this necessarily arises from the very order of society. The well-established and very proper right of inheritance, and the ability which some members of society have to acquire, and which others have not, the difference of education and other obvious causes necessarily produce these distinctions. Who among the various classes is the most contented and happy, is quite another matter. There must be some to serve, and some to be served. They are mutually dependent. We hear great complaints, sometimes from masters with regard to their servants, and sometimes from servants with regard to their masters or employers. This connection is regarded as one of the miseries of life; yet it is not necessarily so. If the connection produce vexation, there must be error somewhere. We shall first speak of the duties of masters, in which we always include those of mistresses.

It is the duty of masters to cultivate the esteem and affection of those whom circumstances have placed under them. Servants have the same sort of bones, muscles, heads, and hearts, the same self-love, and the same sensibilities, as their employers. They may not be so refined, still they have rights to be maintained, and must not be tyrannised over, merely because they are in an inferior condition. They have as good a right to be happy as those above them. If they behave with propriety, and do their duty, they should be spared when sick, advised and relieved when in trouble, and be made as comfortable as circumstances will permit. The commands given to them should be plain, clear, uniform, and not contradictory or capricious. They are not to be sneered at, or commanded with virulence and reproach, but mildly and rather by request. They are also to be treated with uniform civility; but every approach to familiarity with them should be avoided, if respect on both sides is to be preserved. It is always best to let servants know what is their duty, what is expected of them; this being beneficial to both parties. Much mischief is sometimes created by not attending to this rule.

The duties of servants to masters are equally clear. Their entering into servitude is a contract which they engage to fulfil. They are bound to execute all reasonable and proper orders in the line of service in which they are engaged. But besides this, they would consult their interests in being generally obliging and willing to assist in any kind of exigency. A seeming wish to please an employer goes a great way to compensate for deficiencies in ability. A civil obliging turn is indeed one of the chief virtues in a servant, and is certain to secure the affection of masters and mistresses. A strict attention to an employer's interest, regularity of habits, and perfect integrity both in speech and action, form the principal qualifications of a servant. There is usually much less actual dishonesty among servants than a regardlessness of their masters' interests and time. This is more the case with domestic than other servants. This class of persons, who are chiefly females, are very apt to encroach on the time of their employers for their own pleasure and convenience. If sent an errand, they will spend a great deal of more time in executing it than is necessary. It is an idle love of gossiping which generally produces this great failing among servants, and it is our duty here to admonish them of its impropriety. Their time belongs to their master, and it is dishonest to use it for their own purposes, unless by permission. Speaking with regard to persons in service generally, we are sorry to notice that there is a tendency to reduce the terms of contract betwixt employers and employed to one of a purely mercenary nature—so much work for so much money. There appears to be a growing inclination to drop all kindliness of intercourse betwixt the two classes. The consequence is, that many masters feel perfectly indifferent with respect to giving employment to those who have long served them. The injury is, however, mutual; for, when servants know that they are only valued in proportion to the amount of their actual labour, and that they will be paid off without regret, they care little for a master's interest. There can be no question as to who began this improper system. It originated in servants and workmen endeavouring to establish by violence and intimidation a certain amount of wages for their labour, and which the state of society could not warrant. We earnestly trust that it is not yet too late to restore the ancient bond of sympathy betwixt every description of employers and employed. Individual and social benefit would be the result.

DUTY OF TRUSTING TO OURSELVES.

There is a duty of an important nature which we have to perform towards society; and that is, we must *trust to ourselves*. We have each been endowed with reason to guide us, and hands to work; why, then, unless prostrated with bodily disease, or some other infirmity, should we think of leaning upon others for support or assistance? It would not be desirable to see men shut up their hearts against each other, and each stand in the panoply of his own resolutions, determined against every friendly appeal whatsoever. It is possible, however, to be not altogether a churl, and yet to take care lest we be tempted into an exertion of benevolence dangerous to ourselves, while it is of little advantage to our friends. Notwithstanding the many ties which connect a man with society, he nevertheless bears largely imprinted on his forehead the original doom, that he must chiefly be dependent on his own labour for subsistence. It is found by all men of experience, that, in so far as one trusts to his own exertions solely, he will be apt to flourish; and in so far as he leans and depends upon others, he will be the reverse. But there are many who do not recognise this principle. They trust only partially to themselves, and are always poking about after large favours from friends. We find them asking loans of money, asking others to be surety for them, asking acquaintances to interfere to get places for them. If they ask for nothing else, they intrude upon their friends to seek advice. Neither physically nor morally do they seem able to exert themselves for their own behoof. This is so contemptible a mode of living, that it cannot be too severely reprehended. Those who depend on others can never succeed in life. In whatever manner they may be assisted, they can never become front rank men in society. We would earnestly impress upon the young the propriety of depending as little as possible upon prospects of advantages from others, all of whom have enough to do with themselves. It is obviously the duty of every one to think and act for himself, as soon as he attains manhood, and neither be burdensome on relatives, nor troublesome to acquaintances. The acceptance of a trifling favour from an acquaintance always lays us under an obligation, which is sometimes difficult to remove. If the acquaintance ever need similar favours, we feel bound to grant them, and perhaps he estimates the original favour so highly, that he thinks we cannot do enough to serve him. In this way hundreds of men are ruined. We would say, accept no favours, unless upon a principle of common courtesy. If you employ any one to execute a piece of work, take care to pay them faithfully and promptly, and lie under no obligation to them, otherwise you may be called upon when you least expect it, to make payment an hundred fold. Be liberal, affable, and kind; but, knowing that you cannot do more injury to society than by greatly injuring yourself, exercise a just caution in giving way to the solicitations of your friends. Never be too ready to convince yourself that it is right to involve yourself largely, in order to help any person into a particular station in society; rather let him begin at the bottom, and he will be all the better fitted for his place, when he reaches it, by having fought his way up through the lower stages.

MAKING A WILL.

Much distress among families is often produced by individuals who have property to bequeath, not making a will or testament. Why such individuals do not make their wills, it is difficult to explain. Perhaps it arises from carelessness and a spirit of procrastination, or a want of resolution in men to make up their minds with respect to how they would distribute their property at their decease. Some may indeed be so foolish as imagine that the making of their will would hasten the approach of death. From whatever cause it proceeds, it is a highly blameable failing. It is the duty of every person possessing property, whether engaged in business or otherwise, to make a will, and describe in some species of document how he would wish his affairs to be arranged in the event of his dying. There certainly are cases in which men of property would not wish their possessions to be distributed in any other way than as the law would dictate; yet it is a mark of a well-regulated mind to leave a will descriptive of the means to be pursued in the accession to, and management of, their property and concerns. To do so, at least, would often save a great deal of trouble and some expense, and be a preventive of litigation among relations. We therefore must insist that the making of a will is a sacred duty which ought to be performed, and performed without procrastination. In the midst of life we are in death; no one knows but in an hour hence he may be no more. We beseech fathers of families, and others similarly placed—those even who may have property but to the value of a few pounds—to lose no time in executing their will. By leaving so much as a letter subscribed by their name, to be opened after their decease, they may spare much vexation to those whom they hold dear, they may quench much petty jealousy, much unseemly disputation. In a country such as Scotland, where a wife dying without having had any live children, the one half of the moveable property of the husband goes legally to her relations, it is incumbent on wives so circumstanced, if they have any love and esteem for their husbands, to make their wills: that is, put in writing a simple expression of their desire that their husbands may inherit the property which belongs to the wife in virtue of their marriage. By an inattention to this easily performed duty, there are many litigations—many widowers ruined.

MISFORTUNES—EVILS.

Evil is a part of the system of things in which we live, and, as such, must be patiently submitted to. Man was intended to be an active creature. One of the grand aims of the Creator, in his formation, evidently was, that he should never settle down into a sluggish or stagnant state. It would have been easy for the divine power which breathed into him so wonderful a thing as life, to have surrounded him with nothing but blessings, as they are called, so that he would have nothing to do but enjoy himself. But this would not have produced what the Almighty wished, a world in which a rational being was to exercise his faculties, and use his endowments, with a proper regard to a certain end—an account, namely, to be rendered at the close, of what and how he had done. We are here placed between evils which we are to avoid or subdue, and good which we are to aim at and enjoy; and hence, instead of being a set of torpid machines, as we would have been in any thing like a world of perfect happiness, we are in a perpetual state of vigilance and activity, making the fullest use of those mental and bodily properties with which we have been gifted.

If we narrowly inspect the evils or misfortunes with which we are visited, we will find them invariably to be, either of two kinds. Some are the simple result of an occasional or habitual violation of the laws of nature, or an occasional or habitual failure in that vigilance and activity which we are bound to employ for the avoiding of such distresses. These may be called moral evils. The second class are the result of circumstances over which we had no control, and may therefore be called natural evils. Such a division, however, is only necessary in the present state of our attainments as a race; for there can be no doubt that means were intended to be discovered by the ingenuity of man, for the avoidance and neutralisation of all evils whatever; and, therefore, in the case of what we call natural evils, we should only consider ourselves as the victims of imperfect knowledge, and be the more induced to strain after the improvement of ourselves and of our fellow-creatures, so as to obviate these as well as the rest.

Great care should be taken, when an evil befalls us, to ascertain whether it be moral or natural—in other words, whether it be the consequence of our own error, or of circumstances at present beyond our control. Our self-love makes us extremely apt to attribute all our mishaps to the latter cause; but if we are wise, we will not do so. We will rather search back unscrupulously into our own nature, or our own history, for the causes of the evil; and if we find them there, resolve for the future to be more circumspect or more active, so as to make a recurrence of the mischief less likely. The most of the accidents that occur, though they appear at first sight to be natural evils, would be found, on close inspection, to be moral. The most of the diseases that befall us could be traced to a failure in our duty to ourselves, and are therefore moral evils: the rest, such as cancers, wens, organic transformations, &c. which appear natural and unavoidable, are, we have no doubt, moral evils also. If *we knew better*, we might probably avoid them, as easily as we can avoid colds. They may be called natural in the meantime, but not so unless we strive to discover their causes, so as in the long-run to obviate them. They are certainly destined to be obviated at last, as many disorders, now understood, formerly were; and we must at present consider them only in the light of an inducement to the exertion of the spirit of inquiry.

There are some evils which we incur through hereditary channels, and are quite beyond our own control. We are charged, for instance, with the seeds of a harassing ailment, or of an early death, by the long forgone and perhaps long repented vices of our parents. But all this may be accounted for on the same principle. It has been intended that our moral natures should be so much improved, that even the possible distresses of a descendent may operate as a check to our wickedness; and what is a contemporary instance of innocent consumption but a warning to prevent us from doing that which may bring future lives into the same hazard? It is hard, in the meantime, for the sufferer; but what can we say against the course of nature? Perhaps the spectacle (and few can be more painful) of a youth dying in his very bloom, in consequence of natural debility derived from weakly parents, may be the means of preventing two persons from putting themselves into the situation for bringing on similar evils. A very high kind of conscientiousness, but one not unattainable even by ordinary minds, is called into force by the contemplation of such a case of unbought distress. A man who has any reason to fear for the validity of his own constitution, will, if fully impressed with a sense of such results, as likely to arise from his quitting a condition of celibacy, condemn himself to perpetual solitude rather than purchase an improvement of his own happiness, at the expense of unreckonable evil to others. Fortunately, society is beginning to look more narrowly into such matters than it used to do; and we do not despair of seeing a time when it will be nearly as infamous to communicate life under certain circumstances, as, under others, to take it away.

There are other evils which affect society, and which do their full part in making this a world of woe. There is squalid, miserable poverty; there is disgusting, lamentable vice; there is horrible crime, public execution, and national war. All these things, it is said, are inevitable; they spring from the nature of man, and from the laws which compel him to dwell in social connection. Those who say so are shallow thinkers. The world is naturally a beautiful world. But what God has made a Paradise for our dwelling-place, mankind have often rendered a desert by their crimes. Nature and revelation alike proclaim that the Creator intended we should be happy; but how has brutal ignorance, vile intemperance, gross crime, and every species of evil desires, blighted our comforts and degraded our immortal being? It has never yet been proved that there must *necessarily* be poverty, which is the source of many evils. A striking instance of the absence of poverty in a large class of society is found in the case of the Quakers, or community of Friends. With some peculiarities in speech and dress, not worth while to heed, this numerous body of individuals act upon a fixed uniform principle of suppressing the passions. They curb the appetites and headlong impulses of human nature. In this may be said to lie the substance of sound morals. The Quakers, therefore, habitually practise what other classes only theorise upon, at least are seldom performing. The consequence of this guardedness in thought and action is, that although there are many thousands of Quakers in Great Britain, and many thousands in the United States of America, neither in the one country nor the other do we ever find a Quaker begging in the streets, or an intoxicated Quaker, or any one of this class of subjects and citizens at the bar of a criminal court! The Quakers are, like other people, engaged in the common affairs of the world; they are merchants, mechanics, artificers, mariners, and otherwise employed in the ordinary business of life. They are subject to the same temptations and perversions that we are; yet, by the exercise of a singular degree of prudence, they avoid them. Here, then, is a clear demonstration, that even without the aid of civil power, but by the mere force of moral influence, there is a class of men, in the midst of society, who do escape disgraceful poverty, and who are free from vice and crime.

With regard to death, which is so generally looked upon as an evil, and the last and worst of all, it is in reality no such thing, unless it occur prematurely, which it never would do if men were perfect in the observation of the laws of nature. As the conclusion of an existence which never could have been given if others had not died, it must be regarded as only a part of our earthly destiny, and submitted to accordingly.

INEQUALITY OF RANK AND CONDITION.

When the young grow up, they find society to consist of classes of various degrees of rank and condition; some with titles of distinction, others without any title whatever; some rich, some poor, and many in a middle state between great wealth and poverty. The youthful reasoner perhaps thinks that all this is wrong, and that by *natural right* all men ought to be upon a level. It is proper that not only the young, but others who take up notions of this kind, should be told why these differences originate, and why they exist. Mankind, we may suppose, were originally equal in rank and condition; and they might have remained so, or nearly so, had they continued to remain in primeval barbarity, and lived apart from each other. But it was not in their nature to remain in this condition. According to naturalists, man is a gregarious animal; that is, he desires to live in society. As soon as men began to consort together, they began to separate into ranks and conditions. He who was the bravest was made king; he who was the most clever or the most prudent became the most wealthy; he who was the most idle became the most poor. From this kind of beginning all ranks and conditions sprung; and subsequent events have modified society into what we now see it. It may be said that this explanation would do very well if we now found that those who enjoy distinctions in rank were the cleverest of the people; if we found that the richest were always the most deserving of riches. Here, again, we must apply to human nature.

In one sense, titles are contemptible; they are fantastic trappings which a wise man would not covet. But, on the whole, there are few men possessing that degree of wisdom and self-denial which would lead them to despise titles, or the dignities connected with them, *when applied to themselves*. As far as we can discover, the Quakers are the only people who do not regard these things. The citizens of the United States of America affect to despise titles; yet, it is curious, they give a title of distinction to their chief magistrate, whom they style "*His Excellency*;" they also write *Master*, or its contraction *Mr*, before their names. In this we see a degree of the same vanity and weakness which affects the subjects of ancient monarchies. It would appear that there is a yearning after these follies among mankind. Be it so or not, it is an idiosyncrasy which, from time immemorial, has been seized hold of by rulers for the purpose of stimulating men to deeds beneficial to their country. The prospect of being entitled to write *Sir* before their names, or of being called a *Lord*, induces numbers of individuals to do great and good actions, which they would not do for money. As these titles generally descend to their children, they have a double stimulant to action. Genius not being hereditary, these titles may and do fall into the possession of men of no ability; nevertheless, the stimulant to acquire titles such as they have, continues to act beneficially, as it is thought, through the nation; and they themselves feel bound to maintain a certain honourable character consistent with their rank.

The principles of human nature apply in a similar manner in solving the mystery, why there are men enjoying riches which they never wrought for, and may be undeserving of. Riches consist of that part of the surface of the earth which can be used for human habitations and their appendages; of that part which can be used to produce vegetation; of that part over which, and near which, there are flowing waters capable of imparting motion; they consist of all personal estate; and of money, the agreed representative of all property, which is, at the same time, property in itself. Possessions of these various kinds are acquired by inheritance or by industry. Right by inheritance is not wrong. Would any rational mind maintain, that, when the father of a family, or any one who has no family, has acquired property, and dies, that it shall belong of right to any and to all who can get possession, by fraud, force, or whatsoever other means they may? Society could not be held together if such were the rule of right. It is at once apparent, that if such were the rule, there would be nothing to contend for; because all inducement to acquire for the benefit of one's family and connexions would be annihilated. Society would be forthwith reduced to barbarism. The right to acquire, and the right of inheritance, are wisely ordained to be a necessary consequence of society, and one of its strongest motives to act to useful ends.

If it be irreconcilable to justice, to convenience, and to the common good, to take by fraud or violence that which the dead must have left behind them, much more so is it, to take from the living, by like means, that which they can honestly acquire by the exercise of their own industry. If a member of a community were always liable to be despoiled of the fruits of his labour, the great principle of the system of being to which man belongs, would have been misplaced; there would have been no sufficient motive to action. If one would know what society would be, if such were the law and the practice as to property inherited or acquired, he must visit countries steeped in barbarism, and on which the light of Christianity does not shine.

It is contended by some persons that there should be a periodical division of land and property, and that every member of the community shall have an equal share. How often should this division be made? Shall it be made once a-year, once in ten years, once in fifty years? Why should it be made at one time rather than at another? Suppose it could be made, and were made, it must be but a very short time before it ought to be made again, if the reason for making it be, that some have more and some less, and that some are rich and some poor. One must be wilfully blind not to see that either the whole action of society must stop, or that inequality of condition would arise in a single year, perhaps in a single month; and even such inequality as would call for a new division. In a country where the spirit of enterprise and speculation has an unrestrained agency, the causes of regret are, that sad reverses occur, and that property changes hands too often, rather than that it is unreasonably held in the hands of a few of their successors. A small number of generations is sure to bring equality, considering our community as a continuing one. Thus, property comes and goes, in this country, as fast as any one can reasonably desire to have it. The changes which are seen, as to the ownership of it, are regulated by authority far wiser than any of man's institution.

ON FORMING OPINIONS.

Opinion signifies belief. There are good and bad opinions. It is our duty as rational beings to cultivate good or correct opinions upon every subject, and to eschew those which are of a contrary description. There is nothing more easy than to form hasty inaccurate opinions, but it is very difficult to form a correct belief on many topics. Opinion is found to be more or less dependent on times, circumstances, and bodily temperaments. It frequently arises out of prejudice, and is often influenced by impulse. When we form an opinion upon any subject, we are inclined to believe that all opinions of an opposite character have been, and are, erroneous. We are apt to laugh at every body's opinion but our own. All this betrays a deficiency of sober reflection, an ignorance of the history and faculties of mankind, and a want of knowledge of the world. The people of every country possess opinions favourable to their own fashions, customs, laws, and religion, and unfavourable to those of other nations. A love of one's own country is certainly a commendable feeling, but it should be a love arising from examination and conviction, not from prejudice. The Hindoo worships the river Ganges. *We*, by our education, know that this is nonsense. The bigoted but conscientious Turk will go to death upon it, that Mahomet was a true prophet. *We*, by our superior intelligence and reading, know that Mahomet was a vile impostor. The people who lived in our own country a hundred years ago were of belief that certain old women, whom they termed witches, could, by supernatural powers, raise tempests at sea and land, and malevolently interrupt the course of human affairs. The people who possessed this belief were perfectly conscientious in their opinion; yet, *we* know that this opinion was a gross absurdity. *We* know that our ancestors believed in an impossibility. Opinion is therefore, as we see, a thing of time and place. The opinion that is supposed to be right in one century, is wrong in the next. What is considered to be a right opinion in Asia, is thought wrong in Europe. What is deemed a correct and praiseworthy belief in Britain, is reckoned an absurdity in France. Indeed, it is often seen that the opinion which is held good in one district of a country, is looked upon with contempt in other districts—so that the whole world is found to be covered, as it were, with a variety of opinions and shades of opinions, like the diversified colours by which countries are depicted in a map. Opinion, we have said, is also dependent on temperament of the body. This is a melancholy truth. A fat and choleric man does not think in exactly the same way as a lean man. A man who enjoys all the comforts which opulence can purchase, has a tendency to think differently in some things from a man who is suffering under misfortunes or poverty. So strangely constituted is the principle which governs opinion, that most men have reason to alter their opinions on many points in their progress through life. They form an opinion in youth, from which, in manhood, they depart, and form another; and this other they modify into something else as old age comes upon them.

What does all this wonderful contrariety of opinion teach us? Since we see that opinion is dependent on the locality of our birth, on the age in which we live, on the condition in which we may chance to be placed, and on the physical qualities of our bodies, have we therefore no power over opinion? Must we be its slave? These are questions of a solemn character, and we must answer them soberly. The contrariety of opinion existing in times and places teaches us, in the first place, *humility*, which is the foundation of many heavenly virtues. It shows us that the opinions which we may form, particularly on abstract subjects, may possibly neither be the most correct nor the most enduring. Perhaps what we have taken up and cherished as our opinion may after all be a delusion. In learning a lesson of humility and distrust of our own style of thinking, we are impressed with a tender regard for the opinions of others—opinions which, most likely, have been taken up on grounds equally conscientious with our own.

Although opinion is commonly dependent on those contingent circumstances which we have noticed, it cannot be allowed that we have no power over it. We have a power over the formation of opinion to a certain extent, and it is our present object to show how this power can be exerted in order to enable us the better to fulfil the duties of life. The reason why opinion is so illusory in its nature, is, that mankind have ever been excessively careless in the adoption of their opinions. They are in the habit of picking up random ideas, which they mould into an opinion; and after having made up their minds, as they call it, on what *they think* is their opinion, they will listen to no explanation of the opinions of others. Their obstinacy, their self-conceit, their self-interest, their wish to please the party to which they have attached themselves, induce them to hold fast to their original opinion, until time or experience, in all likelihood, wear it down, and its absurdity is secretly pressed upon their notice. But even after its absurdity is disclosed, they are sometimes ashamed to say they have altered it; and so, perhaps, they have one opinion which they keep locked up in their bosom, and another which they bring into daily use, and flourish before company. In the apposite language of Scripture, these men war against the TRUTH.

It is our duty as good members of society, and with a view to self-respect, to be very cautious in the formation, and, most of all, in the display of our opinions. Many excellent men, on arriving at middle life, have deeply regretted that they should have heedlessly published their early and hastily-formed opinions in youth. They had reasoned, as they thought, soundly, but it was without a knowledge of the world, or its history. Speaking to the young, we would say—while yet under the training of parents, guardians, and teachers, it is your duty to receive with confidence the instructions by which it is attempted to enlighten your minds, and to put you in the way of well-doing. But these friends of your youth will probably tell you that when you pass from under their guardianship into the active scenes of life, you become a responsible being, responsible alike to human and divine laws; and that you must now think for yourself. At this critical period of your existence, you have every chance of coming in contact with the idle, the dissipated, the frivolous, who will try to make you embrace erroneous opinions, and who will possibly put the most mischievous books into your hands for perusal. Do not be led away by such machinations; neither be dismayed by the number of wits or profane jesters who may assail you. Do your duty manfully. In order that you may attain a correct opinion on the great debateable subjects that you will hear rung in your ears through life, begin a course of reading those good and authoritative works which intelligent friends will recommend to your notice. Take every opportunity of cultivating your understanding, of enlarging your ideas, of banishing prejudices. Look always at the different sides of a question; for you must remember that there are always many ways of telling a story. In proportion as you advance in your private studies, and acquire a knowledge of the passions and conduct of mankind, you will more and more be able to form a correct opinion. There is one thing which you will learn with surprise from this kind of experience, and that is, that many, though holding different opinions, are driving towards the same end in the main. They have only differed upon trifles, and perhaps fought about mere words. This is one of the strange weaknesses of the human race, into which you will find it difficult to avoid falling. The more that you learn, the more will you see cause to entertain a liberal view of the opinions of others. It is the exercise of this liberality of mind which forms a distinguishing trait in the manners of our country. By the British constitution, every one is allowed perfect freedom of opinion, a gift above all price, which it is our duty not to prostitute or abuse. Let us form our opinions on solid grounds of conviction—let us cherish these opinions to the adornment of our lives—and let us so maintain a due regard for the opinions of others, that we show forth, in our feelings and actions, that most excellent of all virtues—CHARITY.

These observations apply indifferently to various subjects upon which opinions may be formed; and we would, in conclusion, beg to say a few words, in particular, on opinions of a political nature, which are the most difficult of all to be correctly formed. Political opinions are applied to the theory and practice of national government. The policy of national government is not an exact science to be learned, as some would imagine. It is more a fashion than a science. It is a thing dependent on time, place, and other circumstances. The form of government which suits one age or country would not suit another age and country. Some nations are best governed by a despotism, others by a mixture of monarchy and democracy, others by a pure republicanism; but, as we say, what is best at one time is not best at another. The genius and necessities of every people are subject to change, and consequently their governments change with them. If we feel the force of these facts, we will be cautious how we assume an unalterable opinion upon any mode of administering government. The young are particularly liable to take up notions on this subject which they afterwards feel inclined to fall from. We would admonish them to read and digest the history of their country, and reflect well upon the genius of the nation, before they come to a determinate opinion in politics. They will learn, as they advance to maturity, that in nothing is there such a mass of duplicity and affectation as in political matters. They are therefore called upon, by duty, to examine extensively, and probe deeply, the grounds upon which they form their opinion. They will find it much the safest course, as already expressed, to think lightly in the matter till they have had some experience of the world, and been convinced by the evidence of their senses. National exigencies sometimes call upon us to engage more deeply in politics at one time than another. Discretion must here be our guide; yet there is generally greater danger in our wasting much precious time on political disquisition, than in falling into an apathy upon public affairs. He is a wise man who knows how so to guide his steps as to preserve himself from falling into either extreme. Every one who has been for a long series of years politically busy, will acknowledge, that though he thinks he was right in the main (in which opinion he may be right or wrong), yet, that he has spent many busy hours, and anxious thoughts, on subjects, which, looked back upon, are seen to have been profitless and insignificant.

DUTIES WHICH THE PEOPLE OF ONE COUNTRY OWE TO THOSE OF ANOTHER.

It is seen that all the people of the earth belong to some one of the many nations with which it is covered. It is also seen that nations are generally separated from each other, not only by language, manners, customs, religion, and forms of civil government, but also by geographical boundaries. The division of mankind into nations is natural, and possesses obvious advantages. There is a limit beyond which the government of a nation cannot well be administered. By being confined within certain limited bounds, the national institutions may be improved, security and prosperity promoted, and the interests of the people advanced. We frequently find that the people of one nation live at enmity with those of another nation. We find many at open war with their neighbours—that is, they are resorting to brutal physical force to settle a dispute. These are evils deeply to be deplored. Nations have mutual wants which a mutual intercourse and trade will obviate. They have similar interests at stake. Their inhabitants all alike belong to the great human family, and should live at peace with each other. But ambition, and many evil passions—strife, malice, and uncharitableness—are continually in operation to retard their advancement towards a universal philanthropy. National war is the heaviest curse which affects humanity. It leads to enormous debts and taxations, and in reality is the beginning of all kinds of distresses among the people. Yet the people have been frequently very clamorous for war. We say *have been*, for we hope that this sentiment will in future be otherwise regulated. We ought to impress upon our minds a surpassing horror of war. Let us think of it as the scourge of the human race, and as one more destructive, physically and morally, than the most virulent epidemic. Were the inhabitants of countries duly impressed with these feelings—did they reflect upon the blessings which are showered upon nations during a lasting peace, they would henceforth resolve to oppose, by every constitutional means, the commencement of wars by their governments. Besides the actual loss of lives and of property to a nation during war, it is incalculable the injury sustained by society by such an infliction. A war of a few years' duration may retard intellectual improvement for a century. We hold, therefore, that it is the duty of every man to discountenance such a system of folly. He cannot be a lover of his country, he cannot be the friend of moral cultivation, who would countenance such an idiotic process of settling quarrels between intelligent nations. According to a rational view of man's condition in separate nations, war can in no case be reconcilable with social happiness, unless on the obvious principle of self-defence. So long as there remain such masses of ignorance on the earth, so long, we are afraid, force must be employed to preserve the little spots of civilisation from the flood of barbarism which might overrun them. May it be anticipated, however, that this urgent necessity will not exist much longer! How glorious would be the prospect if universal peace were permanently established! We should find one nation instructing another in all the arts and sciences of which it was itself master: we should find an honourable spirit of emulation running through the whole, and all shaping their policy so as to promote the most beneficial intercourse in commerce, literature, and refinements. In the present state of things, as far as it can be accomplished, a kind and friendly international communion is a high moral duty. It is our duty to look with an eye of charity on national peculiarities. We have no right to insult the feelings of the people of any nation, however strange their language, their fashions, or their [illegible] appear to us. We have likewise no right [illegible] with any apparently improper characteristics in their forms of government. It is our duty to consider them as entitled to live and act according to their own fancy, as [illegible] dependent responsible beings. To write, print, and disseminate any scurrilous jests tending to lower them in general estimation, is not only immoral, but inconsistent with the principles of honour, which do not permit any one to be struck who cannot defend himself. When we therefore insult a foreign nation by our obloquy, we commit the mean and cowardly action of injuring a party which has no means of redressing the grievance.

RECREATIONS AND AMUSEMENTS.

We have often had occasion to show that this state of being is one of alternate action and repose. There must be serious action, and there must be amusements. It was intended that mortals should be pleased and happy, if they deserve to be so. Those who maintain that life is to be an uninterrupted scene of labour and gravity, are, we hope and believe, entirely mistaken. We discern nothing in the natural world, nor in man's peculiar constitution nor relations, which gives the least countenance to such an opinion. Amusement, like every thing else in which free agency is concerned, may be innocent and grateful, or improper, pernicious, and introductory of the worst of evils. Young persons must have the former, or they will seek out the latter. It is the duty and the interest of parents to lead children to take pleasure in such things as can be approved of, and to divert children from such as must be injurious to them, and afflictive to those who are deeply interested in them. We apprehend that there may be persons, and classes of persons, who will disagree with us on this subject, as they may have done on some which have been already touched upon. We should deeply regret to displease any one; but on a matter so important as the making good citizens and good moral agents out of children, one should not hesitate to speak frankly and sincerely. If wrong, persons better able to judge will take care that no evil visits them in consequence of such error.

Amusements are physical or mental. It may be more proper to say, that there may be, first, amusements which are intellectual, and, second, such as consist of some bodily motion, in which the mind is more or less interested. If there be such distinctions, athletic sports may be of the second sort. The simple use of the eye, of the ear, and of the imagination, may be of the first sort. It is believed that all amusements must have some contemplated end or result, whether that be defined and certain, or contingent. We believe so, because every thing in this world seems to be moving on to some purpose. One who is acting without knowing for what, is neither labouring, nor amusing himself, but is trying to get rid of himself, and of time. The most captivating sports are those which are contingent; that is, sports or occupations wherein the result may be highly favourable or otherwise. No one engages in them without expecting to come out on the successful side. Hence, hunting, fishing, horse-racing, and gaming, are of this order. The hope of success is a very high excitement, but the mortification and distress of failure ever far exceed the pleasures of success. There is a tendency to discourage out-of-door sports. This is certainly wrong. If not carried to excess, they are among the most salutary and pleasing amusements in fine weather.

Every one admits that the mind and moral faculties are to be developed, and strengthened, and made to do the best, by exercise. This is equally true of physical power. Every action which it can be proper to do at all, ought to be done in the best way, otherwise we do not answer the end of our being. In the vegetable and animal departments, all proper care and cultivation tend to use and beauty. Is there any reason why the physical powers of man should not have care and cultivation to the same ends? Those who prefer a stooping, lounging, awkward, graceless figure and motion, may be on one side of the question; those who think that it was intended that man should be an upright, easy, frank, comely, and convenient being to himself, and pleasant to all within whose observation he may come, will be on the other.

Although the frame of man is so made as to permit him to assume an endless variety of positions, and to apply his strength in all of them, he does, or should, return always to an upright position. No essential deviation from this position can possibly be a natural one, but for a temporary purpose. This is proved by the framing of the human bones. This framing shows, that, when one walks, it was intended that he should be perpendicular; if he walk in an inclined position, he has not only to move himself, but to resist the power of gravitation at the same time. The muscles, in such case, have a strained and unnatural duty to perform. It seems to have been intended, by the same sort of proof, that human beings should walk with the lower limbs, that is, from the hips downward, and not with an unmeaning and ungraceful action of the whole person, as is often seen to be done.

Dancing.

As to the best modes of acquiring strength, ease, and grace, there may be very different opinions. There are many persons who think the discipline of *dancing* a proper mode, and others who think this highly improper. We would not run against any opinions whether they be well or ill founded. But as to dancing, just like every thing else, it may be misused and perverted, or be made to be an innocent, healthy, and commendable accomplishment. There is no mode so much within the reach of the community, in general, as this. Properly taught, it brings out the power of the muscles, and gives them their natural action; all natural motion is graceful. Why should not man conform to this general law of nature? Dancing well is one mode of conforming. Possibly it is considered frivolous and corrupting. Nothing is frivolous in this system of being, which is innocent, pleasing, and adapted to promote healthy action. Persons who are capable of being corrupted by dancing, will certainly find some much more effective mode to become so, if this be denied to them. Dancing among the very young is usually conducted under the eye of discreet seniors, and well-educated adults need no supervision in dancing, but that of good sense and their own self-respect. But suppose dancing could in any case be perverted, so may every thing else be. If we are not to do any thing till it is impossible to err in doing it, what will there be for any one to do?

Music.

It is one of the most convincing proofs of the benevolence of the Deity, that he has so formed the human ear, as to make it capable of finding a rational and elevated pleasure from the action of sound. There might have been organs of speech, and ears to hear, without imparting to the ear the power of knowing and delighting in music. It must have been intended that this gracious gift should be used, and (most probably) as one mode of praise and thanksgiving as well as for innocent pleasure. Music is action; it is action to some end; the end is innocent and delightful. The enjoyment has the double advantage of being solitary and social. Music may be made to produce a sense of high moral feeling, and it may be made to produce a feeling of very opposite character. The same rules must be applied to this subject as to all others, that every thing was created, and for some good and wise purpose; and that every thing must act, and will act, to some useful end, if human ignorance or error do not interfere. We therefore contend that the power to make music is to be cultivated, and its benefits to be thankfully enjoyed.

It is consistent that man, as he is so superior to all other animals, should be alike superior in the making and enjoying of musical sounds. He undoubtedly is so. His voice (it would be more proper to say woman's voice) includes all the sweet sounds which can be made by all other animals. He has, by cultivating this power, by applying the atmosphere through the human lungs, and by delicacy of touch, and by bringing substances in contact with each other, and by sending the wind through that wonderful work of his own hands, the organ, found the means of rendering tribute to the Most High, and of softening and purifying his own heart. No doubt music was given to mortals for their amusement, and that it is their duty to take it in that light, and be thankful for it.

Games.

Games at cards are a very common amusement. They may be innocent, but there is nothing to recommend them. They give no action to the body; they are a very humble occupation for an intelligent mind. Whether the chances in distributing fifty-two pieces of spotted pasteboard fifty successive times in three or four hours, shall possess some of the engaged with fortunate pieces, and others with unfortunate ones, can hardly be said to be doing any thing to any useful end. When the sport is over, the thing proved or arrived at is, that in this use of four hours of a short life, A counted so much, and B so much. This, however, is not the end usually proposed in playing cards. The cards are only the machinery which, with more or less skill, submits, to the laws of chance, the result of emptying one man's pocket and filling another's. A passion for this kind of gaming extinguishes, or converts into a withering curse, every fine feeling of the human heart. Time, health, property, the proper use of the tongue, character, self-respect, and peace of mind, are the sacrifices made at the gaming-table. Unnoticed by the miserable victim, the shackles of habit are put on, which no earthly power can unrivet. When the gambler's last shilling is gone, he starts, as from a dream, into a full sense of the complicated misery and ruin in which he has involved himself. He must then devote himself to infamy, and submit himself to the power of a gravitation, which will bring him inevitably to the bottom of its abyss. The evils of gaming may be judged of by the number of suicidal deaths which it occasions, especially in the great cities of Europe.

All gaming for property leads, in proportion to its character, to such results. The means of gaming, and especially with cards (as they are the easy and most common implements in use), are regarded with the abhorrence which is associated with them by all persons who feel an interest in the young. The young and the middle-aged have no need of cards for amusement. They may have many amusing occupations which are innocent and improving. There may be persons in an advanced time of life, who are beyond the seduction of gaming, to whom the interest of a game of cards may be an innocent and welcome amusement. Undoubtedly, friends who are met for social purposes, and who have nothing better to do with their time, hands, and minds, may play cards in a manner to give no offence to themselves or others. But it is pleasing to know that the state of improvement is such, that in most social meetings there are higher entertainments than that which cards afford, and which are justly in higher esteem.

There might be games, one would think, adapted to amuse children, and to be at the same time innocent and useful ones. Whatever they are, they must be consistent with the principle which requires a beginning, an interesting succession of circumstances, and a result worth attaining. Children must be busy. To require of them to be still, is to require what nature has forbidden. To place a child on a hard bench, and tell him to sit still there two or three hours without any employment for his hands or mind, is as great a violation of natural law as to require of him to stand on his head for the same length of time. There is an obvious want in the means of amusing children; and we apprehend that it arises from disregarding the principles on which the construction of physical and intellectual being rests. If there were an extensive workshop, provided with every variety of tools, with a proper superintendant, to which boys might resort on some proper arrangement, and where they could make articles for themselves, there can be little doubt that it would be diligently frequented. The reason is, that their little efforts would be to some end, and by natural means. On the other hand, the gymnastic machinery is fallen into disrepute. These exercises are uninteresting repetitions to no end, except with those who know that bodily motion must be had to secure health. In such case they endure the labour for the end in view. But the amusements of the young must be of a nature to secure action to an innocent and useful end, and health will take care of itself. Perhaps there may be some persons who can follow out this matter, and invent rational amusements. They would deserve to be regarded as benefactors, and would probably find a substantial reward. We cannot but remark that there is one game, which is one of the most interesting and healthful that can be played—that of tennis, or hand-ball. There are many things to recommend it; and among others, it is one sufficiently interesting to be played for itself, without adding to it the zest of winning or losing any thing but the game. We incline to think that it is the game, of all others, which deserves the patronage of colleges and seminaries, and is well adapted to develope the physical force.

Conversation.

The principal amusement of rational people is the interchange of thoughts by speech, or conversation, which word is made out of the Latin words *con* and *versor*, and means literally *to be turned to* or *with*. The principle of this amusement is found in the law of association of thought. Intelligent persons can always make a conversation. The only difficult step is the first; that ought not to be so considered. Persons who are skilled in the art of talking can always give it a direction. The purposes of conversation are, to put one's self in the way of learning something; to impart something that others want to hear; to form opinions on interesting subjects; to settle the merits or demerits of public action; to recount amusing or extraordinary facts, &c. &c. Every human being knows something which he is willing to tell, and which any other that he is in company with wishes to know; or which, if known to him, would be amusing or useful. To be a skilful conversationist, one's eyes and ears should be busy; nothing should escape his observation. His memory should be a good one, and he should have a good-natured willingness to please, and to be pleased. It follows that all matter of offence in conversation should be avoided. The self-love of others is to be respected. Therefore, no one is tolerated who makes himself the subject of his own commendation, nor who disregards the feelings of those whom he addresses. There is as much demand for politeness and civility in conversation as in any other department of social intercourse. One who rudely interrupts another, does much the same thing as though he should, when walking with another, impertinently thrust himself before his companion, and stop his progress. Under favourable circumstances, and among persons who know how to train a conversation, there are few if any amusements more grateful to the human mind. We need not say any thing of the amusement derived from reading. It is very properly one of the standard amusements of persons of all ages. The influence of the press on the character of a country is not to be measured or calculated. It is strikingly true of this admirable invention, as it is of so many other things in natural and moral agency, that, *well used*, it is an inestimable blessing; ill used, the corrupting demon of social life. Happily, attention to the proper wants of the young has required of the press its action for their benefit; not as to books of study only, but sheets of amusement.

RELIGIOUS OBLIGATIONS.

Religion signifies a system of faith and worship. Religion arises from man's perception of his relation to the system of being of which he is a necessary part. The presence and influence of religion is to be felt and manifested throughout the duration of human life, in all that is thought and done, with a view to a happier and more perfect state of existence after death. Just conceptions of the character and attributes of the Deity, are of the utmost importance, especially to the young, whose minds require to be led aright in all that pertains to the great truths of religion. The religion professed in this country is Christianity—the most cheering, the most noble of all faiths. The books to which we point for instruction in the religion of Christ are those of the Old and New Testament. To them the instructors of the young will direct the religious studies of those under their charge, as may best seem fit. Besides inculcating religious obligations, these works furnish us with the most perfect system of moral duty ever promulgated. The sum of the earliest delivered moral law is comprehended in the Ten Commandments, which are as follow:—1. Thou shalt have no other gods before me.—2. Thou shalt not make unto thee any graven image, or any likeness of any thing that is in heaven above, or that is in the earth beneath, or that is in the water under the earth: Thou shalt not bow down thyself to them, nor serve them: for I the LORD thy God am a jealous God, visiting the iniquity of the fathers upon the children unto the third and fourth generation of them that hate me, and showing mercy unto thousands of them that love me, and keep my commandments.—3. Thou shalt not take the name of the LORD thy God in vain: for the LORD will not hold him guiltless that taketh his name in vain.—4. Remember the Sabbath-day, to keep it holy. Six days shalt thou labour, and do all thy work: But the seventh day is the Sabbath of the LORD thy God: in it thou shalt not do any work, thou, nor thy son, nor thy daughter, thy man-servant, nor thy maid-servant, nor thy cattle, nor thy stranger that is within thy gates: For in six days the LORD made heaven and earth, the sea, and all that in them is, and rested the seventh day: wherefore the LORD blessed the Sabbath-day, and hallowed it.—[By the practice of Christians, the Sabbath has been transferred to the first day of the week.]—5. Honour thy father and thy mother, that thy days may be long upon the land which the LORD thy God giveth thee.—6. Thou shalt not kill.—7. Thou shalt not commit adultery.—8. Thou shalt not steal.—9. Thou shalt not bear false witness against thy neighbour.—10. Thou shalt not covet thy neighbour's house, thou shalt not covet thy neighbour's wife, nor his man-servant, nor his maid-servant, nor his ox, nor his ass, nor any thing that is thy neighbour's.

Such was the sum of the moral law, until Christ added to it a number of the most transcendantly excellent admonitions, and which are found scattered throughout the history of his ministrations in the four gospels in the New Testament. The chief moral which he inculcated was, "Whatsoever ye would that men should do unto you, even so do unto them, for this is the law and the prophets." But the whole of his sayings breathe a similar spirit of benevolence and gentleness. He preached, for the first time that it had been done on earth, the doctrine of "peace and good-will towards men;" that is, universal love and peace among all mankind. "Ye have heard," said he, "that thou shalt love thy neighbour as thyself; but I say unto you, Love thine enemies: bless them that curse you: do good unto them that hate you: pray for them which hurt you and persecute you." Again, he said, "Blessed are the poor in spirit, for theirs is the kingdom of heaven: blessed are they that mourn, for they shall be comforted: blessed are the meek, for they shall inherit the earth: blessed are they which hunger and thirst after righteousness, for they shall be filled: blessed are the merciful, for they shall obtain mercy: blessed are the pure in heart, for they shall see God: blessed are the peacemakers, for they shall be called the children of God: blessed are they which suffer persecution for righteousness' sake, for theirs is the kingdom of heaven: blessed are ye when men revile you, and persecute you, and say all manner of evil against you for my sake falsely." In this manner he taught the great necessity for being humble and lowly in spirit as the basis of all virtue and social happiness. He likewise inculcated, at different times, the necessity of putting away every thing like ostentation in doing good actions. He tells us not to give our alms before men, but to bestow them in secret; not to pray ostentatiously in public, but in a private place. No one, until he appeared, ever pointed out that there was no difference betwixt actual transgression and the wish to transgress. He tells us that sins of the heart are equally punishable with the commission of an offence. He likewise taught that men "cannot serve two masters," that is, do evil actions, however apparently trivial, and at the same time be good men. To break "the least of the commandments" is to be reckoned equivalent to breaking the whole; and it is further said, it is impossible that our oblations to God can be accepted of so long as we live at enmity with a brother, that is, having a quarrel with any one—"Leave thine offering before the altar, and go thy way; first be reconciled to thy brother, and then come and offer thy gift. Agree with thine adversary quickly whilst you are in the way with him." Who among us, may we ask, keeps this saying in remembrance? Do all who attend the public worship of God, hold it in mind?

Again, he says that we are equally to avoid hypocrisy, or a pretence of self-righteousness and ability to show our neighbours their faults, before we have put away the same or other faults from ourselves. "Hypocrite, first cast out the beam out of thine own eye, and then thou shalt see clearly to cast out the mote out of thy brother's eye. Judge not, that ye be not judged." How valuable are these reproofs! Continuing to admonish us of the danger of hypocrisy, he says that we shall know men by their fruits, that is, we shall know them by their actions, not their words. "A good tree cannot bring forth evil fruit, neither can a corrupt tree bring forth good fruit: therefore by their fruits ye shall know them. Not every one that sayeth unto me, Lord, Lord, shall enter into the kingdom of heaven, but he that doeth my father's will that is in heaven." We are likewise told that there must be no stop to the extent of our forgiving of injuries. Being asked if we should forgive an injury for seven times, he said to those about him, "I say not unto thee, until seven times, but until seventy times seven;" by which we are to understand that there is to be no limit to our forgiveness. Three things, we are told by St Paul, are essential—Faith, Hope, and Charity, but that the greatest of these is Charity, or a disposition to think well of our neighbours whatever may be their actions. It is also variously inculcated that charity is the first of the Christian virtues. Personifying it, it is said, "Charity suffereth long and is kind; charity envieth not; charity vaunteth not itself, is not puffed up, doth not behave itself unseemly, seeketh not her own, is not easily provoked, thinketh no evil, rejoiceth not in iniquity, but rejoiceth in the truth; beareth all things, believeth all things, endureth all things."

Such are some of the invaluable moral admonitions conveyed to us for our temporal guidance by the Christian dispensation. It would be needless to quote farther from a book which we earnestly hope is in every one's possession. The summary we have presented will point out that the Old and New Testament form the basis upon which all our morality is founded, and are the only correct guides under the solemn obligations of religion.

CONCLUSION.

We have now given an elucidation of what we consider to be the principal duties we are called on to perform during life, both to ourselves and to others. The subject is by no means exhausted, yet enough has been said to afford human beings a view of what line they ought to follow in the pursuit of individual and social happiness. The object we held in view has been accomplished. We have, to the best of our ability, put young and old, high and low, rich and poor, *in the way* of executing their temporal duties. We hope we have shown that if man be not a happy, a grateful, a satisfied being, he must accuse himself, and not complain that the system of being to which he belongs is wrong and malevolent. We have attempted to prove that man, individually and socially, is capable of improvement; that he has removed himself from his original condition, and has advanced far in disclosing his own powers, and in applying them in the promotion of his own happiness. But it has to be added, that he has still much farther to go in the same course, that the way is known to him, and that there are no obstacles in it which he may not remove. We do not believe in the perfectibility of mankind. The crimes and follies, which affect even the most cultivated of our race, tell us too plainly that there is a natural bias towards evil, which it requires the utmost skill on the part of religion and reason to counteract. The passions ever seem to stand as a barrier against human perfection, and it is only by their due regulation that we can gain so much as comparative worldly happiness. Yet it is incalculable to what extent the exaltation of the mental faculties may be carried by systems of education, and to what extent the community may be purified of its vices. Let us hope that nothing may occur to interrupt the physical, the intellectual, and moral improvement of society, which is now so happily in the way of advancement.

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HYDROSTATICS AND HYDRAULICS.

THE term Hydrostatics is compounded of two Greek words which signify the *stopping or balancing of water*, and hence designates the science which treats of the pressure of water. The term Hydraulics is also formed from two words of the same language, which signify *water* and a *pipe*, in reference to the movement of water in certain musical instruments used by the Greeks, and accordingly denotes that branch of science which treats of the *motion of water*.

Although water has given a name to these branches of mechanical philosophy, and although the phenomena which it exhibits, and the laws which it is said to obey, are those in general spoken of, yet these phenomena and laws are alike referable to all bodies which exist in a similar state—that is, in one of liquidity. It is difficult to define in a few words what a liquid is, notwithstanding that the term when employed is perfectly understood even by a child, and a correct idea of the substance meant conveyed to the mind of every one. The distinction between a liquid and a fluid is, that the term liquid implies only one class of fluids. There is another class distinguished by the name of aëriform fluids, such as the atmosphere; to these the name of liquid is never correctly applied, but is only referable to bodies such as water.

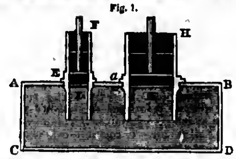
A liquid may be called a body in which the attraction of cohesion is so far overcome as to admit of its yielding to the slightest pressure, and the particles composing its mass easily changing their relative position with reference to each other, without separating from the mass, or repulsing one another as those of aëriform substances do. This explanation does not apply to a mass of matter which is pulverised into fine grains, such as sand; for in this case the cohesion between each grain and the rest, even those which lie contiguous to it, is entirely destroyed, whilst amongst the particles composing every individual grain it still exists in full force. But in a watery fluid, the cohesion of all the particles composing the mass is overcome in exactly the same degree, to a greater extent than exists between the atoms of each grain of sand, and to a less extent than is seen to exist between grain and grain of the same material. In other words, the mass of any liquid possesses a certain quantity of cohesion which is distributed equally amongst all the particles composing the mass. Hence, it may be assumed, that in such bodies the particles are all placed at exactly equal distances from one another. This, however, is the case with all aëriform bodies, and also with many solids. But the former do not answer the condition which it has been observed is characteristic of a liquid, that the particles which compose it should not repulse one another; and the latter are deficient in another characteristic, namely, that the particles which compose a liquid should move easily amongst themselves.

Between the solid and the aëriform state there are a great number of conditions in which a body may exist, corresponding to the extent to which the attraction of cohesion has been overcome, and repulsion established amongst the particles. Honey and spirit of wine or alcohol, for instance, exhibit very different degrees of liquidity. Scientifically speaking, however, there is but one state—namely, that in which a body is perfectly liquid, as water is; hence it has been fixed upon as a type of all other bodies of the same kind, and has given a name to the divisions of science, Hydrostatics and Hydraulics.

PRINCIPLE OF EQUAL PRESSURE.

In treatises which are strictly mathematical, there is one property which is considered as the leading characteristic of liquidity, indeed as forming the basis of all reasoning upon the science. This remarkable quality of fluids is their power to transmit pressure equally in every direction. Each particle of the mass presses equally on all the particles that surround it, and is equally pressed upon by these. It equally presses upon the solid bodies which it touches, and in return is pressed upon by them to a similar extent. This singular property may be illustrated in the following manner:—Let A B C D, fig. 1, be a vessel

Fig. 1.



having an aperture E, in which a tube or cylinder E F is inserted, and another aperture *a*, in which the tube or cylinder *a* H is inserted, and let I and K be severally a piston which works in these cylinders. Let us now suppose this cylinder to be filled with water up to the mouths E *a*, and the level A B. The pistons are conceived to be pressed down to a level with the surface of the water. Now, if upon the piston I we place a pound weight (for the present the piston K is supposed to be immoveable), then to every part of the surface of the vessel, equal in magnitude to the base of the piston I, the same degree of pressure will be transmitted. Thus, supposing the base of the piston to be a square inch, and the number of square inches in the vessel to be 20,000, then there is urged upon the inner surface of the vessel a pressure tending to burst it, equal to 19,999 square inches. This is very easily proved in the following manner:—If the base of the piston K be equal to ten square inches, and if, after having loaded the other piston, which is only one square inch, with one pound, and placed upon the large one any weight less than *ten* pounds, it will rise in the cylinder quite in accordance with the principle above explained. For, since the large piston is *ten* times the size of the small one, it must necessarily take *ten* times the weight with which the latter presses upon the water to balance it and maintain an equilibrium. Accordingly, if ten pounds be placed upon it, it will be found to do so. It is to be observed in this case that the piston I does not resist the whole of the ten pounds which are laid upon the piston K; nine of them press upon the bottom of the vessel, and the remaining one alone is resisted by I. It is evident, that, in ordinary cases, the friction of both pistons will prevent the experiment from being performed with perfect nicety and exactness. But this inconvenience has been obviated by employing a liquid lighter than water, such as oil, as an equivalent for the piston and weight. Suppose that a pound of oil were poured into the cylinder at F upon the top of the piston, and that the piston was provided with a valve at *l*, which, when opened, allowed the oil to reach the water, upon the surface of which it would float, being lighter than that fluid. The same may be done with reference to the other cylinder, which could also be provided with a valve at *m*; and if *ten* pounds were here poured in, the oil in the two cylinders would be found to stand at the same level; thus clearly proving the truth of the theory.

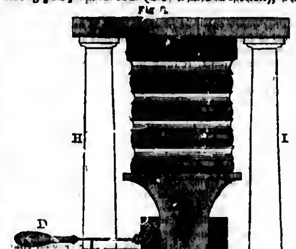
This very remarkable property of water and other such fluids has been termed the *hydrostatic paradox*. But in reality there is nothing paradoxical in it, any more than in many of the effects produced by the mechanic powers. The above case is explained on the principle of action of a lever. Ten pounds on the shorter arm is balanced by one pound on the longer arm. The liquid is the bar which transmits the effect of the lesser weight to the greater, and the surfaces of the vessel perform the office of the fulcrum, by sustaining both the power and the weight.

This principle is strikingly illustrated in the instrument which is called the *hydrostatic bellows*. It consists of two wooden boards, connected together with leather, as in a pair of common bellows. There is of course no valve, but in place of it a long narrow tube A B is inserted into it, through which water is poured, so as to fill the space between the boards. If these be a foot and a half long, and sixteen inches broad, and the upper one be loaded with three hundred-weight, a quarter of a pound of water poured into the tube, and rising to the height of three feet in it, will raise the weight as high as the leather allows. If, instead of using water, the pipe is blown into by the mouth, the same effect will be produced. The smaller that the bore of the pipe is, the easier will any weight be raised. This evidently results from the principles already explained; for if the section of the tube at E have the magnitude of one square inch, and the surface of the upper board C contain 10,000 square inches, then a column of water in the tube weighing one pound will sustain a weight upon the board of 10,000 pounds. But suppose the magnitude of the tube were only the hundredth part of a square inch, still, however, by being sufficiently lengthened to contain a pound of water, then upon every hundredth part of a square inch there will be the pressure of a pound; on every inch 100 pounds; and on the 10,000 square inches, 1,000,000 of pounds, or 446 tons, 8 cwt., and 64 lbs.

Fig. 2.

Striking as this property of fluids is, it remained until recently only a barren fact in science. It has, however, been applied by Mr Bramah in the construction of a singularly powerful machine, called the *hydraulic* or *hydrostatic press*. Compared with the bellows, there is merely substituted a forcing pump for the lofty tube, and a barrel and piston for the leather and boards. It consists of a short and very strong pump barrel A B (shown here in section), with

Fig. 3.



a solid piston C of proportionate strength, which piston is pushed upwards against the thing to be compressed, G, by water driven into the barrel beneath it at F, from the small pump E. The whole machine is bound together by a very strong metallic framing, of which H I are two pillars. If the small pump have only one-thousandth of the area of the large barrel, and if a man, by means of its lever-handle D, press its piston down with a force of five hundred pounds, the piston of the great barrel will rise with a force of one thousand times five hundred pounds, or more that two hundred tons. The power of such a press becomes, therefore, prodigious, and the advantages which it possesses over those worked by a screw are obvious. Between solids and fluids there is comparatively little friction; and, accordingly, in the hydrostatic press none of the force which has been generated is lost by friction, except what is necessary to overcome the friction of the pistons in the cylinders. It is much used for condensing and pressing substances, particularly by printers and bookbinders, who employ it now in general instead of what is called the dry-press (which was wrought by a screw), for squeezing the printed sheets of books in order to smooth the surface of the paper.

Dr Lardner observes, that the property of fluids, which we have been describing, might be easily applied to transmit force to any distance, and under circumstances in which other mechanical contrivances might be inapplicable. It would only be necessary to have a tube filled with water, which stretched from the point where the force originated to that to which it was to be transmitted. A pressure excited on the liquid at one end of the tube would thus be communicated to any surface in contact with the water at the other end, and this instantaneously, although the tube extended from Edinburgh to London, and were curved and angular instead of straight. On account of this rapidity of transmitting impressions which water possesses, its application in telegraphic communications has been suggested, and even practically illustrated, by an ingenious individual in England, who laid several miles of pipe for the purpose, and, we believe, succeeded in verifying the truth of the hypothesis.

Dr Arnott has suggested the application of the same principle to surgical cases. He considers that a liquid might be conveyed through a flexible tube, so shaped, that, when filled by the liquid, the proper degree of pressure will be exerted on those parts of the body which require it. It is occasionally necessary to produce a certain degree of pressure on some internal parts of the human frame which cannot well be reached except by a tube or channel, through which a surgical instrument could not be very safely or easily conveyed, but in which the effect might be conveniently produced by means of fluid pressure. An account of the instruments necessary in these cases will be found in Dr Arnott's able work on Physics.

The fluids of the animal frame exhibit many apt illustrations of the principles of hydrostatics, as the solids do those of mechanics. The heart being an instrument possessing great power of expansion and contraction, and the reservoir from which the blood is supplied to all other parts of the system, by its expansion, excites a pressure upon the sanguine fluid, and impels it into the arteries; from thence it is urged forward into the [illegible], and so is made to complete the circulation, passing through various pipes and conduits, which are composed of a material so elastic as to continue the pressure commenced at the heart.

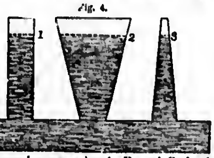
PRESSURE OF FLUIDS IN PROPORTION TO THE DEPTH.

In every fluid the particles that are below sustain the pressure of those that are above them, which pressure is in proportion to the perpendicular depth, and is not influenced by the size or shape of the containing vessel. The first part of this proposition has already been proved in the case of the *hydrostatic bellows* and *press*, but many remarkable illustrations of it may be adduced. One general truth we may mention, which the reader would do well to keep in recollection: it is, that the pressure of water at any depth, whether on the bottom or sides of the vessel, or on any body immersed in the fluid, is nearly one pound on the square inch for every two feet of depth. It is at sea that the effects of fluid pressure at great depths are most strikingly exhibited. A strong square glass bottle, empty and firmly stopped, if sunk to the depth of about ten fathoms, will be crushed together, the shape of the vessel being unfavourable to strength. But if a common empty cylindrical bottle be firmly corked in the same manner, and plunged to a considerable depth in the ocean, the cork is generally pressed inwards at a certain depth, and this does not depend upon the direction in which the mouth of the bottle may point. The cork thus carried far under water, beautifully illustrates the doctrine of equal pressure in all directions. It is not flattened as if it had been pressed from above only, but is reduced in every direction, so as to appear like a small phial-cork of the usual shape. It frequently happens that vessels entirely disappear in the ocean, leaving not a fragment of wreck to reveal their fate. This occurs when they founder in great depths of water; the vast pressure of the sea far down compresses the wood, and renders it specifically heavier than the surrounding fluid, so that it can never reascend through the immense column of water which fixes it for ever to the bottom of the deep.

As pressure, then, increases in proportion to the depth, many valuable suggestions are afforded as to the construction of sluices, dams, and bulwarks or walls for keeping out the ocean, as is the case in Holland in particular. It is evident that, as pressure is in proportion to depth, in a vessel whose bottom and each of whose sides are severally two square feet, the water which it contains presses upon the centre of any of the sides with half the force with which it presses upon the bottom. At the surface the pressure is inconsiderable, and hence the wall or other erection may be made of corresponding lightness; but as the depth increases, the pressure increases in the same ratio; and hence the building must become gradually thicker and stronger, so that, when completed, it will resemble the perpendicular half of a pyramid, whose base is of great breadth, but whose top is comparatively a point. It matters not what the breadth of the water may be. A flood-gate which shuts out only a small lake or sheet of water, that is, provided the depth be the same, sustains as much pressure as if the broad expanse of twenty Atlantics were resting against it.

The second part of the proposition at the beginning of this head was, that pressure is entirely uninfluenced by the shape, size, or position of the containing vessel.

Fig. 4.



Here we have three vessels, A, B, and C, having all different shapes, but provided with flat bottoms of exactly the same dimensions. If water be poured into them to the height represented by 1, 2, and 3, although the quantity in each vessel be very different, the pressure upon the bottom of all will be the same. This truth is proved experimentally by making the bottoms moveable, fixing them in their several positions by springs or weights calculated to measure the degree of pressure which each sustains. Or, it may be proved by allowing all of them to communicate with a vessel of water below them, and then observing that the fluid in all has still the same level. For, as a column of the water resting on the middle of each bottom just presses with its whole weight, and, therefore, according to its altitude, this column could not remain at rest if there were any greater or less pressure than its own near it. Then, as the fluid is actually at rest in all the cases, and in all a central column is of the same height, the pressure must be equal on all the bottoms.

The scientific fact of water rising in no case able to rise beyond the height of its fountain head, whatever may be the volume of water in the fountain, suggests a plan by which cities might in some instances be saved from inundations by rivers. When the inundation takes place, not from the surface of the river, but from the water projected through the common sewers running into it—as, for instance, in the case of Glasgow—and rising through the gratings in the streets, wooden funnels might be inserted in a tight manner into the openings, whereby the water, instead of spreading along the streets, would rise in the funnels to the level of the surface of the river, and then stop. Of course there is no necessity for the vessel so applied being funnel-shaped; it is sufficient that its base be suitable to the orifice of the sewer.

AMOUNT OF PRESSURE.

In the above cases, we have seen that the pressure on the bottom of a vessel depends upon the magnitude of the bottom and the depth of the liquid, and does not in the slightest degree depend upon the shape of the sides, or upon the quantity of liquid in the vessel. It may be generally inferred that the pressure upon a flat horizontal bottom is ascertained by multiplying the number of square inches in the bottom by the number of feet in the depth of the fluid; the product will express the number of solid feet of the liquid whose weight is equal to the pressure on the bottom. In a vessel similar to that represented in fig. 2, the pressure on the bottom is less than the whole weight of the liquid. In one like that shown in fig. 3, it is greater than the weight of the liquid; and in such a vessel as is represented by fig. 1, it is equal to the weight of the fluid.

In these examples the surfaces are supposed to be flat; but as surfaces are subject to every variety of shape, it is necessary to have rules which are applicable to all surfaces containing liquids. The point first to be ascertained is the medium pressure, for there is in every case a certain mean, which is the result of the various pressures. This is the centre of gravity, and to find it, the finding of the total pressure is reduced. When the mean is found, and the magnitude of the surface in contact with the liquid is ascertained, the whole amount of pressure is readily found. For instance, if the average pressure be 15 lbs. upon the square inch, and the magnitude of the surface be 200 square inches, then the whole amount of pressure will be 3000 lbs. The average pressure is produced at the average depth, which is of course an average of the depths of all the surfaces in contact with the liquid, and where the surfaces are irregular this is very difficult to discover. Indeed, to determine the centre of gravity in such cases is a mathematical problem of considerable difficulty, and can merely be alluded to in this place. With respect to a sphere or a cube, however, it is comparatively an easy matter. In a sphere, the total pressure is ascertained by multiplying the number of feet in half its diameter (for its centre is obviously the centre of gravity) by the number of square feet in its surface. It is proved by geometry that the solid contents of a globe are ascertained by multiplying the number of feet in half its diameter by a third part of the number of square feet in the surface. Hence the pressure on the surface of a globe is three times the weight of its contents. In a cubical vessel, which is one having four square sides, each of which is equal in size to the bottom, the centre of gravity is that point which is equally distant from the four sides, the top, and the bottom of the vessel. The pressure on each of the sides is equal to half the weight of the fluid in the vessel; the pressure of the four sides will therefore be equal to twice the weight of the contents of the vessel; and as we have already seen that the pressure upon the bottom is equal to the whole fluid, the total pressure upon the vessel will be equal to three times the weight of liquid which it contains. The pressure which a body sustains when immersed in a fluid is determined by the same rules. We have already noticed some of the phenomena which admit of explanation by the hydrostatical theorems which we have endeavoured to explain; namely, that liquids transmit pressure equally in all directions; and that the amount of pressure is in proportion to the depth of the liquid; but a few more remarkable instances might be adduced. If a fissure in a rock happen to communicate with an internal cavity of a considerable size, and if by means of rain this cavity becomes filled, and the fluid finds no means of escape, then it is possible that the rock or mountain may be rent asunder by the pressure of the small strip of water percolating through it.* In large and extensive walls of masonry, which are intended to confine banks of sand or earth, we generally see openings left at the bottom, for the purpose of allowing the water which collects during rain to pass through them. Where provision for this has not been made, the wall will be inevitably rent, and many extraordinary catastrophes have occurred in this way. The increase of pressure in proportion to the depth of the fluid, proves the necessity of making the sides of pipes or masonry, in which fluids are to be contained, stronger the deeper they go, and shows that it is a superfluous expense to make them equally thick and strong from the top downwards. The same remark applies to flood-gates, dams, and banks, as we have already observed. The lower hoops and other securities of brewers' vats, some of which contain many thousand barrels of liquid, are made of far greater strength than those higher up. The increased pressure nea the bottom of such vessels is seen in the force with which the fluid rushes out when a plug w[illegible] it is removed. For some feet it flows in nearly a horizontal line; a few yards farther up, the current is bent downwards considerably, immediately after it issues from the vat, and this curve continues to increase the higher up that we ascend.

FLUID LEVEL.

Besides the two properties of fluids explained in the foregoing observations, there is a third of no less importance than either of them, and which indeed may be said to result from them; that is, the tendency which fluids have to find and to maintain their level. The level or equilibrium of fluids is a natural result of their gravitation, or of all the particles of the mass being attracted towards the centre of the earth independently of each other, and being perfectly moveable amongst themselves. Hence it follows, that, when any part of the water in a vessel is raised by agitation higher than the rest, it is drawn downwards again by the force of attraction; for it has an equal tendency towards the earth's centre with the other portions of the fluid surrounding it. And this force is never failing, but continues to operate, lessening the height to which it is elevated at each successive ascent of the wave, until it is brought finally to a level with the rest of the liquid. Thus, then, a fluid left to itself will settle at the same level, no one part of its surface being more elevated than another. Hence, if water be poured into a vessel shaped like the letter U, although one limb be twice the diameter of the other, the liquid will attain the same level in both. In further illustration of this, we may increase the number of vessels to an indefinite extent, and vary their shapes as fantastically as fancy can devise; yet if they all have a common communication with each other, and if water be poured into one of them, it matters not which, still each will appropriate to itself a quantity of the fluid proportionate to its containing capacity; and when this is completed, the water will be found to stand at exactly the same level in all the

* May not the remarkable property of water, above described, be applied in explanation of at least some of those phenomena which are usually ascribed to the agency of a central fire? The power of water to produce convulsions of the most tremendous nature, is evident from the facts which we have stated; and that the liquid exists in a considerable depth in the interior of the earth, we have abundant evidence. Suppose that at certain depths downwards there are cavities (such as will be afterwards shown to be the reservoirs of springs) which are supplied with water by means of fissures communicating with the surface of the earth. When these cavities are filled, the columns of water will press upon their surfaces with an extraordinary degree of force; the water communicates this pressure to the minerals, metals, and other matter with which it is surrounded. These will yield, and, splitting into fissures, which, of course, widen as they proceed upwards, create those openings and chasms upon the surface of the globe, such as frequently occur, and where the agency of fire is not apparent. Indeed, occasionally there are seen in them bodies of water of considerable size. It is to be observed, however, that convulsions of the earth are generally sudden, and that those which are likely to arise from liquid pressure would not commonly be gradual; but it is easy to suppose circumstances in which they would also be instantaneous. The pressure of water may also, in some cases, be the cause of that heat, which, it is now generally admitted, increases as we descend into the bowels of the earth. It may even condense some species of matter so much as to ignite them, and thus originate combustion. It is not here, however, that we should speculate upon conjectural theories; perhaps the idea is not worthy of more space than has been devoted to it.

vessels, so that any body resting upon the surfaces of the water in the whole of them would lie perfectly horizontal. Although, from the law of gravitation, the surface of water in every vessel is a portion of a sphere, yet the sphere of the earth which it represents, as far as it goes, is so exceedingly large, that any deviation from the horizontal cannot be discernible in a space so small as that to which such experiments are confined; and thus a body resting upon surfaces confined within three feet or so of each other, will seem to press equally upon the whole surface of each, and appear to lie in a perfectly horizontal position, even when a spirit-level, which we shall immediately describe, is laid upon it. Any small portion of water, therefore, for all common purposes, may be looked upon as a perfect plane. So completely does water assume the level, and so glassy smooth does its surface become, that in some instances a polished mirror cannot reflect the rays of light which fall upon it more exactly in the order which they had on leaving the object than it does. Perhaps one of the loveliest sights in nature is to contemplate over the sides of a vessel the gorgeous array of clouds mingled together in beautiful confusion around the setting sun, as they appear mirrored in the bosom of the deep.

It is in the magnificent operations of nature that we meet with the grandest displays of this property of water to find its level. The ocean is to the earth what the heart is to the human body: it is the great reservoir whence is derived that fluid, which, circulating through it and over it, nourishes the vegetation upon its surface; thus perpetuating the present state of things. All the rivers and streams which we see flowing into the mighty basin of the deep, had their origin there. By the action of the sun's rays upon it, water is converted into vapour, which, ascending into the higher regions of the atmosphere, is formed into clouds. These, again, descend to the earth in the shape of rain, snow, hail, &c.; and part of it falls upon lakes, rivers, and other sheets of water which communicate with the sea, whilst a very great proportion descends directly into the ocean itself. But not a little of it sinks into the porous earth, where it forms springs and fountains, these again giving rise to rivers. To the subject of springs we shall return immediately.

RIVERS.

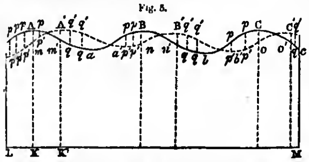
It is the tendency of water, then, to find its level, which gives rise to those far-stretching and perpetually-moving bodies of water called rivers. If in the interior of the land, water be confined on all sides, and prevented from flowing to the sea, it forms a sheet of water called a lake. If any of the earth or rocks which surround the fluid be removed, it immediately flows downward, and a very slight declivity is necessary to give the running motion of water. A descent of only three inches per mile in a straight and smooth channel, gives it a velocity of three miles per hour. The Himalaya mountains, in Asia, the highest in the world, give rise to the great river Ganges, which has a course of 1800 miles, and yet at its commencement is only 800 feet above the level of the sea; that is, about the height of Arthur Seat, near Edinburgh, or twice the height of St Paul's Church, at London; and to fall these 800 feet in its long course, the water requires more than a month. Some of the great rivers of South America travel above a thousand miles, and yet in all that extended course fall only four or five hundred feet. Rivers as they advance towards the ocean sometimes suddenly disappear in the bowels of the earth, where they run for a considerable way through subterranean beds, and then re-appear, and flow in a channel upon the surface of the deep. They take the passage underground because it is more precipitate than that which the surface of the earth afforded; but sometimes this becomes choked, and they are again compelled to seek a channel on the surface. The waters of the Oronoko, at one part of their course, lose themselves beneath huge granitic blocks, forming immense natural arches, under which the torrent pours with tremendous fury. In the year 1752, the bed of the Rio del Norte, in New Mexico, became suddenly dry to the extent of sixty leagues; the river had precipitated itself into a newly-formed chasm, and disappeared for a considerable time, till at last its subterranean course being stopped, the river returned to its former channel. About the beginning of the last century, the river Amazon exhibited a similar phenomenon.—For the effects produced by rivers in changing the face of a country, see the "Account of the Globe," No. 6 of this work.

Amongst other examples of the tendency of water to seek its level, cataracts and waterfalls exhibit some of the most striking. When a river in its progress to the sea meets with some abrupt declivity, it is precipitated over it with tremendous fury, forming what is called a cataract. These phenomena are amongst the most sublime and appalling of natural appearances. To witness the falls of the Niagara, in North America, say most of those who have enjoyed the spectacle, is an era in one's lifetime, an event never to be forgotten. This tremendous cataract falls 150 feet of perpendicular descent, and the sound of it is audible at thirteen miles' distance. The stream has a breadth of 400 yards immediately before the descent, and its depth is also considerable. The fall of such an enormous column of water may be conceived to produce a dreadful concussion. The celebrated cataract of Sequandama, formed by the Rio Bogota, in South America, was long considered the grandest in the world, one traveller having estimated the height of its fall at 1500 feet; but Humboldt, who has conveyed to us so much correct information with respect to the southern portion of the New World, says that its descent does not exceed 600 feet. The stream, before it approaches the precipice, has a breadth of 140 feet, which immediately contracts, and at the edge of the abyss is reduced to 35 feet.

WAVES.

The surface of the land displays every variety of hill and valley, here heaved up in immense mountain ridges, and there depressed into deep hollows, so that the mind, unenlightened by science, is almost justified in supposing that at one time it was a fluid mass, tossed like the sea into all fantastical forms by some primeval tempest, and that by the fiat of Almighty power it was consolidated in a moment, the hills and the vallies which it exhibited in the fluid state becoming permanently fixed. The reason why the earth does not assume the level surface which the sea exhibits, arises from the force of cohesion in solids resisting the power of gravity to separate their particles. The sea, like the land, exhibits at times great inequalities, but they are fluctuating continually, and this alternate depression and elevation of a liquid gives rise to a curious optical deception. The waves appear to have a progressive motion, and move as it were along the surface of the ocean from one end of it to the other. By a moment's reflection, however, we will soon be convinced that this idea is erroneous. Any body floating upon the surface of the water is not borne along by the wave, as would certainly be the case did the waters composing each wave move along with the undulation. For instance, the foam of the sea is an exceedingly light substance; and had the water, which composes a wave, a motion onwards equal to the speed of the undulation, the froth would undoubtedly be carried forward. But this is not the case. When water rises in the form of a billow, it is elevated upon its surface; and when the liquid is again depressed, it sinks into the hollow along with it. But a progressive motion appears to take place in something, whether it be the liquid or not, for we have the evidence of sight in proof of the fact. To what then does the motion belong? To the *form* of the wave, and not to the liquid which composes it. Dr Lardner, in his work on Hydrostatics, gives the following explanation of this phenomenon:—

Fig. 5.



"Let the undulating line in *fig.* 5 be supposed to represent the surface of the sea, and let A B C be the crests of three successive waves, and *a b c* the intermediate vallies: Let L M represent the bottom of the sea at A, the depth of the water is represented by the line A K; take any point near A, as *m*, and the depth here is represented by *m* K', the summit of the wave being A; the depth at A is greater than the depth at *m*, the pressure of the column A K being greater than that of *m* K, the point A has a tendency to fall, and the point *m* to rise, by reason of this excess of pressure; therefore *m* will rise to the point A, while A sinks to the level *m*. Thus the points A and *m* have interchanged levels, the point *m* being now raised to as great a height above the bottom L M, as the point A had before the change, and the point A having fallen to the height which *m* had. In like manner, it will be found that for every point in the first position of the wave, there is another point in the second position, with which it interchanges elevations. If these circumstances be closely considered, it will not be difficult to perceive that in the interval which we have supposed, the various points on the surface of the water, such as *m*, which were before on the sloping sides of the waves, have now become their summits A' B' C', &c. Not that the points A' B' C', &c. have advanced to A B C, &c., but that they have fallen from their former elevations, while the latter have risen. It appears, therefore, that the undulations of the surface are produced by its different points ascending and descending alternately in a perpendicular direction, without any kind of progressive motion.

To make this still more clear, let us suppose that perpendicular lines be drawn from every part of the surface A *a*, B *b*, C *c*, &c. to the corresponding points in the surface A'*a*', B'*b*', C'*c*', &c., and let the interval between the periods at which the surface of the liquid assumes these two forms be conceived to be one second; in that time the several points of the first surface which are marked by the letters *p*, fall in the direction of the dotted lines perpendicularly downwards to the points marked *p*', and the points marked *q* rise perpendicularly upwards, in the directions marked by the dotted lines, to the positions indicated by the letters *q*'. Between the two positions A and A', the points of the surface between A and *m*' have both risen and fallen during the second; they have first risen to an elevation equal to that of A, and have for an instant in their turn formed the crest of the wave, but, before the expiration of the second, have again fallen perpendicularly to their position in the dotted line. It will thus, it is hoped, be understood how the *form* of a wave may actually have a progressive motion, while the water which composes it is stationary.

If a cloth be loosely laid over a number of parallel rollers, at such a distance asunder as to allow the cloth to fall between them, the shape of waves will be exhibited; if a progressive motion be now given to the rollers, the cloth being kept stationary, the progressive motion of waves will be produced as the cloth will appear to advance. It is the same cause which makes a revolving corkscrew, held in a fixed position, seem to be advancing in that direction in which it would actually advance if the worm were passing through a cork. That point which is nearest to the eye, and which corresponds to the crest of the wave in the former example, continually occupies a different point of the worm, and continually advances towards its extremity. This property has lately been prettily applied in ornamental clocks. A piece of glass, twisted so that its surface acquires a ridge in the form of a screw, is inserted in the mouth of some figure designed to represent a fountain; one end of the glass is attached to the axle of a wheel which the clockwork keeps in a state of constant rotation, and the other end is concealed in a vessel designed to represent a reservoir or basin; the continual rotation of the twisted glass produces the appearance of a progressive motion, as already explained, and a stream of water continually appears to flow from the fountain into the basin."

CANALS AND SUPPLY OF WATER FOR TOWNS.

Every one knows that a canal is a long artificial hollow filled with water, and, passing over the surface of a country, serves to facilitate the intercourse of one part of it with another. Canals generally communicate with the sea at one end, whence they derive the water with which they are filled; sometimes they communicate with it at both ends; and occasionally the water is derived from lakes and other sheets of water. The methods of conducting a canal through a country depend upon the property of fluids to find a level. From the inequalities which the surface of a country presents, the course of a canal is necessarily divided into levels of various lengths, like the steps of a stair. At each level there is what is called a lock; that is merely a part of the low level sufficiently large to contain the vessel, and furnished with high walls and flood-gates at both ends. When the gates below are shut, and water is introduced from above, the boat of course rises to the high level. When the upper flood-gates are shut, and the water is gradually allowed to escape from the lock, it becomes a part again of the low level, and a boat may go in or come out by its lower gates. It is evident, whether a vessel ascend or descend, that a certain quantity of water must necessarily be lost, which of course is to be supplied. The objections urged against locks are the delay which they necessarily occasion, and the expense of their construction, their repairs, and their management. Thus, then, where it is practicable, it is advisable to take a circuitous route, rather than be subjected to these inconveniences. In countries such as our own, railroads, which are now becoming so common, appear to be in many respects preferable to canals. By a knowledge of the fact that water has a tendency to maintain its level, or to rise again through any channel, such as a pipe, to the level of its source, the moderns have been enabled to construct the admirable apparatus by which towns are supplied with water. In these a reservoir is constructed, in a situation more elevated than any to which we wish to conduct the water; the reservoir may be supplied by natural or artificial means; it may either be replenished from a higher part of the country, or forced up by pumps. From the reservoir many pipes lead off, from which, again, smaller ones ramify through all the intricate windings of a town, dwelling-house, or manufactory. As long as there is water in the reservoir, these will continue to be supplied, provided they do not rise above the level of the source from which they are fed. Whether the ancients were ignorant of the principle of water rising to its level or not, at all events they made no use of it, as their immense aqueducts for supplying cities with water, sufficiently prove.

LEVELLING.

In another place it was observed, that every surface of water was not, strictly speaking, a "level," but described a portion of a sphere, which, if extended, would complete a globe equal in dimensions to the earth. The reason of fluid bodies assuming the spherical form is, as was formerly mentioned, that the particles gravitate independently of each other. The point to which they are attracted is the earth's centre; and as at the surface they are all attracted with the same degree of force, no one part will stand higher than another, but the top layer of each column of particles will stand at exactly the same distance as the rest from the centre of the earth, and thus the sphericity of the earth is easily accounted for. In large bodies of water, such as the ocean, this is very perceptible. When a vessel departs from view, or comes into sight, the top of her mast in the first instance is the last, and in the second is the first visible, so that, as far as vision is concerned, she may be said to sail up or down hill, accordingly as she is coming to the spectator or leaving him. The swelling curve of the sea hides her hull, but as she rises over the bulging element, other parts besides her mast become gradually visible. But in a small portion of water this curvature is not discernible, so that, in a calm day, a lake appears to exhibit a plane surface, every part of it settling on the same level. The definition of the equilibrium of a fluid is, that every part of the surface is equally distant from the centre of the earth.

Upon the tendency of fluids to dispose themselves in a surface, such as we have described, depends the making of *levelling* instruments, or those by which we ascertain whether a surface is level, or a plane horizontal, or if two points are on the same level; that is, equally distant from the centre of the earth. The simplest form of these is what is called a spirit-level, which is represented by the following figure:—

Fig. 6.

It consists of a cylindrical glass tube *a c*, filled with alcohol or spirit of wine, except a small bubble of air *b*. The ends are closely sealed, to prevent the escape of the liquid. In whatever position the tube may be placed, the bubble of air will always tend to the highest part of it; when placed in a perfectly horizontal position, the bubble will stand in the middle, the tube having a slight convexity upwards. When used, it is generally fixed in a brass case, having an opening at the top, exactly in the centre of which the air will appear when the case lies in a perfectly horizontal position. If one of its ends be lower than the other, it will not be seen there, and the end must accordingly be raised, the space necessary for bringing the bubble to the middle being exactly that which the one extremity of the instrument, or rather the surface which supports it, wants of being on a level with that which supports the other. There are other more complicated instruments, but the above is sufficient to show the principles of levelling.

IMMERSION OF SOLIDS IN LIQUIDS.

When a solid is immersed in a liquid, it displaces exactly its own bulk of the fluid; and this method of ascertaining the solid contents of a body is resorted to when the figure of the body is so irregular as to be incapable of geometrical measurement. Let the reader suppose a glass vessel before him, say a common tumbler, having divisions marked upon its exterior surface, by parallel lines extending from top to bottom being drawn either all round or to a certain extent round it. These divisions indicate a certain quantity of water, say the twelfth part of a cubic inch. If the tumbler then be half filled with water, and the body which we wish to know the solid contents of immersed, this will be shown by the number of lines which it raises the water above the level which it had before the introduction of the solid substance. If it be raised say eighteen divisions, then the magnitude of the body is one and a half cubic inches. It is evidently necessary to correctness that the sides of the vessel should be truly perpendicular, and free from all inequalities. The fact that a solid, when plunged into a liquid, displaces exactly its own bulk of the liquid, was discovered by Archimedes, one of the greatest mathematicians of ancient times. Hiero, king of Syracuse, himself an eminent philosopher, had given a certain quantity of gold to an artist for the purpose of making a crown; and suspecting, from the lightness of the diadem, that the fabricator had adulterated his gold with silver, he required of his friend Archimedes to solve the difficulty. Whilst this great man was intent upon the question, he one day observed, whilst he was bathing, that on the immersion of his body the water ran over the sides of the bath, and finding by calculation that the quantity corresponded to the bulk of his body, the idea of specific gravity immediately flashed upon his mind, and he rushed out of the chamber, exclaiming, as he passed along, "I have found it! I have found it!"

Having seen the effects which the immersion of a solid in a liquid has upon its volume, let us now ascertain what effect is produced upon its apparent weight. If into each of the scales of a weigh-beam we place a tumbler such as that we have described, half filled with water, they will of course exactly equalise or balance each other. If in one of them we suspend by a horse hair a cubic inch of gold, the metal being completely immersed, but not touching the bottom of the vessel, the scale in which that tumbler is placed will outweigh the other. If, then, into the other tumbler water be poured, so as to restore the equilibrium of the scales, the fluid will be found to rise to exactly the same height as it stands in that in which the gold is immersed, as will be seen by the graduated scales of the vessels. For any other substance, no matter what its weight may be, provided its magnitude be the same as that of the gold, the same quantity of water is required to balance the scales. If the body be lighter, but pressed down by a piece of thin rigid wire, the same results will take place; and if only half of the body be immersed, just half the quantity of water is required in the opposite scale to restore them to a level with each other. The facts may be summed up in two propositions:—1. That the apparent weight of the liquid is increased, and the apparent weight of the solid diminished, by immersion. 2. That the apparent weight of the liquid is increased in a proportion of itself exactly corresponding to the magnitude of the body introduced, whilst the apparent weight of the body is diminished to an extent exactly equal to the difference between its specific gravity and that of the liquid.

FLUID SUPPORT.

We have almost daily illustration of the fact that a body specifically lighter than water floats upon it; unless, indeed, it be also lighter than air, when it rises above the surface of the earth altogether; and from what we have said above, the fact is likewise clear, that although bodies which are heavier than water sink down through that fluid, they are yet to a certain extent lifted up in it, by which we mean that they are rendered lighter there. Thus, a stone which it would be impossible to move out of the water, when immersed in it can be borne along with ease. This is experienced in a particular manner by those who are enabled to work under water by means of the diving-bell. Those who practise angling must often have observed the difference of weight of a fish whilst it was dragged along under the surface of the water, and after it had been raised above it. Indeed, the ease with which it is carried along in the liquid gives rise to a deception which an unpractised fisher often suffers from. If rapidly pulled out of the water, the sudden jerk which the line receives, when the fish passes from its native element into the atmosphere, often snaps it through, and the prey is lost.

In floods which carry away bridges, and bear immense blocks of stone to a great distance, much wonder is excited at the force exerted by water on such occasions. But our surprise is materially lessened when we consider that most stones in water do not weigh much more than half what they do when out of it, and can thus be more easily carried forward.

When a solid body floats in a liquid, it displaces as much of the liquid as is equivalent to its own weight. If for instance the body weigh one hundredweight, no matter whether it be a log of dense wood or a hollow vessel made of the lightest material, such as cork, still just one hundredweight of water would be displaced. [illegible] easily proved by trying the experiment [illegible] scale, in a vessel so graduated at the side [illegible]ate how much the water which it contains is [illegible]y the immersion of any body in it. Although every body which is specifically heavier than water sinks in it, yet the heaviest bodies can be made to float upon any liquid, however light. This is done by giving it such a shape as will enable it to displace a quantity of liquid which is as many times greater than its absolute bulk as its weight is greater than that of an equal bulk of the liquid. Thus, a metallic or earthenware bowl will float upon water if it be placed upon it with the convex end downwards. There are a great variety of shapes by means of which a very heavy body may be rendered buoyant, but they must all be formed upon this principle, that when the vessel is immersed in water, there will be, below the level of the liquid, some space in it occupied by air, or by some substance lighter than the liquid. Iron boats are now used for various purposes, particularly, we believe, in canal navigation; and a species of timber called Indian teak, which in the form of a log sinks in water, is now used in building vessels.

When the human body is in a state of ordinary health, with the chest full of air, it is lighter than water—a fact which, if it were more generally known and credited, would lead to the saving of many lives. When the body is as we have described, it floats with a bulk of about half the head above water; and thus a person who cannot swim may live and breathe, until chilled or otherwise paralysed, by simply exerting volition sufficient to keep the face uppermost. There are various kinds of apparatus for preventing drowning, called life-preservers. The most common are those which consist of pieces of cork or other very light material attached to the upper part of the body. But air-tight bags are preferable, as they may be said scarcely to encumber the body when empty, and, as danger approaches, they can be inflated with ease by being blown into. Life-boats have large quantities of cork in their structure, and also air-tight vessels made of thin metallic plates; so that, even when filled with water, a considerable portion of the boat still floats above the general surface. The bodies of some animals, as sea-fowl and many other species of birds, are considerably lighter than water. The feathers with which they are covered add very much to their buoyancy. Quadrupeds swim much easier than men, because the natural motion of their legs in walking or running is that which best fits them for swimming. Fishes are enabled to change their specific gravity by means of an air-bag with which they are provided. When the air-bag is distended, they rise to the surface; and when it is contracted, they descend to the bottom.

STABILITY OF FLOATING BODIES.

"A floating body," says Dr Arnott, "to be stable in its position, must either have its *centre of gravity* below the *centre of buoyancy*, that is, the centre of gravity of the fluid which it displaces, in which case it resembles a pendulum; or it must have a very broad bearing on the water, so that any inclination may cause the centre of gravity to ascend, in which case it resembles a cradle or rocking-horse."

That the centre of gravity of a floating body, in order to secure stability, should, to speak familiarly, be as far as possible below the surface of the water, is obvious. A body which is equally dense throughout its whole bulk, may be so shaped as to float upon water in every possible position in which it may be placed, without having any tendency to alter it of itself. Its centre of gravity must therefore be that part of it which is equidistant from every point of its surface, that is, the centre of its own mass. If, however, there be introduced into it, and placed a little on either side of this centre, a heavy substance, such as a lead bullet, that half of the body in which the weight is, will have a tendency to keep undermost, and this will increase the farther it is removed from the centre towards any of the sides; for in doing this, we are always depressing the centre of gravity. Hence any body, the parts of which have different weight, will only float steadily when the heavier parts are immersed, for among these or near them the centre of gravity is always to be found. In the stowing of a ship's cargo, care is generally taken to put the heaviest part of the merchandise undermost, and it is usual to have heavy ballast placed beneath all. It is on account of these circumstances not being attended to that vessels are frequently overset in squalls of wind. The whole case reduces itself to a simple one of mechanics. The masts of the ship with its sails are the long arm of the lever; the ship with its cargo is the short arm of the lever; the wind is the force applied to lift these, the fulcrum being the centre of buoyancy of the water. Now, it is evident that the farther the weight to be raised by the lever is removed from the fulcrum, the more difficultly will the task be accomplished. If, for instance, there be fifty tons equally distributed between the fulcrum and the extremity of the short arm of the lever, which is say twenty feet in length, it would be far more easily raised than if the fifty tons were all concentrated within ten feet of the lowest part of the vessel or the keel. When a ship is empty, she floats high in the water, thus raising the centre of gravity; and if the weight of the masts and rigging be considerable, they also assist in elevating it, so that the equilibrium is rendered unstable. In reference to the lever, we see the danger of having the masts too high, for the power of the lever is increased, without a proportionate degree of force for the impulsion of the vessel forward in the water being generated. The equilibrium of a boat may be rendered unstable by the passengers standing up in her; they thus raise the centre of gravity, so that, in certain circumstances, the slightest disturbance would overturn the boat. In other words, and to continue our simile of the lever, whilst the fulcrum remains the same, a portion of the weight to be lifted is brought nearer it, whilst other parts of it are removed farther up the long arm, thus materially increasing its power.

It is customary with those who are learning to swim to use bladders; but this is a very dangerous practice, unless these supports be very firmly attached to the upper part of the body. Should they shift downwards, and be yet so fixed as not to be easily got rid of, they will raise the lower part of the body, and the head will inevitably sink. Dr Arnott relates some anecdotes of an amusing description connected with this subject. A gentleman believing that he had made the great discovery of walking on water, invited the public to witness his first trip on the fickle element. He stepped with infinite confidence and self-complacency into the water, equipped in a pair of bulky cork boots, which he had previously tried in a large vessel of water at home. But, after having got fairly to sea, the law of nature took effect, and all that could be seen of the doughty experimenter was a pair of legs sticking out of the water. He was, however, happily rescued from his precarious situation.

It is well known that liquids are not all of the same specific gravity, and that some of them are considerably lighter than others. Thus, oil swims on water, and water on mercury. Oil sinks in alcohol and ether. The term *proof spirit* means spirit light enough for oil to sink in it, the strength of spirit being in proportion to its lightness. If wine be very slowly and carefully poured upon water, it will float on it. Sea water is more buoyant than fresh water; hence, bodies float easier on it. After these observations, it is scarcely necessary to observe, that, on any liquid lighter than water, a body will sink deeper in it; and on any one heavier than water, it will be buoyed higher up, and more of it will be seen above the surface of the liquid.

SPECIFIC GRAVITIES.

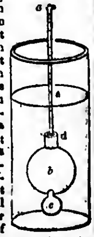
The meaning of the term specific gravity was explained in a note at the end of the number upon Chemistry. When bodies are to be compared to each other, in respect to one common quality, a standard of comparison is absolutely necessary. The standard which has been chosen is water; and it is to be preferred to every thing else, because it can be easily procured in a pure state, and is, therefore, uniform in all situations. The specific gravity of water is estimated at unity; and when we say that the specific gravity of a body is, for instance, 10, we mean to say that, bulk for bulk, this substance is ten times heavier than water. The specific gravity of a solid heavier than water is ascertained by the weight it loses by immersion in that fluid. The proportion which this weight bears to the actual weight of the solid will determine the specific gravity. For instance, if a piece of pure gold weighs 77 grains in the air, and only 73 when immersed in water, it therefore displaces four grains of water. The proportion, then, of the weights of equal magnitudes of the metal in the water is 77 to 4, or 19¼ to 1; hence, 19¼, or 19.250, is the specific gravity of gold. The instrument by which bodies are thus weighed is called the hydrostatic balance, which is simply a delicate weighing beam, with a water vessel below one of the scales. The specific gravities of bodies insoluble in water, and heavier than it, such as the metals, &c., are easily ascertained. They are merely suspended by a thread of hair, which has nearly the specific gravity of water, to one scale of the hydrostatic balance, and allowed to descend until completely immersed in the water of the vessel below. Solids lighter than water are weighed in it by fixing them to a rigid wire attached to the bottom of the scale, which keeps them below the surface of the water, the weight necessary to do this showing how much lighter they are than water.

There is another method of ascertaining the specific gravity of solids lighter than water; it is by loading them with a known weight of some substance heavier than water, which may cause them to sink, and then making an allowance for the load's difference of weight in air and water. A solid soluble in water, such as a crystal of any salt, may be protected by being previously covered by a thin coating of melted wax, or it may be weighed in some liquid which does not dissolve it, allowance being made for the difference between the weight of such a liquid and water.

The specific gravities of different fluids are ascertained by the same principle. If a substance be weighed in two fluids, the weight which it loses in each is as the specific gravity of that fluid. Thus, a cubic inch of lead loses 253 grains when weighed in water, and only 209 grains when weighed in rectified spirit; therefore, a cubic inch of rectified spirit weighs 209 grains, an equal bulk of water weighing 253; and so the specific gravity of water is about a fourth greater than that of the spirit.

The instrument called a *hydrometer* is constructed upon this principle. Its name is derived from two Greek words, signifying measure of water; but it is of course used for ascertaining the density of all kinds of liquids. There are various kinds of hydrometers. One of them consists of a glass or copper ball with a stem, on which is marked a scale of equal parts or degrees. When immersed in any fluid, the stem sinks to a certain depth, which is indicated by the graduated scale. The length to which it sinks in the standard of comparison being known, we can thus easily ascertain how much it is specifically heavier or lighter than it. Much in the same manner is constructed another hydrometer of great delicacy and exactness. It consists of a ball of glass about three inches diameter, with another joined to it and opening into it of one inch diameter, *b c*, fig. 7. and a brass neck *d*, into which is screwed a wire *a e*, divided into inches and tenths of an inch, about ten inches long and one-fortieth of an inch in diameter. The whole weight of the instrument is 4000 grains when loaded with small weights, such as shot, in the lower ball *c*. When plunged into water in the jar, this instrument is found to sink an inch if a single grain be laid upon the top *a*; hence a tenth of a grain sinks it a tenth of an inch. So great is the delicacy of this hydrometer, that the difference in specific gravity of one part in 40,000 can be detected. Its total weight of 4000 grains is convenient for comparing water; but the quantity of shot in the lower ball can be varied, so as to adapt the instrument to measure the specific gravities of fluids lighter or heavier than the standard of comparison.

Fig. 7.



There is another very simple hydrometer, which consists of a number of glass beads of different weights, but whose proportions are known, and the beads marked accordingly. These are dropped into the fluid under examination, until one is found which neither sinks to the bottom nor swims upon the surface, but remains at rest wherever it is placed in the liquid; and this bead being numbered, indicates the specific gravity.

The *areometer* is more simple than the hydrometer represented by fig. 7, although it much resembles it. A glass phial, about two inches diameter, and seven or eight long, with a plane or round bottom, is corked tight, and into the cork is fixed a straight wire about one-twelfth of an inch in diameter, and thirty inches long. The phial is loaded with shot so as to make it sink in the heaviest liquid, the wire being left immediately below the surface. The liquor to be examined is placed in a glass cylinder three or four feet long, and some three or four inches in diameter. It is furnished with a scale of equal parts on the side, to indicate the depth to which the top of the wire sinks. This instrument is so delicate, that if the sun's rays fall upon a fluid whilst under examination, the slight increase of temperature which it receives will cause the wire to sink several inches—heat, it is well known, by its expanding power, rendering bodies specifically lighter. A pinch of salt or sugar thrown into the liquid, by making it slightly denser, causes the instrument, on the other hand, to rise some inches.

The principal use of the hydrometer is to ascertain the specific gravity of distilled spirits, such as whisky, rum, brandy, &c.; but it is applicable to all fluids, and in Switzerland is used for ascertaining the purity of milk brought every evening to a common dairy where cheese is made.

Where extreme accuracy is required in scientific investigations, the specific gravity of a liquid is ascertained in the following manner:—A glass vessel of a determinate size and ascertained weight is filled with the fluid under investigation, and carefully stopped. It is first weighed in air, and then in water, and the loss of weight observed. From this loss let the loss of weight sustained by the glass alone be subtracted, and the remainder will be the weight of a quantity of water equal in bulk to the liquid contained in the bottle. The specific gravity of the liquid may thus be inferred in the same manner as if it were a solid.

The specific gravity of *aëriform* substances is ascertained in much the same manner. A glass flask of known size, and furnished with a stopcock, is first weighed when emptied by the air-pump, and afterwards, when filled successively with water, and with the different airs or gases. Comparison of the weights gives the specific gravities as already described.

As the specific gravity of every body depends upon the density or the closeness with which the particles composing it approximate to each other, care must be taken, when experiments are made, that the density of the body has not by any means been altered. Heat is the great agent in the expansion of bodies, which, by increasing their bulk, decreases their specific gravity. The temperature should therefore be carefully discriminated, else the results will not be correct. A cubic foot of distilled water at 40° Fahrenheit, weighs 1000 ounces avordupois. It is then at its least dimensions; for if it either sinks below or rises above that temperature, it expands in bulk. At 40° Fahrenheit, its state is independent of time, place, or other circumstances; it is the same at all parts of the earth, and under whatever circumstances it may be submitted to experiment. It is not, however, always convenient to obtain water at this temperature when experiments on specific gravity are made, so that it is necessary to have numerical tables expressing the change of weight which a given bulk of water sustains with every change of temperature; and thus, when the specific gravity of any substance has been found, with reference to water, at any proposed temperature, it may be reduced by a simple process of arithmetic to that which would have resulted, had it been compared, in the first instance, with water at the temperature corresponding to the state of greatest condensation.

Besides the temperature, there are other causes of fallacy in the results obtained by means of the hydrometer and hydrostatic balance. The internal structure of bodies is frequently altered by their union with each other, so that the measure of the compound is sometimes less, sometimes greater, than twice the measure of the bodies not so combined. Thus, the specific gravity of the compound formed, is not a medium or average specific gravity of the specific gravities of the two bodies in a simple state. In a mass of gold, a piece of silver may be inserted to fill up a cavity, and this weighed in water could be easily detected; but if the two metals were melted together, and chemically united, it is quite possible that they might form a compound having a specific gravity greater or less than the medium of the specific gravities of the gold and silver separate. This is the case with regard to copper. A cubic inch of gold mixed with a cubic inch of copper produces a mass of metal measuring less than two cubic inches. Thus, then, the component parts of these bodies have penetrated the dimensions of each other's mass, or the attractive affinities awakened by the process of melting have caused the particles to come closer together and occupy less space. The same occurs with regard to fluids. A pint of pure water and a pint of sulphuric acid, when mixed together, measure less than a quart. Before, therefore, placing implicit reliance upon the results obtained by the instruments above described, trials should be made with the simple substances and their compounds in known proportions. The effects of the mixture being thus ascertained in these cases, the weight becomes an accurate test of the degree of adulteration; because we know what allowance to make for the effects of chemical combination.

SPRINGS, FOUNTAINS, &c.

We have already observed that springs are to be accounted for on the principle of water seeking its level. In percolating through the earth, after having fallen in the shape of rain, dew, &c., water sometimes meets with strata of earth or stone, which will not permit of its passing downwards. Its progress therefore is stopped, and a reservoir of the liquid is formed, giving rise to various kinds of springs, which will be better understood by a figure. But first let us describe the syphon, an instrument which acts a conspicuous part in the natural phenomena of certain kinds of springs. A syphon is simply a tube bent in the manner represented in fig. 8. If it be filled with water and inverted, so as to turn the two orifices downwards, the liquid will not run out, but remain suspended in the tube, because the pressure of the column of water within is not so great as the pressure of the air without, and thus its escape outwards is prevented. If one end of it be put into a vessel of water, it will empty it down to a level with the orifice. It is evident that, when one end of the syphon is inserted in water, the pressure of the atmosphere upon the surface of the water impels the liquid through the tube, and it could be forced upwards to an elevation of above thirty feet, the height to which water rises in a vacuum, as will be afterwards described. The diagram represents an instrument of this kind furnished with two cups, firmly attached to the ends, which, by retaining a portion of the liquid, keeps the syphon always full and ready for use.

Fig. 8.

Fig. 9.

Let A B C, fig. 9, represent a mountain, and D E F a hollow in its centre containing water *G*, which flows to it through several small ducts, H H H H. Let I I' be a natural syphon, one end of which is connected with the water at *a*, and the other ramifies into diverse branches, issuing from the mountain at *b b b b*. Let K be also another stream issuing from the hill at L, but which, for the present, we shall suppose is closed at E. Now, if the hollow cavern be filled to the height M by the rivulets H H H H, it is evident that, on the principle of the syphon above described, the hollow will be emptied to the level N; and the water thus withdrawn will emerge from the mountain in the form of springs *b b b b*, because they are all at a lower level than that to which the water rises in the syphon at I'. When the whole has run off, they will then cease to flow until the hollow is refilled to the level M, when it will flow again, and thus the process goes on. This is what is termed an *intermitting spring*. Some springs, called *variable* or *reciprocating*, do not cease to flow, but only discharge a much smaller quantity of water for a certain time, and then give out a greater quantity. This arises from there being two hollows, one above the other, in the bosom of the mountain, the highest one having a runner which joins the stream of the lower one beyond the bend, or inflection, I'. This runner keeps the stream always supplied to a certain degree, although the lower cavity be dry. But when it is filled to M, the current is of course greatly augmented, which augmentation continues until the under hollow is again drained.

In some places there are springs which run freely in summer, or in dry weather, and almost stop in winter, or in wet weather. This is explained in the following manner:—Suppose the passage K L to be now open at E, and the water in the hollow to be very low, as it is in summer, or in dry weather—so low indeed that none can escape through the syphon I I'—then the spring at L will flow constantly. If during wet weather, however, the cavern be filled to the level M, the syphon will act, and drain off the water; and if we suppose the mouth of the syphon to be lower than the outlet at E, and to drain off as much as the runners H H H H supply, it will allow none to issue from the orifice at L at all.

The orifice at L, supposing there was no other outlet from the mountain, may be taken as an instance of those springs, most common, which flow continually. The reservoir from which these are supplied is generally to be traced to some hill or range of hills in the neighbourhood, which, from the quantity of rain, &c. collected by them, keep the internal cavity continually full or nearly so. Springs cannot rise higher than the reservoir from which they are supplied, and fountains, which are springs that burst out at a level considerably lower than the water in the reservoir, do not rise so high, because when they issue from the orifice, they have the resistance of the air to overcome, which retards their ascent. The current also branches out laterally, and thus the force which impels it upwards is partly expended in giving it an oblique direction.

In some parts, intermitting springs have afforded an opportunity for designing individuals imposing upon the credulous. Taking advantage of the flowing and stopping of those water-runs, these charlatans have gained credit to themselves by predicting the period when the events would happen, which, from a few years' observation, would soon be learned. In superstitious times the whole was ascribed to witchcraft; and even yet, in some places the ignorant still retain, with some slight modifications, the ancient belief of their fathers.

CAPILLARY ATTRACTION.

If we take an open tube of a very small bore, and place one of the ends upon the surface of a liquid, the latter will be found to stand somewhat higher in the inside than on the outside of the tube. If a smaller tube be taken, it will rise higher, the amount of elevation being always in an inverse ratio of the diameter. Tubes so small in the bore are called *capillary*, from a Latin word which signifies hair, because they are small like hairs. If the diameter of the tube is the fiftieth part of an inch, the water will rise to the height of one inch; if the one-hundredth part of an inch, it will rise two inches; if the two-hundredth part of an inch, it will rise four inches, and so on; always increasing in height with the smallness of the bore of the tube. The facts above stated are well ascertained; but upon what principle they are to be explained, it is difficult to determine. By some it has been asserted that the water is raised and supported by the attraction of the ring of glass immediately above the water's surface; but as an objection to that hypothesis it may be urged, that the ring immediately below the surface ought to draw it down as much as the ring immediately above it draws it up. Those who have not tubes small enough for the experiment may use instead of them square plates of glass. If one of the ends of each of the plates be placed close together upon the surface of water, and the other ends be made to approach each other gradually, but not to touch, the water will be seen to rise between the plates, forming itself into a curve line. All fluids which rise do not rise to the same height, and this is independent of their specific gravity. If the plates or tubes be made of grease or wax, the water will not rise in them; if glass plates or tubes be oiled or waxed over, watery fluids do not rise at all in them; neither does mercury nor melted lead.

In regard to an explanation of the phenomenon, nothing satisfactory has yet been advanced. That wax and grease should destroy the power which plates of glass and some other substances have of attracting and raising water, seems very extraordinary. It is commonly said that the liquid will not *stick* to these, and hence they will not rise. This seems to be a very clumsy explanation; and the cause appears to us to lie a little farther from the surface. May capillary attraction not be one of the various ways in which electricity developes itself? That chemical attraction results from bodies being in opposite states of electricity, has now been rendered highly probable; indeed, a majority of European philosophers are of this opinion, and it seems quite philosophical to bring it forward as explanatory of these kinds of attraction. But it is impossible to pursue the subject farther in this place.

HYDRAULICS.

The division of science which we have endeavoured to present a view of in the foregoing pages, is so closely or rather so inseparably connected with that upon which we are now about to enter, that part of what properly belongs to Hydraulics it was found necessary, for the sake of clearness, to give under Hydrostatics; whilst parts of the subject which ought, in a strict division of the science of watery fluids, to have appeared under Hydrostatics, will now be found under Hydraulics. But it should ever be kept in mind by the general reader, as well as by the student, that these sciences ought always to be studied together, and with reference to each other, else only a very superficial knowledge of either of them will be obtained. Hydraulics, then, being the science of fluids in motion, has for its object the investigation of the motions of such fluids as water, the methods by which these are effected, the laws which regulate their production, and the results of their impact either with themselves or with solids. The particles of liquids having little cohesion, a mass of fluid, such as water, cannot assume any particular form without some external support, but always takes that of the vessel which contines it. From this cause arises the difference which exists between their pressure and motion, and that of solids. A solid "moveth all together if it move at all," and can only produce a pressure downwards, upwards, or laterally, according to the direction in which it may be impelled, and in only one of these directions at once. If it be at rest, its pressure is downwards; but a fluid at rest presses in every direction at the same instant, and a part of a fluid mass may then be in motion, whilst other parts of it are perfectly quiescent. This constitutes the principal difference between the motions of solids and fluids. The subject seems to be naturally divided into three distinct heads:—1. The natural motions of fluids in ducts and channels, independent of mechanical contrivances. 2. The artificial motions of fluids, as produced by pumps and other hydraulic machines. And, 3. The power generated by fluids flowing under either of these circumstances.

The following facts, already stated under Hydrostatics, it will be necessary to recall to recollection:—That the particles of fluids flow over or amongst themselves with less friction and impediment to motion than when they have to pass over solid substances. That all fluids, when in a state of perfect rest, have level surfaces; that is, not a level plane, but a surface every point of which is equidistant from the centre of the earth, to which every particle tends by the power of gravitation. That fluids have a natural tendency to assume this level; and that the weight or pressure of fluids is simply as their quantities or heights. Thus, if a perpendicular pipe, three inches in diameter and three feet in length, contains nine pounds of water, it will exert a pressure of nine pounds upon any valve or stopper of any description, which is three inches in diameter, and placed in the bottom of the pipe; and that, if the pipe be made twice as high, twice the pressure will be exerted; if three times the length, three times the pressure, and so on. This is a circumstance of great consequence in the construction of pumps and engines for raising water.

FLOW OF WATER FROM A VESSEL.

When a vessel containing water is pierced at the side or bottom, the water flows out with a certain degree of velocity, in accordance with the law by which it seeks its level. In flowing out, those particles which were in immediate contact with the hole will be first discharged, creating for an instant a vacuum or void space above the hole; but the particles of fluids moving easily amongst themselves, it is immediately filled. The pressure is not that of a perpendicular column of particles, for the fluid pressing in all directions alike, there is from all parts of the vessel a general rush as it were to the outlet, thus putting the whole mass in motion. But the rapidity with which water thus set free flows, depends upon the depth. Thus, if a vessel ten feet high be penetrated at the side on a level with the bottom, and the water stand at two feet and a half within, it will issue outwards with a certain degree of velocity. If the height of the water be quadrupled, that is, if the vessel be filled, the velocity will be doubled. In order to obtain a threefold velocity, a ninefold depth is necessary, for a fourfold velocity sixteen times the depth is required, and so on. In fact, in whatever proportion the velocity of efflux is increased, the quantity of liquid discharged in a given time must be also increased; hence the pressure or the depth must be increased in proportion to the quantity discharged, as well as in proportion to the velocity. There is here a striking coincidence between the descent of water and the relation which exists between the height from which a body falls and the velocity acquired at the end of the fall, as described in Natural Philosophy.—*See that article.*

The motion of a solid down an inclined plane can be easily calculated, but that of a fluid moving in the same manner—that is, in the ordinary bed of a river, from a higher to a lower level—is very difficult to ascertain. Indeed, the results of theoretical computation are so very uncertain, that little or no dependence can be placed upon them. It is easy to find out the amount of friction between a solid and the surface upon which it moves; not so that of a fluid. When a solid is set in motion, all the parts move with the same degree of velocity, but in a mass of moving water, such as a river, some parts of it move with greater velocity than others; some are almost stationary, and occasionally there is a current at the sides moving in a contrary direction altogether. In all rivers there is a main current in the centre, which flows with greater rapidity than the water at the sides; and this is also the case with water in pipes. The fluid which is in contact with the pipe moves with more resistance than that at the centre, by which the calculated discharge of any given pipe of considerable length becomes much less than is due to its magnitude; hence the propriety of always making the conveying pipe of larger dimensions than would otherwise be necessary were there no obstruction from friction. Other circumstances also retard the motion of running water, such as sharp or right-angled turns, which form eddies or currents. It is therefore always proper in conducting water by means of pipes to any place, when it is necessary to bend the pipe, to make the curve as large and gradual as possible. And care should be taken not only to have the pipe of dimensions sufficiently capacious to afford the necessary supply, but also to have it of an equal bore throughout, and free from all projections and irregularities. These subjects have been particularly investigated and examined by Newton, Bernoulli d'Alembert, De Buat Robeson, Venturi, Dr Young, and many others; and the following important practical results obtained from their labours are highly worthy of attention:—First, the friction of water in rivers or channels increases as the square of the velocity. Second, although the sides of a pipe must in every case produce a certain degree of friction, yet that defect is frequently overbalanced by a duly-proportioned size of pipe properly fixed, giving a moving direction to the fluid which it would not otherwise obtain, and by which a greater quantity of discharge is produced than could otherwise take place. Thus, for example, a vessel or reservoir, having a thin bottom of tin, with a smooth circular hole formed therein, might be supposed most capable of parting rapidly with its water, because the fluid in running out has no continued length of substance to rub against, and consequently it might be imagined that very little friction could be generated; but M. Venturi found, by his experiments, that such a vessel did not discharge its water so rapidly as another containing the same height of water and area of hole to which a short pipe of the same diameter as the hole was applied; and by varying the length of pipe, he ascertained, that, when its length was equal to twice its diameter, it produced the most rapid discharge; for, being so circumstanced, it discharged eighty-two quarts of water in one hundred seconds, whilst the hole without the pipe discharged in the same time only sixty-two quarts. He also found, that if the pipe, instead of being flush or level with the bottom of the reservoir, entered into it to some distance, it had the effect of making the flow of water even less than that which issued through the simple hole without any pipe. The singular fact of a pipe and hole of the same dimensions discharging different quantities of water under different circumstances, whilst the head of pressure remains the same, must be accounted for by their being cross or opposing currents created by the rush which all fluids make to the orifice. Currents will thus form from the top and sides of the containing vessel, and by their inertia they will cross each other, and thus impede the descent of the perpendicular column, causing the water which issues to run in a screw-like form; this, however, is in a great measure obviated by the application of a short tube below the hole, such as we have described. That the projection of the tube too far into the interior of the vessel should make the flow less than if there were no pipe at all, may be thus explained:—The columns which descend from near the outside of the vessel, by turning up again to reach the discharging orifice, come into more direct opposition to the motion of the central descending columns, whilst they are at the same time themselves compelled to turn suddenly in opposition to their own inertia before they can enter the pipe. Thus, the discharge is more effectually impeded than if it were proceeding from a mere hole in the bottom of the vessel.

It was discovered by Sir Isaac Newton that the figure formed by fluids flowing to a common centre or orifice, such as we have described, was what is technically called a hyperboloid of the fourth order; and Venturi, after ascertaining the facts already mentioned, applied a pipe of the natural form of running water to the bottom of a reservoir, and found, that, although the external orifice was the same as before, the discharge was increased to 98 quarts in the same period of time. He also conjectured that the curve which water assumes in running was continued beyond the point of discharge, and, accordingly, enlarged or opened up the lower end, from which he obtained the maximum quantity of water that could be delivered from a vessel in a given time by a given orifice. To obtain these results, the discharging-pipe must be bell or trumpet-mouthed, or funnel-shaped, both internally and externally. Thus, by the simplest means possible, the flow of water from a reservoir may be increased or impeded in practice. Running fluids communicate a lateral motion to the bodies through which they flow. Thus, when a river runs through a sheet of water in a quiescent state, it loses a part of its own motion, which is communicated to the waters of the lake, and the current is thus retarded in its progress. Nor is this motion imparted confined to a fluid of the same kind as that from which the impulse is received. A column of water in its descent through the atmosphere in the form of a cataract, produces in some instances a current of air which can scarcely be withstood. This lateral communication of motion, combined with the irregularities in the shape of beds and banks of rivers, produces those eddies and petty whirlpools which are so frequently observed. It is also obvious that these irregularities in the bottoms and sides of rivers necessarily retard their currents; and although water in descending follows the same laws as solid bodies, and has its motion accelerated on account of this friction, it is impossible to calculate with any degree of certainty the exact velocity of rivers.

FLUID RESISTANCE.

With regard to the resistance which a fluid offers to a solid body which is impelled through it, one proposition will be obvious to every one, that the resistance will be greater the denser the fluid, and the larger the surface is which moves in it. It is also very clear that the figure of the body has a very material influence upon the amount of resistance offered to it. Thus, a wedge impelled by the sharp end will move far more easily through water than if the broad extremity were pushed forward in the liquid. Bossut instituted several experiments for the purpose of determining the absolute resistance sustained by a solid moving in a fluid. He found, that if a flat board were moved perpendicularly against a liquid, it would suffer a resistance equal to the weight of a column of the fluid, the base of which is equal to the board, and its height equal to the height from which a body should fall, in order to acquire the velocity with which the board is moved against the liquid. Of course it follows, that the resistance of a fluid will depend upon its specific gravity. When a jet of liquid strikes a solid at rest, it is found that the absolute resistance is different, but that its variation depends upon the same laws. In this case, the force sustained by the solid is equal to the weight of a column of the liquid whose height is double the height from which a body should fall to acquire the velocity. Hence it follows, that a column of liquid striking a solid with a certain degree of velocity, produces an effect amounting to double that which would be produced by moving the solid with the same velocity in a similar liquid at rest.

That a body which moves through the water with a given speed, and meets a given resistance, should, when moved twice as fast, just meet with double the former resistance, seems at a first glance to be a very obvious conclusion. But this is not the case; the resistance is four times greater with a double rate. The fact is thus easily explained: A vessel moving at the rate of one mile per hour displaces a certain quantity of water, and with a certain velocity; if it moves twice as fast, it of course displaces twice as many particles in the same time, and requires to be moved by twice the force on that account; but it also displaces every particle with a double velocity, and requires another doubling of the power on this account; the power thus twice doubled, becomes a power of four. When the body is moved with a speed of three or four, a force of nine or sixteen is wanted, and so on. Thus, in the language of mathematics, the resistance increases as the square of the speed.

This important law suggests many practical hints of very considerable importance. For instance, in steam navigation, if an engine of fifty horse power impel a vessel at the rate of seven miles an hour, it would require two of the same power to drive her ten miles an hour, and three such to drive her twelve miles an hour. Hence the enormous expense of fuel attending the gaining of a high degree of velocity; and in steam-vessels which sail to distant parts, it is better that the speed be medium than great; because as in these the fuel necessary for the voyage is a principal consideration, nothing would be saved by the celerity with which the vessel gained her destination; the immense space necessary for the additional coal required would far more than counterbalance any thing gained in time by increased velocity.

The law above explained holds equally in the case of a fluid moving against a solid. If a current be moving against a ship at the rate of four miles an hour, the strain upon her cable is not one-fourth part so great as it would be were the current flowing at the rate of eight miles per hour; and the same may be said of the force of the winds.

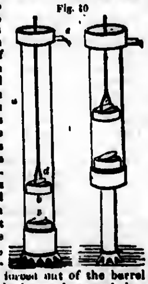
We have said that the resistance between a fluid and a solid is influenced by the shape of the solid. A flat or plane surface moved in water throws the particles of a fluid almost directly outwards from its centre to its circumference, whilst a concave or wedge-like surface, although it displaces them just as far, does so more slowly and with a less expenditure of force, and this in proportion as the tapering point is in advance of the broadest extremity. Obliquity of surface in a solid which is to move through water is therefore an important consideration in the construction of vessels of all kinds. We see in nature many instances of a wise provision of this kind in the shape of animals. Birds, and especially those of rapid flight, have a neck and breast tapering from before, and increasing by slow degrees towards the thicker part of the body, thus considerably diminishing the resistance of the air. Fishes have also been fashioned with a due regard to this principle.

PUMPS AND MACHINES FOR RAISING WATER.

There are various kinds of machines for elevating water above the level at which it stands in a reservoir. Those first used were wrought by mechanical force, without reference to atmospheric pressure. The most celebrated of these simple machines are the screw of Archimedes and the Persian wheel. The former consists of a long hollow tube, twisted into a spiral form, with an axle at the upper end, to which is attached a handle for the purpose of winding round the screw. The machine is laid in the water intended to be raised, at an angle of about forty-five degrees, the lower end dipping into it at every turn made by the handle. By this means a quantity of water passes into the hollow tube, which, being forced upwards into a higher convolution of the pipe at every revolution, is at last ejected at the upper end, where it can be caught in a vessel, or carried off by means of a spout. The Persian wheel consists of a rim or circle of wood of considerable diameter. It is provided with a number of iron bolts projecting outwards, firmly fixed, to which are attached a number of buckets. When the wheel is driven round, these buckets dip into the water or mud which is intended to be raised; and since they turn in the bolts (as long as they are not in contact with any thing) so as to keep the open end always upwards, they are elevated with the wheel, until coming in contact with a cistern at the top, they are tilted up, and discharge their contents into it. Going down empty on the other side, they are again filled and raised as before. The *bucket-engine* and *chain-pump* are but modifications of the above described machines, and are very useful in particular situations.

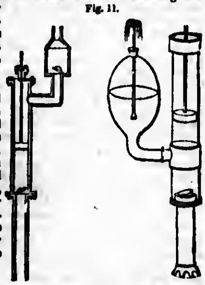
The next class of machines are those in which the water is raised by the pressure of the atmosphere, and to which the name of *pump* is applied. They act upon the principle of removing the pressure of the atmosphere from the surface of the water; when this is effected, water will rise independently of any other artificial contrivance, to the height of about thirty-two feet. The principle upon which this is effected will be fully explained in one sheet upon the properties of Air, or Pneumatics. In the accompanying diagram are shown two forms of the common sucking-pump. It consists of a cylinder *a*, furnished with a piston *b*, made to fit air-tight. When the piston is raised, a vacuum is formed in that portion of the cylinder through which it has moved upwards, and the pressure of the air upon the surface of the water on the outside of the tube forces the fluid into it. The valve *c*, which opens upwards, is lifted, and the water rushes in above it. When the upward stroke of the piston is complete, it is again depressed—the water passes through the valve *d*; and on the next stroke, it is discharged at the spout *e*. It is evident, that, when the piston is sunk downwards, the water cannot be forced out of the barrel again, because the valve at the bottom is pressed close down, and prevents its escape.

Fig. 10



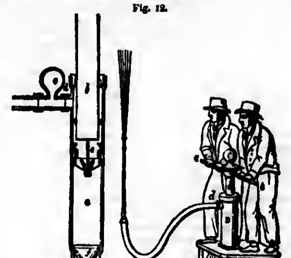
The force-pump is of more universal application than the above. It consists of a cylinder and piston, as in the former case, but the latter is constructed without a valve. In the right-hand figure of the following engraving, the piston sucks the water by its upward motion; but, on depressing it, the water passes by the side-pipe, and enters the air-vessel. The pipe placed in the centre serves to discharge the water, and the air by its elasticity ensures a continuous flow. In the left-hand figure, the piston is pierced for a valve, which would be too small to be indicated in the engraving, and when the water is above the piston, it is discharged by the air-vessel placed at the top, as in the former case. In this arrangement of the pump, the water may be raised to any required height.

Fig. 11.



Mr Perkins has made numerous improvements upon the forcing-pump. These may be enumerated under three heads. 1st, The enlargement of the bottom of the pump, or suction-pipe, which is so contrived as to allow all bodies heavier than water, as sand, stones, pieces of iron, &c., to subside by their own gravity, so as to prevent the inconvenience of the pumps choking, as frequently occurs on shipboard under circumstances of extreme danger. 2dly, The combination of the plunger and the pump-box, so as to produce a forcing stroke both by the ascent and descent of the plunger. And, 3dly, The separation of the valves from the stuffing of the pump-box, by which means a much larger water-way is effected than in any pump of similar size hitherto produced.

Fig. 12.



The left-hand figure exhibits a section of a fixed pump for raising water from wells, or out of the hold of a ship, which is also capable of being converted into a forcing-pump, for extinguishing fire, &c. *a* is the chamber or working barrel of the pump, and *b* a plunger, smaller than the calibre of the barrel, working up and down through a stuffing-box; *c* is an air vessel, which may be attached to the nozzle *d*, when it is required to be converted into a forcing-pump or fire engine, in which case the hose is to be connected to the end of the nozzle; *e*, the valve-box, which is made water-tight by fitting accurately in the barrel; the bottom of the pump may be enlarged, as shown in the right-hand figure at *f*, in order to prevent all heavy substances from coming up with the water, and getting into the pump barrel.

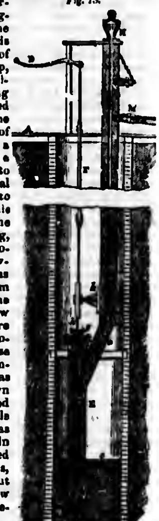
The right-hand figure represents a portable forcing-pump, to be employed either as a garden engine or fire engine, in which *a* is the chamber, *b* the plunger, passing through the stuffing-box, the interior parts of which are shown in the left-hand figure. In this portable pump, however, it is to be particularly remarked that the plunger *b* is made hollow, for the purpose of allowing the water to rise within it up into an air vessel *c*, at the top of the plunger; *e e* are the handles by which the plunger is to be raised and depressed by the men standing upon a platform.

Wooden pumps may sometimes be employed with advantage, though they seldom last more than forty or fifty years. The figure at the top of the next column represents one of the best forms of this pump.

A represents the surface of the ground, and B B the section of the brickwork forming the wall. The water stands at the ordinary level *c*. D is the lever or handle of the pump, which has the rod F jointed to it, and descending to the pump; the rod is made of wood, in several lengths, which are united by joints of iron; the wooden rods being capped with iron forks, which include the ends of them, and are rivetted fast; the ends of the forks are jointed together to connect the several lengths.

E is the working barrel or chamber of the pump in which the bucket *d* works; this part is formed of a tree bored through, and having a projecting branch *e*, which is bored obliquely to the barrel, and forms the forcing-pipe; in the bottom of the barrel the suction valve *f* is situated, being at the top of the suction part of the pump, which is bored with a smaller auger than the working chamber, which is also lined with a brass tube where the bucket works. The top of the barrel is covered by a metal lid *g*, which has a stuffing-box in the centre to receive the metal cylindrical part of the pump-rod *h*; to the lower extremity of this the bucket *d* is fixed. The metal lid consists of a ring, which is screwed to the wooden barrel by five screw-bolts passing through as many ears, projecting from the circumference of the ring; they have eyes below to hook upon pins which are fixed in the wood, but project sufficiently for these bolts to hold, and are formed into screws above, so as to hold the ring firmly down by means of nuts screwed upon them. The moveable lid of the pump, which has the stuffing-box *g* formed in the centre of it, is screwed to the ring by five screws, and these can be taken out to remove the lid and draw up the bucket when it requires to be leathered.

Fig. 13.



k is the forcing-pipe, formed of as many pieces of wooden pipes as are required to make up the length; they are united together by making the upper ends conical to enter a similar cavity made in the lower end of the next pipe; the lowest piece fits upon the extremity of the projecting branch *e*, and a valve is proposed to be put in the pipe at this joint to prevent the return of the water and bear part of the weight of the column from the lowest valve at *f*; the upper length of the pipe has a spout *i*, at which the water is delivered.

M is a second spout, fixed into the pipe lower than the former; it has a screw by which it can be united to a hole or leather pipe to convey the water to a distance; or by means of a jet, or branch-pipe, to throw it in the manner of a fire engine; in this case the upper spout *i* must be stopped up, by a screw, plug, or cap; and there is a copper air-tight vessel H, situated at the top of the wooden pipe, to equalise the pulsative motion of the water, as thrown by the pump.

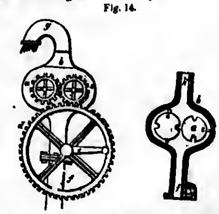
There is a bracket fixed to the pipe *k*, and projecting over the centre of the pump, where it has a hole to receive the pump-rod *h*, and guide it steadily in its motion up and down, that it may not wear the stuffing-box away on one side. As the wooden tubes of which this forcing pump is composed may be made from waste or crooked timber, it makes a great difference between the low price of such, and that of the straight trees necessary for common pumps.

A wooden plug may be chained to the pump betwixt the spouts or nozzles M and *i*, so as to be ready to stop that which is not wanted in use.

Mr Stephens, who was rewarded by the Society of Arts for this arrangement of the pump, is of opinion that it is better to place the valve *f* beneath the level of the water in the well.

There is a valuable rotatory pump invented by Mr Eve, which nearly resembles one form of the steam-engine. The two figures beneath will serve to show the general arrangements of its parts.

Fig. 14.



The left-hand figure represents an external view of the pump. Two cylinders turning on axles are placed in contact, and made to revolve in opposite directions in an outer case *a b c*, through the ends of which the axles protrude; each cylinder has two wings, leaves, or pistons, *c c*, shown in the next figure, and two recesses; and, in revolving, the wing or leaf of one cylinder falls regularly into the recess of the other, where their peripheries touch, and so on alternately. The equal motions of these cylinders are regulated by a pair of wheels *a a*, gearing into each other, placed outside the case, and affixed to the projecting axles. The speed of the wheels which drive the cylinders round is increased by a larger toothed wheel *d*, to be worked by a common handle *e*. The pump-case is connected by means of flanches and screws to a pipe *f*, leading down to the well. The two cylinders above described are three inches and a half in diameter, by six inches long, and the wings three quarters of an inch. The quantity of water pumped up by two men placed at the handle of the multiplying wheel, would be half a ton in three minutes.

Rotatory motion being given by means of the winch *e* to the large wheel, the teeth upon that wheel take into and actuate the pair of small toothed-wheels *a a*, which work into each other; and these, being affixed to the axles of the cylinder *a*, cause them to revolve with their peripheries in contact. The outer edges of the leaves *c* slide round against the circular parts of the interior of the box *b*, and by creating a partial vacuum, in the first instance, in the rising main *f*, causes the water to flow into the box. As the cylinders revolve, the leaves *c*, now lifting the volumes of water which encompass the outer halves of the peripheries of the cylinders *a*, force it to the upper part of the box, and thence through the discharge-pipe *g*. This pump possesses many advantages over the ordinary reciprocating pump.

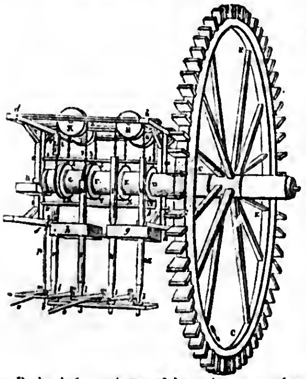
The operation of the *double plunger-pump* is entirely independent of pneumatic pressure, and is well calculated, both from its simplicity and effect, for raising large quantities of water to small heights. It is made by fitting two upright beams or plungers, of equal thickness throughout, into cavities nearly of the same size, allowing them only room to move without friction, and connecting the plungers by a horizontal beam moving on a pivot, as shown in

Fig. 15.

The water, being admitted during the ascent of each plunger through a large valve in the bottom of the cavity, is forced, when the plunger descends, to escape through a second valve in the side of the cavity, and to ascend by a wide pipe to the level of the beam. The plungers ought not to be in any degree tapered, on account of the great force which would be unnecessarily consumed in continually throwing out the water with great velocity as they descend, from the interstice formed by their elevation. This pump may be worked by a labourer walking backwards and forwards, either on the beam or on a board suspended below it.

The *compound plunger-pump* was formerly employed in almost all large water-works; and one of the best specimens is delineated beneath.

Fig. 16.



B, the shaft or axle-tree of the engine, twenty-four feet long, and twenty-four inches diameter.

C C C C, an undershot water-wheel thirty feet diameter; its vanes eighteen inches broad. The water-way eighteen inches broad and twelve deep. The fall seven feet. D E F G, four moveable rings or collars placed on the shaft, about three feet in diameter, and six inches broad.

H I K L, four forcers, rising and falling alternately by means of the collars having four chains fastened to the collars and the tops of the forcers, as W X Y Z represents. The forcer L is cut off, to show the chain more plain. As the collar G moves (with the wheel and axle) half round, the chain Z fixed at one end to the lower part of the collar G at 2, and its other end at the top of the forcer L l, will pull down the forcer L l four feet and a half, and at the same time a chain 1 to the head of the forcer L l, going over a pulley R, and to the head of K, pulls up the forcer K four feet and a half, by which time the collar G will have carried its trigger 2 up to the bar 1, 1, which will unlock its trigger, and the trigger 3 in the collar F will be brought backwards down to Y, and there lock the collar F. Then, the movement continuing, K will be depressed four feet and a half, and the chain 1, 1, over the pulley R, will raise four feet and a half. And thus these two forcers and collars continue rising and falling, moving forwards and backwards, locking and unlocking alternately. And in like manner the other two collars D and E move with their forcers H and I.

But to prevent one collar moving the backward way faster than the other moves forward, there is a guage-chain 4 fixed to the collar G, passing over another pulley T to the collar F at 5, which regulates their motions. These chains are lengthened or shortened by screws as occasion requires.

M N O P, four brass cylinders or pumps, seven feet long; the bores of M and N six inches diameter, and O P seven inches and a quarter; having at *l l l l* each a valve below, which are for taking in the water; and at *m m m m* valves in the horizontal parts.

The branches *n n*, *n n*, communicate the water of their two forcers together by *o o*, and so into one pipe *o*. Then O is joined to *o* coming from the other two, so the whole water is forced along one pipe.

g h are two cisterns supplied by a pipe in *p*, to keep the forcers or pistons always wet.

a b c d e f is a frame of wood to carry the pulleys Q R S T, and the bars *i i*, *k k*.*

HYDRAULIC MACHINES.

As a mover of machinery, water has been employed from a very early period. Water-wheels vary in their construction; the chief forms which they assume are denominated overshot, undershot, and breast-wheels.

Undershot-Wheel.—A common water-wheel must have been so often seen by every one, that any pictorial representation of it is unnecessary in this place. All water-wheels consist in common of a hollow cylinder or drum revolving on a central axle or spindle, from which the power to be used is communicated, while their exterior surface is covered with vanes, float-boards, or cavities, upon which the water is to act. The undershot, tide, or stream-wheel, is by far the oldest construction of the kind in use, and was for a long time the most common. It is the cheapest and simplest of water-wheels, and consists of a large drum, such as we have described, having vanes or float-boards projecting outwards. The toothed-wheel of any machine exactly represents a common undershot-wheel. Suppose this placed upon a stream of running water, so that these broad vanes of wood or float-boards dip to a short depth in the water, it is evident that the wheel will be driven round by the force of the water which flows against them. As this kind of wheel requires no other fall in the water than that which is necessary to produce a rapid progressive motion in it, and as it acts chiefly by the momentum of the water, its positive weight being scarcely called at all into action, it is only fit to be used when there is a profusion of water always in motion. Hence, it is more applicable to rivers in their natural state than any other form. As it works equally well upon either side of its float-boards, it is particularly applicable to tide-rivers, where the current sometimes runs in one direction, and at other times in an opposite course. Advantages are gained by not making the float-boards point to the centre of the wheel, but giving them a sloping or oblique direction a slight inclination from the centre. The following observations are from the pen, we believe, of Lord Brougham:—

"As action and reaction are always equal, but in contrary directions, of course it is the same thing whether the power of the moving water be applied to the float-boards of a wheel which revolves in a fixed building, or whether any extraneous force be applied to the axle of a wheel to cause it to move in still water. In the first case, the power of the water will be transferred to the axle of the wheel, and is applicable to the driving or moving of machinery; while, in the second case, the power applied to the axle will be resisted by the quiescent water, and will be converted into so much power for moving the building or boat in which the wheel is placed; and upon this principle depends the action of those steam-boats which are impelled through the water by means of water-wheels driven round by the power of steam-engines applied to their axles, instead of permitting the water to move the float-boards, and transfer its power to the axle.

Whenever the weight and motion of water can be made use of, as well as its momentum, much greater effects can be produced than the last described machine is capable of, and with a much less lavish expenditure of the fluid, for then its utmost powers of action are brought into play at once; and accordingly those water-wheels that are distinguished by the names of breast-wheels and overshot-wheels, will produce much greater power with a much less supply of water than the undershot-wheel already described. The overshot water-wheel, which of all others gives the greatest power with the least expense of water, requires a fall in the stream equal to rather more than its own diameter; therefore it is customary to give this description of wheel a greater length in proportion to its height than is given to any other, by which an equality of power is obtained. In the construction of the overshot-wheel, a hollow cylinder or drum, that is impervious to water, is fit prepared, and hung upon a proper central axis. A number of narrow troughs or cells, generally formed of thin plates of metal, extending from one end of the drum to the other, are next fixed round the outside of the wheel, so as to give a transverse section through the middle of the wheel. The water is conducted by a level trough of the same width as the wheel over its top, and is discharged into the buckets or cells placed round the wheel to receive it. From the particular form of these buckets, they retain the water thus thrown into them, until by their motion they descend towards the bottom, when their mouths being turned downwards, they discharge their contents into the tail-stream, where the water runs to waste. The buckets on the opposite side of the wheel descend with their mouths downwards, and thus remain empty, until they arrive under the end of the water-trough to be refilled, where there is a penstock or sluice for regulating the quantity of water and preventing waste. The overshot-wheel acts by the gravity or weight of the water contained in the buckets for nearly one-third of its circumference; and from the experiments of Mr Smeaton, which were made with great accuracy, it appears that the dimensions, quantity of water, and height of fall being the same, the overshot-wheel will produce double the effect of the undershot.

The breast-wheel is by far the most common, and may be considered as a mean between the two varieties before mentioned. In this, the water, instead of passing over the top of the wheel, or entirely beneath it, is delivered about half-way up it, or rather below the level of the axis, and the race or brickwork upon which the water descends is built in a circular form, having the same common centre with the wheel itself, so as to make it parallel to the exterior edges of the float-boards or extreme circumference of the wheel. It is formed with float-boards in the same manner as the undershot-wheel; but instead of the water acting upon its lower part, it is introduced upon it at the middle by the sluice or penstock, which, by rising or falling, permits a greater or less quantity of water to act on the wheel; and as the float-boards are made to fit as accurately as possible, without contact, into a circular hollow of brickwork, no water can escape past the wheel without producing its proportionate effect.

Mr Smeaton makes no observations on the nature of breast-wheels in his valuable papers on the subject, except to state that all wheels by which the water is prevented from descending, unless the wheel moves therewith, are to be considered of the nature of overshot-wheels, having power in proportion to the perpendicular height from which the water descends; while all those that receive the impulse or shock of the water, whether in an horizontal, perpendicular, or oblique direction, are to be considered as undershot. The breast-wheel is nearly allied to the overshot; for, notwithstanding it has only float-boards instead of buckets, yet as the mill-course is made concentric to the outside of the wheel, and is not only there, but at the two sides made as close as convenient, so as to prevent the escape of water as effectually as possible, the spaces between one float-board and another become buckets for the time being, and retain the water; and thus the breast-wheel is not only impelled by the weight of water, but by its impetus or momentum also, for the water is so confined as to be incapable of splashing or being lost, and consequently its moving force may be exerted to great advantage. Notwithstanding this apparent superiority, still the breast-wheel is, in effect, vastly inferior to the overshot-wheel, not only on account of the smaller height at which the water is supplied, but from the waste with which it must always be attended, even under circumstances of the most perfect workmanship."

There is a water-mill known by the name of Barker's centrifugal mill. It consists of a hollow upright tube of metal, terminating at the upper end in a funnel, and attached to an upright axle having a toothed-wheel, from which motion may be communicated to any machinery. The lower end, which is closed, turns in a socket, a little above which there passes through the hollow upright tube another at right angles to it, having a communication with it, and opening into it in the inside. Each extremity of this horizontal tube is perforated on opposite sides as near the end as possible, so that water issuing out of them horizontally, and spouting in opposite directions, drives the machine round. The motion results principally from the centrifugal force, which is generated in the horizontal pipe, and not, as is generally stated, from the resistance of the air, for the machine will move in a vacuum.

* British Cyclopædia, article "Pumps, Water."

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HISTORY AND PRESENT STATE OF EDUCATION.

GENERAL HISTORY.*

As the object of education is to make the rising generation as well-informed, or as capable of receiving information, as that which has given it birth, by which means the disadvantage arising from the perpetual renewing of the human race may be obviated, it is natural to suppose that, as soon as there was any knowledge in the world, and the state of things had become in other respects suitable, there would be establishments for the instruction of youth. There was some knowledge in the world at a very early period—something even like literature from fifteen hundred to two thousand years before the birth of Christ. Knowledge, however, was in those days confined to narrow classes: the blessed light had no sooner sprung up, than it became a matter of monopoly, and an instrument of power. Schools were accordingly established only for the sons of the great, and for priests. Moses was educated in a priestly school in Egypt, Cyrus at a seminary connected with the Persian court; the Indian brahmins imparted instruction in secret schools; in Palestine, those conversant with the Scriptures taught in the schools of the prophets, at later periods in the synagogues and the schools of the rabbies. The advantages of these schools were attainable by few; the means of learning were limited to conversation, reading, committing to memory, and hearing the explanation of sacred books. The very difficulty of putting knowledge into a written shape must have operated powerfully in those days against its being communicated to youth.

In Greece there were schools almost from the dawn of letters, and in Rome from the year 300 before Christ. These, however, did little for any except the higher class of youths, and nothing whatever for children who resided in the country. From the age of Cæsar, Rome had the higher class of teachers called grammarians, who taught Greek and Latin systematically, and from whose hands the youth of best talent were transferred to the rhetoricians, who qualified them for speaking in public. Till the time of Vespasian, near the close of the first century, the Roman schools were matters of private enterprise alone; and it was only from Cæsar that teachers acquired the rights of citizenship. Vespasian for the first time established public professorships for grammar and rhetoric, with fixed salaries attached to them, for the education of young men for the public service; and about the year 150, Antoninus Pius founded what were called imperial schools in the larger cities of the empire. Though there was no systematic cooperation among the various professors, the imperial school at Rome, after the organisation which it received, in 370, from Valentinian, approached near in character to the modern German universities. In the lower schools of the ancient Romans, the rod was not spared; and Ovid is not the only one who complained of the severity of an Orbilius.

Christianity by degrees gave a new turn to education. In the East, it came gradually into the hands of the clergy, and under their superintendence. Schools were instituted in the cities and villages for teaching religion to youth catechetically, and in some capitals there were others for the instruction of clergymen: that of Alexandria was, from the second to the fourth century, the most prosperous of all the academies of the latter description. Rather apparently from the accident of schools having thus fallen at first under the care of ecclesiastics, than any other cause, it has been impossible, ever since that early time, in any country, to obtain a secular education at a public school, without at the same time imbibing or at least submitting to the dogmas of a religious party. From the fifth century, the clergy were chiefly taught at the episcopal schools, where, besides theology, the seven liberal arts—grammar, logic, rhetoric (these three formed what was called the *trivium*), arithmetic, geometry, astronomy, and music (these four were termed the *quadrivium*)—were taught from the *Encyclopædia* of Marcianus Capella, a poor compendium which appeared at Rome in 470, and continued for upwards of a thousand years to be the common text-book of the schools of Europe. Gradually, as the Roman empire declined, the imperial schools sunk also; and as Christianity rose on the ruins of the empire, so were schools under the charge of the Christian clergy established in their place. At these institutions, boys of all classes were instructed in reading and writing, which were generally followed by the *trivium* (grammar, logic, and rhetoric): hence the appellation of Trivial Schools, which came to be applied to such seminaries.

Throughout the middle ages, learning and religion are always found together: there is nowhere the one without the other. About the seventh century, a new class of schools rose into importance, but still in connection with devotion. They were originally designed to prepare persons for the monastic life, which now began to be followed in many places, but gradually became seats of instruction for laymen also. From their always being connected with convents, they were called Conventual Schools. The Benedictine convents, which flourished in England, Ireland, France, and Germany, from the sixth to the eleventh century, forming a bright though slender link between the civilisation of ancient and modern times, were the chief seats of these seminaries. The discipline was severe and monkish; but the instruction was generally better than in other institutions, partly on account of the many distinguished literary men who embraced the monastic life, and partly on account of the superior collections of books which they possessed. The conventual schools at Canterbury, Westminster, and York; at Armagh and Clogher; at Paris, Tours, Rheims, and Clermont; at Salzburg, Ratisbon, Hersfeld, Corvey, &c. were particularly famous. These are "the schools" so frequently alluded to in modern literature as the birthplace of the scholastic philosophy, which may be said to have consisted in an endless wrangling misuse of the philosophy of Aristotle—the apparition of reasoning, without the body of reason.

Charlemagne, who in 789 issued a decree for the improvement of the schools throughout his extensive dominions, was the first modern sovereign who thought of lending state influence to the noble cause of education. This illustrious man, after placing himself at a school which he established for the use of his court, undertook the superintendence of the seminaries throughout his empire, had reports sent to him, made examinations, and, by every means in his power, endeavoured to enlighten the nations under his sway. Alfred of England made similar exertions for the promotion of education; but scarcely had these great men passed away, when the tide of barbarism, like the waters of the Red Sea after the passage of the Israelites, resumed its usual flow, and obliterated all their efforts. Learning was not as yet able to exist, except where it was protected under the robe of religion.

The ninth century is the era of the Cathedral Schools. The clergy of the bishops' churches then adopted the canonical life, and at the same time commenced seminaries for the education of the clerical order, of which the schools of St Paul's, Winchester, and others, may be considered as surviving specimens or relics. About the same period, Jewish and Arabian teachers were introducing ancient literature into the south of Europe, as well as a knowledge of mathematics, of medicine, and of natural history.

Schools for instruction in law were now established in several parts of the Continent. That of Bologna was perhaps the most famous; and the privileges which it received in 1158 from the Emperor Frederick I., became the foundation of the constitution of the Universities, which originated in this and the subsequent centuries.

From this time, on account of the inactivity and luxury of the clergy, the Cathedral and Conventual Schools began to decline; but still, wherever there were places for instruction, this class of men maintained a controlling, and in too many instances a counteracting, power. The monks intruded even into the universities, where they laboured to augment the importance of their various orders, and the power of the Pope. In the upper schools, they caused the scholars to waste most of their time in copying the manuals: in the lower, they would not permit the pupils to learn writing at all, being desirous to confine the art, which was highly lucrative, to themselves. The exercises were mere matters of parrot-song, without any care being taken that the pupils understood what they learned. For a long time, the privilege of establishing writing-schools for the children of citizens could not be obtained by magistrates except by special agreement with the clergy; but at length, as the cities increased in independence, the magistrates took this as well as other branches of instruction under their own charge, though they could hardly obtain teachers who were not of the clerical order. It is surprising how long mankind were in seeing the necessity of a distinct profession of teaching. Luther, in the sixteenth century, complains of the wretched characters of the teachers, which he ascribes to the circumstance of the more learned youths being attracted to the church. A set of upper pupils, called *vocantivi*, or idlers, went about seeking employment as schoolmasters, and were almost the only professors of that art who could be obtained: they seem to have been mere vagrants, equally ready to act as mummers and as teachers, and subsisting by begging and plunder when other means failed.

Unique in its kind, in the history of the schools of this period, was the pious fraternity of the Jeronymites. They consisted of clergymen and laymen, who lived together, occupied partly with mechanical arts, partly with the instruction of girls and boys, to whom they taught reading, writing, and useful arts. For boys of talent and diligence, there were Latin classes. On the model of these schools, others were established in the Netherlands, on the Rhine, and in Northern Germany. These soon came into communication with the Greeks who had fled to Italy; and thus the study of the classics became more cultivated. Through the efforts of such men as Thomas à Kempis, Erasmus, and Melanchthon, a liberal study of the remains of classic antiquity was commenced. Much was done, in and after the latter half of the fourteenth century, to promote this object by Italian courts and universities, through the instrumentality of learned Greeks, and of the Platonic academy at Florence, and, towards the end of the fifteenth century, through the learned Rhenish Society, established by Conrad Celtes. It is curious that it cost as much pains to get this study introduced, as now, after its main utility is past, it will probably require to sink it to its proper place as only one of many branches of knowledge.

The Reformation gave a considerable impulse to education in almost every country where it took effect. Acting themselves under the influence of the light of knowledge, the reformers regarded the imparting of it to others as a sacred principle; nor did they fail to see, that, for a religious party to have the command of the schools where youth were taught, was the most effectual way of keeping that party dominant in the land. In Germany, the property of the convents, and of the church in general, which had been confiscated by the governments, was in most cases applied to the use of schools, the numbers of which were now greatly increased in this country, and their character elevated. Seminaries of a superior

* The Editors find it convenient to state in this place, that *elementary* education is the chief subject of the present sheet.

character, entitled gymnasia, were set up by most of the city corporations, and even in the villages instructors were appointed to teach the Catechism. So early as the year 1529, the reformers furnished a great example of the care which government should bestow on schools, by the visitations which they made of the schools in the electorate of Saxony. The example of Germany was, perhaps, more strictly followed in Scotland than in any other reformed country.

The invention of printing lent, as might be supposed, a great aid to the cause of education, not alone by the books of instruction which it more readily furnished to pupils, but by the force of that intellectual current to which it gave rise. About the end of the sixteenth century, education first became a subject of deep reflection among philosophical men. Bacon, and Amos Commenius, the exiled bishop of the Moravians, then made it the subject of treatises. During the seventeenth century, the Jesuits' schools attracted considerable notice, on account of the excellent education which they imparted to the youth of the superior orders, as well as to boys of talent selected from the humbler walks of life, for the service of the order. About the close of that century, the Pietists in Germany, and the Quietists in France—religious sects resembling the Methodists, who soon after sprung up in England—exercised a considerable influence of a beneficial kind upon education, though Latin and Greek still continued to be almost the only branches taught in any part of Europe. The idea of an education adapted to the nature and general destination of man, suggested by Bacon and Montaigne, received about this time a more complete developement from Locke: it was not practically introduced, however, till nearly a century later. The system of philanthropism, suggested by Basedow, which repudiated the rod, denounced the want of proper exercise for the children, and cried down the system of loading the memory without exercising the active faculties, then caused the establishment, in Germany, of schools, in which natural history, technology, civil arithmetic, &c., were taught, in addition to languages. The close of the eighteenth century is also the era of the system of Pestalozzi, a Swiss of simple manners and great enthusiasm, who adopted the idea of communicating all instruction by immediate address to the sensations or conceptions, and effecting the formation of the child by constantly calling all his powers into exercise, instead of making him a mere passive recipient; selecting the subjects of study, moreover, in such a way that each step should best aid the further progress of the pupil. We may only further observe, in the present department of our sheet, that education has now arrived at a point where the systems of comparatively unenlightened times are beginning to sink before a variety of new, but in almost every instance more promising, schemes; of which various scattered notices will be found in the chapters which follow.

ENGLAND.

Among the things incredible in Christendom—to use the forcible expression of a German writer—is the fact that England possesses no general system of elementary education. For the instruction of her clergy and gentry, she has several great public classical schools and two universities; but she has no national establishment, like that which exists in Prussia and other countries, to meet the convenience of the people at large, and enable every man in the kingdom to give his children the means of reading. Custom or chance has decreed that the landholders of England, instead of paying a comparative trifle to teach the lower orders, should be burdened with the enormous tax of seven millions annually to support a body of paupers, most of whom may be described as having sunk into that condition, or being born into it, through the effects of the low morality attendant upon ignorance.

To remedy as far as possible the want of a national establishment, two charitable associations have been in operation for some years, one of which is chiefly composed of friends of the church, and the other of dissenters; while the same purpose is served in some measure by the prevalence of Sunday Schools, first suggested by Mr Raikes of Gloucester about the year 1780, and of Infant Schools, recently brought into repute by the exertions of the ingenious Wilderspin. There had previously existed many private schools, which, however, were not adequate, either in number or in system, to supply elementary instruction to the people; while the boarding academies so prevalent throughout England were accessible only to the middle ranks, and chiefly aimed at giving a classical education. In 1818, there were in England 4167 endowed schools, 14,282 unendowed schools, and 5162 Sunday schools, educating 644,000, or one-sixteenth of the entire population, instead of the sixth, which Prussia has shown to be the proper amount of school-attenders. Thus England was shown to enjoy little more than a third part of the proper amount of education, even supposing the education she did enjoy to be good. Of the 11,000 parishes, 3500 were in 1820 without a school.

The system adopted by the two great associations just mentioned is the Monitorial, which was first practised by Dr Andrew Bell, at Madras, in the year 1786. Dr Bell was a native of St Andrews in Scotland, and at this time was one of the ministers of St Mary's, in Madras, and one of the chaplains of Fort George. With the spirit of a genuine philanthropist, he undertook the task of superintending a school established by the East India Company for one hundred orphans of the European soldiery, refusing the handsome salary of L.480 which was offered with the situation. At the opening of the school, the boys were in general stubborn, perverse, given to tricks, lying, and almost every vicious habit, insomuch that a single teacher could hardly expect to produce the least impression upon them. The difficulty of the circumstances suggested to Dr Bell that it would be necessary either to prepare a number of ushers, or a number of elder boys, to take charge of little detachments of the scholars. Finding most obstacles in the former mode, he finally adopted the latter; he succeeded beyond his hopes, and soon perceived that he had discovered an engine for increasing the impetus and abbreviating the labour of education, from which the greatest results were to be expected.

The first new practice which Dr Bell introduced into his school was that of teaching the letters, by making the pupils trace them in sand, as he had seen children do in a Malabar school. This mode of instruction has various advantages, besides the saving of expense. A distinct notion of the different forms of the letters is immediately obtained, and the difficulty of distinguishing those letters which closely resemble each other (b and d, p and q, for instance), by which children are so long perplexed, is removed at once. The scholar, at the same time, learns so much of the art of writing as materially to facilitate his progress when he arrives at that class wherein it is taught.

The next improvement of the Madras school was the practice of syllabic reading: the child, after he had learned to read and spell monosyllables, was not allowed to pronounce two syllables till he had acquired, by long practice, a perfect precision. Upon the old plan, children make continual blunders, in the beginning and middle, and more especially in the termination of words; to prevent this confusion, they were taught to read syl-la-ble by syl-la-ble, and, when so far advanced as to read sentences, to pause awhile at the end of a word. "So much," says Dr Bell, "for the first minutiæ; were I to pursue this subject through all its stages, I should fill a volume."

From the commencement of his experiment, he made the scholars, as far as possible, do every thing for themselves: they ruled their own paper, made their own pens, &c. with the direction only of their teacher. The maxim of the school was, that no boy could do any thing right the first time, but he must learn[a] when he first set about it, by means of his teacher, so as to be able to do it himself ever afterwards. Every boy kept a register of the amount of work which he performed, so that his diligence at different times might be compared. There was also a black-book in which all offences were recorded: this was examined once a-week; and Dr Bell's custom, in almost every case of ill behaviour, was to make the boys themselves judges of the offender: he never had reason, he says, to think their decision partial, biassed, or unjust, or to interfere with their award, otherwise than to mitigate or remit the punishment, when he thought the formality of the trial and of the sentence were sufficient to produce the effect required. But the business of the teachers was to preclude punishment by preventing faults; and so well was this object attained, that for months together it was not found necessary to inflict a single punishment. If a bad subject came to school, a good boy was chosen to take care of him, teach him right principles, treat him kindly, reconcile him to the school, and render him happy like the rest in his situation. The consequence of such a system was, that the boys, feeling themselves happy, felt also that their advantage was the only object which the master had in view: they were sure of his favour if they continued to do right, and of his disapprobation and displeasure if they offended; but knowing that he was just, and feeling that he was good, they regarded him as their friend, and benefactor, and common parent.

About the close of the eighteenth century, Dr Bell returned to Europe on account of his health, published an account of his system, and was gratified by seeing two experiments made upon his plan in England. Some short time before, Mr Joseph Lancaster, a Quaker teacher, began to make experiments of a similar kind; and on being made acquainted with Dr Bell's plan, eagerly added it to his own. Lancaster's improvements, with the addition of Bell's, were gradually brought into repute, and, by the aid of the Quakers, schools, upon what was called the Lancasterian plan, were introduced in many parts of the kingdom. The partisans of the church first despised and then condemned this educational project of a body dissenting from them, and finally were obliged to set up something of the same kind themselves, as the only available means of defending the interests of the establishment. Two rival associations, denominated the British and Foreign School Society, and the National School Society, the former composed chiefly of the liberal and dissenting party, and the latter under the patronage of the crown and church, now endeavoured to anticipate each other in the planting of monitorial schools in every cluster of population throughout England; and thus were the people indebted for once to party spirit for one of the greatest boons they ever received.

Notwithstanding the very great, and, in general, very useful exertions of these societies, a vast field of ignorance still remains. In many seats of population, a large proportion of the people know not one letter from another. The metropolis alone contains 150,000 persons, or a tenth of the whole population, to whom the means of education are not accessible. Two out of the fourteen millions of the entire national population are calculated to be in the same wretched state.

While such is the general condition of the country in respect of popular education, there are several features in the case which must cheer every heart. The system of teaching by real knowledge has at least been exemplified in various parts of the country, particularly in Dr Mayo's school at Cheam in Surrey, the establishments of the Messrs Hill at Hazelwood, near Birmingham, and Bruce Castle, near Tottenham, which have now fully acquired, as they eminently deserve, the confidence of the public. In Mr Bruce's academy at Newcastle-upon-Tyne, in addition to the usual branches, the following philosophical courses are taught:—Chemistry, electricity, magnetism, and pneumatics, as connected with physical geography, meteorology, &c.; natural history, with reference especially to the mechanism and physiology of the human frame—making Paley's Natural Theology the text-book—mental philosophy, the evidences of Christianity, &c. There is a seminary in Bath, under the direction of Messrs Clark, which bears a close resemblance to that of Mr Bruce. It is agreeable also to know that the government has at length taken up the subject of popular instruction, with every appearance of a desire to extend its blessings throughout the land. In the session of 1833, a grant of L.20,000 was voted by Parliament in aid of general education; and already has an account been rendered of the appropriation of that sum, an additional grant made to the same amount, and a select committee of the House of Commons charged with an inquiry into the state of education among the poorer classes in England and Wales.

The object of the grant of 1833 was the erection of schoolhouses, and the principle adopted in apportioning it was, that no aid should be given till one-half of the estimated expense was raised by private contribution. Upon this excellent arrangement, 98 schoolhouses were built within eight months, at the joint cost of L.46,000, by which many populous districts will be for the first time furnished with the means of instruction. A prospect is held out that, by the farther grant of L.20,000, no fewer than 187 other schoolhouses will be added to the above number. If to these exertions were added the establishment of a few schools for the instruction of teachers in the improved plans of education—moral, intellectual, and physical—the educational philanthropist might be content to wait with patience till the public mind shall become a little more alive to the subject.

INFANT SCHOOLS.

It has long been admitted as an abstract proposition, that in early childhood the mind is more pliable, and habits are more easily formed, than at any other period of life. "The little, or almost insensible, impressions on our tender infancies," says Locke, "have very important and lasting consequences: and there it is, as in the fountains of some rivers, where a gentle application of the hand turns the flexible waters into channels that make them take quite contrary courses; and by this direction, given them at first in the source, they receive different tendencies, and arrive at last at very remote and distant places. . . . . . The great mistake I have observed in people's breeding their children has been, that this has not been taken care enough of in its due season; that the mind has not been made obedient to discipline and pliant to reason, when at first it was most tender, most easy to be bowed."[a] Miss Edgeworth, to the same effect, observes, "Practical education begins very early, even in the nursery. Without the mountebank pretence that miracles can be performed by the turning of a straw, without the dictatorial anathematising tone which calls down vengeance upon those who do not follow to an iota the injunctions of a theorist, we may simply observe, that parents would save themselves a great deal of trouble, and their children some pain, if they would pay attention to their early education. The temper acquires habits much earlier than is usually apprehended; the first impressions which infants receive, and the first habits which they learn from their nurses, influence the temper and disposition long after the slight causes which produced them are forgotten." Yet these undeniable principles have not till the present generation begun to be systematically reduced to practice. It is only within the last few years that infant schools have appeared amongst us, and even yet their number is lamentably small. Mr Owen of New Lanark was the first in Britain who established what deserves the name of an infant school. Mr Brougham and some of his friends who had visited New Lanark, established, in 1819, an infant school at Brewer's Green, near Tothillfields, London, and transplanted thither the New Lanark teacher, Mr

[a] Locke observes with truth, that "some men's constitutions of body and mind are so vigorous and well framed by nature, that they need not much assistance from others; but, by the strength of their natural genius, they are, from their cradles, carried towards what is excellent; and, by the privilege of their happy constitutions, are able to do wonders." But what he adds is not less in accordance with fact, that "examples of this kind are but few;" and that, "of all the men we meet with, nine parts out of ten are what they are, good or evil, useful or not, by their education."—*Thoughts on Education*, § 1.——It must be kept in view that Locke uses the word *education* in its original and most comprehensive sense—training or bringing up.

Buchanan. The latter happened incidentally to meet Mr S. Wilderspin, then a young man, and had the merit of seeing his talent for the business of education, and of recommending him to the patrons. A new school was established at Spitalfields, at the expense of Joseph Wilson, Esq., of which Mr Wilderspin was appointed master. In his hands the system was rendered what it now is, and what has been adopted all over the country. Mr Wilderspin's method was the mere result of practice and observation; but at the same time it is perfectly sound in theory, and admirably adapted to human nature, as elucidated by philosophical writers. The London Infant School Society was instituted in 1824, and many similar bodies now exist in various parts of the United Kingdom. Infant schools are much more numerous in England than in Scotland, and we are sorry to say that Edinburgh possesses only one school conducted according to the method of Mr Wilderspin, and even that one is not fully appreciated by those for whose benefit it was established. Glasgow has several.

Education comprehends three great branches—physical, moral, and intellectual. Hitherto the two first have been deplorably neglected, and to the last alone almost exclusive attention has been paid in our schools. It is the object of physical education to promote the developement, consolidation, and strength of the body, and thus to prepare it for the exertions which it will be called on in future life to perform. Moral education has for its aim the cultivation and direction of the social, moral, and religious feelings, and the repression of the too great activity of the selfish propensities. Intellectual education exercises the understanding, and furnishes the mind with knowledge. All these are attended to in the infant schools. This, as well as other excellencies of the system, will be obvious from a statement of the objects of the London Infant School Society.

That society has been formed to promote the establishment of schools, or rather asylums, for the children of the poor, before the age at which they are capable of engaging in any profitable employment, or at which they may be received into the other schools, to which they are not usually admitted until the age of six; the proper objects of the society's care, therefore, are children of both sexes, from two to six years of age. It is well known that children of this age generally prove, during the working hours of the day, a heavy incumbrance on parents who are obliged to toil hard for a subsistence. One of the society's objects is to lighten the pressure of this inconvenience, and to leave the parents—particularly the mother—more fully at liberty to pursue some gainful occupation for the common benefit of the family. So convinced of this are the poor themselves in England, that, in numerous instances, Dames' Schools, as they are called, have been established, in which ten, twenty, or thirty infants are placed under the care of an old woman, by whom they are shut up, perhaps, in a close apartment, in order to be kept out of harm's way while the parents are at work. For this accommodation, parents are willing to pay from twopence to fourpence a-week for each child. The children are left with the dame, and remain under her care (with the exception, in most instances, of the dinner hour) until the evening.

Infant schools are intended for the reception of from two hundred to three hundred children, and, while they secure the same relief to parents, are made subservient to many other purposes, important not only to the children themselves, but through them to the parents, and to the community at large. The plan, therefore, is, in the first place, to provide an airy and spacious apartment, with a dry, and if possible large, play-ground attached to it, where, under the eye of a properly selected master and mistress, these infants may pass the hours during which their parents are at work; and, in the second place, to render this receptacle not a place of irksome restraint and confinement, but a school for the proper exercise of the body in cheerful sport, for the acquisition of useful knowledge, and for the attainment of habits of cleanliness and decorum, of cheerful and ready subordination, of courtesy, kindness, and forbearance, and of abstinence from every thing impure or profane; a scene, in short, at once of activity and amusement, of intellectual improvement, and of moral discipline. If the period of mere infancy is less fitted, comparatively speaking, for intellectual progress, yet curiosity is even then sufficiently active to enable the teacher to convey much useful knowledge to his pupils, by means which are calculated to call forth, *without oppressing*, their faculties. By means of pictures, models, and a museum of miscellaneous objects, it has been found possible, even in the case of very young children, to engage the attention, develope the faculties, and impart ideas, without the necessity either of resorting to any harsh expedients, or of imposing any strain on their minds. They are taught by easy lessons to read and calculate. But the first years of life are still more valuable, with a view to the formation of the temper and moral character of the future man. No doubt can be entertained both of the susceptibility of right impressions which belongs to the earliest age, and of the unhappy permanence of those vicious or selfish propensities, and of those peevish or violent tempers, which are then too often contracted; and which, when suffered to expand, lead in after-life to domestic misery, to profligacy, and to crime.

To counteract such propensities, and to prevent the growth of such tempers, is the prime object of the plan; and it is with a view to this object that the whole frame and discipline of infant schools ought to be regulated. Locke insists very strongly, in his work formerly quoted, on the paramount importance of this sort of training. "Seek out somebody," he advises, "that may know how discreetly to frame the manners of your son; place him in hands where you may as much as possible secure his innocence, cherish and nurse up the good, and gently correct and weed out any bad inclinations, and settle him in good habits. This is the main point; and this being provided for, learning may be had into the bargain." In like manner Lord Kames observes, "It appears unaccountable that our teachers have generally directed their instructions to the head, with very little attention to the heart. Surely, as man is intended to be more an active than a contemplative being, the educating of a young man to behave properly in society is of still greater importance than the making him even a Solomon for knowledge." At the infant schools it is not by precept merely that moral education is impressed; the children are trained to *act* in accordance with justice, and benevolence, and truth; and thus acquire the *habits* which it is desirable that they should possess in future life.

At present we behold many of the streets and lanes of cities—particularly those of London—crowded with squalid children, left to wallow in filth, to contract disease, and to acquire habits of idleness, violence, and vice. Almost the first language which many of them learn to lisp, is that of impurity and profaneness; almost the first science in which many of them are instructed is that of depredation. Abroad, they are exposed to every vicious seduction; at home, they suffer from the caprice or violence of parents who are incapable of giving them instruction, whose poverty makes them discontented and irritable, and who feel the very presence of their children to be a drawback on their efforts to earn a subsistence. From such a course of education, what can be expected but a proficiency in vicious propensities and criminal practices—what, in short, but that mass of juvenile delinquency, which in the present day we have been forced to witness and to deplore?

But if we contrast with this state of things the effect which may be anticipated from the general establishment of infant schools, conducted on the principles now explained, what heart but must exult in the prospect? Let all who regard such expectations as visionary, only take the pains of personally and minutely inspecting the schools already formed in different parts of the kingdom (our Edinburgh readers will find one in the Vennel, Grassmarket); let them view the children, clean, healthy, joyous, giving free scope to their buoyant spirits; their very plays made subservient to the correction of bad and the growth of good dispositions; the happiness they manifestly enjoy; and the habits of prompt and cheerful, of mutual kindness, of unceasing activity, of purity and decorum, which they acquire. And let them watch the return of these children to their homes, and witness the pleasurable sensations with which they are received, so different from the scowling looks and harsh tones with which their teasing importunities and interruptions, during the hours of labour, are apt to be met. And let them, moreover, contemplate the striking reaction of the improved manners and habits of the infants on the older branches of the family. Let them view and consider all this, and they will no longer doubt the beneficial influence of these institutions.*

SCHOOLS OF INDUSTRY.

The object of schools of industry is to combine with the ordinary elements of school education, instruction in such manual labours as the poor are generally called upon to perform. There are not many such schools in Britain, but their utility cannot fail to render them much more numerous in the course of a few years. The establishment of Mr Montagu Burgoyne, at Potton, in Bedfordshire, may be taken as an example. The children, besides being instructed in reading, writing, and arithmetic, are employed during half of the school-hours in works of useful labour and industry. The boys mend their own clothes; they clean and mend their own shoes, and are taught to clean knives, to use the hammer, to dig and cultivate a garden, to hedge and ditch, and even to plough. The girls are accustomed to the most useful kinds of needlework, are required to mend their own clothes, and learn the business of a house and dairy. This preparation tends to enable both the boys and girls, when they leave school at fourteen years of age, to earn an honest living. The boys will be active and useful farming servants, or grooms, or coachmen, or valets, or gardeners, or apprentices to different trades; and the girls will be clever housemaids, dairymaids, or cookmaids, and, when they marry, will be able assistants to their husbands, and acquainted with the best way of preparing food and clothing for a young family.

SCOTLAND.

Previously to the Reformation, Scotland was in much the same condition as to education as the other Christian countries of Europe, with perhaps some inferiority on account of its remote situation and narrow resources. The grammar schools, by which Latin is taught in the principal towns, are in several instances of considerable antiquity; and, in 1496, an act of the legislature endeavoured to *enforce* the attendance of the sons of landowners at these institutions, with a view to the better administration of the laws, which was then entrusted to that class of society, and for more than two centuries later, as a matter of hereditary right. There were also *lecture-schools*, in which children learnt to read the vernacular language. The Scottish reformers, following the example of their German predecessors, endeavoured to obtain a part of the confiscated funds of the church for the support of schools, of which they wished to have one in every parish, under the immediate charge of the clergy, in order that each successive generation might be inspired with an attachment to "the trew religioun." Though they did not succeed in obtaining any considerable part of the church funds for this or any other pious purpose, a considerable portion of the people of Scotland seem to have enjoyed the blessings of education, during the latter part of the sixteenth and early part of the seventeenth centuries. In 1616 and 1633, while the church was Episcopal, efforts were made, in the first instance through the Privy Council, and in the second by an act of Estates, to establish a school in each parish; throughout the subsequent struggles of the Presbyterians for ascendancy, the same object was kept in view; and the latter form of church government had hardly gained its final ascendancy at the Revolution, when the long-contemplated plan was at length accomplished, and the education of the people put upon its present footing. By an act of the Estates in 1696, it was provided that there should be *a parochial school and schoolmaster in every parish of the kingdom*, with a fixed salary, not under L.5, 11s. 1d., nor above L.11, 2s. 2d., payable by the heritors or proprietors of the parish, in proportion to the extent of their property, who should have the power of drawing one-half of the outlay from their tenants. The duty of planting the school was imposed on the heritors; and the appointment of the teacher, and supervision of the whole school, were entrusted to the presbyteries—district church-courts, which in Scotland exercise nearly the same ecclesiastical powers as in other countries are consigned to bishops.

In consequence of this public endowment, which never, so far as we have observed, was grudged by those from whose pockets it proceeded, each parish in the kingdom, except some of those in the large towns, was furnished with a school, in which reading, writing, and arithmetic, and, in some instances, classical literature, were to be learned. The fees were generally—for English, 1s. 6d., for arithmetic, 2s., for Latin, 2s. 6d., per quarter; the poor being admitted at about two-thirds of these rates. The system thus avoided at once the disadvantage of high fees, and that of an indiscriminate gratuitous admission, which, unless where the support is derived from the national funds, is so apt to lessen the value of instruction in the eyes of the lower orders. One prominent department of education in these seminaries was religion. The primer was prefixed to, and inseparable from, the Catechism approved of by the Westminster Assembly of Divines; and the first lessons in reading were from that venerated abridgement of Calvinistic divinity. The Bible was the only other text-book of importance; and thus almost the only ideas obtained at school were those of religion. To these causes, so early put into force, the uncommon diffusion of pious feeling and observance, and of a certain extent of acquirements in literature, which forms so striking a feature in the national circumstances, is generally ascribed.

On account of the decline in the value of money, it was felt, towards the end of the eighteenth century, that the fixed incomes of the parochial schoolmasters ought to be advanced; and, accordingly, in 1803, an act of the legislature provided that the salaries should not thenceforward be under L.16, 13s. 4d., nor above L.22, 4s. 5d., with a free house; the salaries more recently have been respectively elevated to L.17, 2s. 2d. and L.34, 4s. 4d. These emoluments, to which there are generally added others arising from the duties of session-clerk, precentor, and manager of militia-returns, are found, in populous parishes, where a considerable amount of fees is received, to secure the services of men of respectable acquirements—many of them disappointed aspirants for church preferment; but in many remote and more thinly-peopled situations, the remuneration altogether fails to attract properly qualified persons. An idea very generally prevails, and nowhere more generally than in the country itself, where its falsehood might be most readily detected, that Scotland is remarkably fortunate in respect of education. In reality, its parochial system is so very defective, that, considering the difficulty there is always found in reforming any old institution, it is questionable if the country would not have been better with a school establishment yet to be commenced. In 1818, there were 942 parochial schools, attended by 54,161 children, and drawing a gross revenue of L.29,611. Thus it appears that only 1 in every 36 persons was provided for by the schools of the establishment, while in Prussia there are government schools for 1 out of every 6 persons, and a greatly superior system of education. The average of stipends in 1818 was L.22 per school;

* For farther details we refer to Mr Wilderspin's work on Infant Education. Though written in a plain style, it contains matter of deep importance to society

and an inquirer in 1827 calculated that a full half of the teachers did not enjoy gross incomes above L.45, while a full third had from L.25 to L.35. These incomes are in all instances so very humble, that, upon fair consideration of circumstances, we are entitled to assume a very low standard indeed for the character and attainments of a vast proportion of the teachers.

In 1824, the General Assembly of the Church of Scotland appointed a committee for the purpose of increasing the means of education throughout the kingdom, wherever those means might appear to be deficient. This committee, after an inquiry occupying two years, reported that the means of elementary education appeared to be within the reach of the entire population, excepting in the Highlands and Islands, where, owing to the extent of the parishes and other causes, there were not less than 50,000 persons unable to read, or to obtain instruction. The Assembly, by means of charitable collections, was able, before 1833, to establish eighty-six schools in these districts; but it was found, by an apparently more searching inquiry in the latter year, that there were 83,397 persons above six years of age, out of a population of 504,955, who could not read either in Gaelic or English, and had no means of school-instruction within their reach. In some districts, the proportion of the ignorant to the instructed is a full fourth; in the Presbytery of Mull it is a third; in Uist, more than a half. Be it also remarked, a vast proportion of those who can read are unable to write or cypher; while the reading itself goes little way beyond a mere power to spell through a Bible or a Catechism, and can only be compared to an instrument, which, though possessed, is not used. Only 6443 pupils were attending the Assembly's schools in 1832, being less than a thirteenth part of those who require instruction; so that, without aid from the national purse, there is little reason to hope for the speedy universality of education in this part of the empire.

The branches taught at the Highland charity schools are Gaelic and English reading, writing, arithmetic, geography, and Latin. It is curious that the people in general prefer the English to the Gaelic, though there is great reason to fear that all their acquirements in that foreign tongue are only so much parrot learning. There are some other schools, opened upon private adventure, but of the most miserable kind, the teacher being generally a boy, an aged female, a retired soldier, an innkeeper, or a fisherman, and the emoluments seldom exceeding ten pounds a-year—in some cases, only three or four. But even the parochial schools in this department of the kingdom are in too many instances upon a footing inferior to that of the Lowland seminaries. The legal salaries are in many places evaded by compact, and the schoolhouses and abodes for the teachers not provided. In eleven parishes in Argyleshire, the stipends are divided into three, so as not to amount, probably, to ten or eleven pounds each.

The present state of Scotland as to elementary education may be thus briefly summed:—There are 1005 parish schools, being a few more than the entire number of parishes. In the Highlands, besides 171 parish schools, there are, or were at a recent period, 324, supported by the Society for Promoting Christian Knowledge, and other charitable associations, and eighty-six planted by the General Assembly. Throughout the whole country, but especially in the more populous parts, and in large towns, there is a great number of private schools: in 1818, the number was 2222, instructing 100,027 children, nearly double the amount of those who were then reared in the established parochial schools. In the year just mentioned, the county of Lanark, including Glasgow, contained fifty-six parochial schools, attended by 3437 children, and 307 private schools, attended by 18,270 children. Mid-Lothian, including Edinburgh and other populous towns, had twenty-five parish schools, attended by 1704 children, and ninety-seven unendowed schools with 4312 children. In Renfrewshire the numbers were twenty-one parish schools, with 1630 children, and 137 unendowed schools, with 8690 children. It is indeed apparent to the most superficial inquirer that the parochial establishment has fallen completely behind the population, and only accomplishes in a small degree the purposes for which it was intended. The idea of the Reformers in the sixteenth century seems to have been that there should be a minister, a catechist, and a schoolmaster, for every 1000 of the population: were the same principle now followed, there would be 2300 instead of 1005 endowed teachers.

The success or efficiancy of these means of instruction is very various. In the 143 parishes of the Highlands, as already stated, even after the establishment of 86 charity schools, there are above 83,000 persons who, from local circumstances, have no means of instruction within their reach. In the 132 parishes of Aberdeen, Banff, and Elgin, the average attendance at school is one-eleventh of the whole population, which is little above one half of the Prussian amount. The average in other districts ranges from this to one-twentieth, which last must be considered as deplorably low. It has been stated that one parish, Fossaway, has one-fourth of the population at school; two parishes, Comrie and Midcalder, one-fifth; four parishes, Colinton, Ruthwell, Kirkwall, and Tongue, one-sixth; so that it appears as if only a mere scantling of the Scottish parishes are in a proper condition as to education. The country parishes, from their extent and other local peculiarities, and the large towns, from the absolute want of cheap seminaries, and the demoralisation that is so apt to beset large masses of population, are alike ill provided. In Edinburgh there are no parish schools; nor till lately were there seminaries of any kind accessible to the poor: hence, a very great number of the children of the lower orders grow up without education. In Glasgow, 20,000 persons are in this condition, so ominous of moral degradation, turbulence, and crime. In Paisley, where, thirty years ago, the artisans were an enlightened and virtuous body of men, there are now 3000 families into which education does not enter. The proportion of the population which attends school in Glasgow is one fourteenth; in Dundee, one-fifteenth; Perth, under one-fifteenth; Old Aberdeen, one-twenty-fifth; Paisley Abbey Parish, one-twentieth. Yet in one of these instances—Dundee—it cannot be said that the object is overlooked. In that thriving town, besides a grammar school with two masters, an English public school with two masters, and an academy with four masters, who teach mathematics, natural philosophy, chemistry, moral philosophy, logic, drawing, and the modern languages, there are no fewer than 77 private schools, several of which are supported and partly taught by the masters of factories. As there is thus a school for every 570 of the population—which cannot be considered a mean allowance—it follows that much of the fault lies in the short attendance of each individual. A child learns to read, and no more is supposed to be required. He is hurried off to the factories, with his faculties still in a great measure dormant. But it is not alone among the working classes of large towns that an ability to read is supposed to be a sufficient education.

The writer of the late statistical account of Dundee states, that hardly any individual above six years of age is found unable to read, though a vast number of the working people have not learned to write. It may be conceived, then, since a sixth of every population is at the school-going age (between seven and fourteen), and since only a fifteenth are at school in Dundee, that the period of attendance is very far from perfect. Every thing, indeed, tends to show that the sneer of Dr Johnson as to Scottish education is now realised—all get a mouthful, but none a bellyful. In Scotland, the monitorial and intellectual systems have as yet been very partially adopted. One teacher in general superintends the tuition of a large number of boys, only a few of whom can at one time be getting any benefit from his exertions. The period of attendance is short, and the impression of school-learning upon the mind very slight: even the Catechism is learnt only by rote, and, at a very fair computation, not understood, even glimmeringly, by one in a hundred pupils. The private teachers are, in a vast proportion of cases, women, or else males of very humble accomplishments; a result of the extremely slender emoluments, which range from L.4 to L.25, the latter sum being very rarely exceeded. Altogether, the system is a starveling one—starveling in its provisions for both teacher and taught—and a disgrace rather than an honour to the nation.

IRELAND.

In the dark ages, Ireland was remarkable above the most of other countries for the number and excellence of its schools, which were then resorted to by students from various parts of Europe. Under the domination of the English, however, this, as well as every other matter connected with good government, has been, till a very recent period, neglected. An act of Henry VIII., indeed, imposed on the vicar or rector of every parish the duty and cost of keeping up a parochial school, in order to instruct the natives in the English tongue, as the existence of the Irish was considered a main obstacle to the progress of civilisation, and to the establishment of English and Protestant supremacy. This, however, though confirmed by an act of William III., was never more than a dead letter. The clergy regularly, among other oaths, swore at admission that they would support an English parochial school; but nothing of the kind was ever done. At the same time that the keeping of Protestant schools was thus evaded or found impracticable, the same act of William III. forbade Catholics to keep schools, under a penalty of twenty pounds and three months' imprisonment. The Catholic Irish, however, who are nationally characterised by an anxiety to give their children education, have all along contrived to maintain a great number of the mean establishments called *hedge schools*, where a slender and imperfect degree of instruction was conferred on a considerable portion of the rising generation.

During the century between 1731 and 1831, various attempts were made by private associations, generally with the aid of government, to educate the people of Ireland. Almost every one of them, however, went to wreck upon the fatal principle that the religious instruction should be exclusively Protestant. The celebrated Charter School Society, commenced at the first of these dates, has continued up till a recent period to spend vast sums in the vain attempt to proselytise by means of education. Their plan was to get hold of children—the term is quite appropriate—to catch them, if possible, wild, or transfer them from the Foundling Hospital, and to immure them in schools where they also got food and clothing, so that they should never come in contact with their parents or with the Catholic religion, till they should be firmly established in the Protestant faith. As hardly any Catholic families would allow their children to be taken from them for such a purpose, the system has been signally unsuccessful. The society has never had above 50 schools or 2000 scholars, more generally about 40 schools and 1400 scholars; an amount so trifling as compared with the whole population, that it would not be worth mentioning, if it were not for the instructive lesson which the failure of such a plan holds forth. The expense of these few schools has been enormous. Besides all the private contributions, about L.10,000 per annum has been voted to them by Parliament; the whole grants of public money amounting to L.1,105,869. It is also alleged that the few scholars thus reared were striking examples of the utter folly of such an attempt. A horrible system of cruelty and coercion prevailed in the schools; all the natural affections of the pupils were suppressed; they were forbidden to see any human being related to them; and they grew up in total ignorance of nature and society. Hence, when they were sent abroad, they appeared stunted both in body and mind, and were found totally unfit to make their way in the world. In 1824, the society was found maintaining no fewer than 706 grown individuals, or about a half of their usual number of pupils, who had been unfitted, by their system, for procuring a maintenance in any other way. A more deplorable instance of human folly could not easily be found in any part of the world, than what is presented by the Charter School Society of Ireland.

The Incorporated Association for Discountenancing Vice, commenced in 1792, was the second of these societies, and made a great improvement upon the first. In the schools established by it, whilst the Church Catechism was used for Protestant children, nothing was required from those of Catholic parents but to read the Scriptures. In November 1819, it numbered 110 schools, attended by 4460 Protestants and 4360 Catholics; in 1824, 9578 of the former, and 6344 of the latter. The London Hibernian Society, established in 1806, was less liberal in its plan, and has not done so much good among the Catholics. In 1823, it had 653 schools, attended by 61,387 scholars; besides which, it had many Sunday schools.

In 1812, a society was formed, under the sanction of a Parliamentary committee, for the education of the Irish poor: it is usually called the Kildare Place Society, from the street in Dublin where its chief establishment has been built. Its grand principle was to afford education to every description of the lower class of the people, keeping clear of all interferenc with the particular tenets of any; and its specific o' jects were—to aid in the founding of new schools the improvement of old ones, provided the prine of the society were adopted; to maintain two n schools for the exhibition of their plan, and the t... ing of teachers; and to publish moral, instructive, and entertaining books, fitted to supersede the objectionable works then in use. The Kildare Place Society began to operate in 1817, and had prospered so much before 1825, that it then had 1490 schools, attended by about 100,000 scholars; in 1830, 1620 schools (two-thirds of them in Ulster), and 132,573 scholars. The system of instruction was a combination from those of Bell, Lancaster, and Pestalozzi. Each child attending the model schools in Kildare Place paid one penny per week. In the course of the seven years ending 1824, the society had published fifty-two small treatises, of which the total issue had been 956,702 volumes; the loss upon the sale L.650 per annum. Up to 1828, the Kildare Place Society had received L.170,508 from the public funds, and there has since been a grant of L.30,000, making the whole L.200,508.

During the same recent period, something has been done for the instruction of the poor in Ireland by the Baptist Society, the Irish Society, and the Sunday School Society. The last has been particularly efficient.

From inquiries made in 1828, it appears that there were in Ireland 11,823 elementary schools, of which no less than eight-elevenths were pay-schools, conducted by private enterprise, and altogether unconnected with either the clergy or charitable societies. The number of scholars in 1824 was 560,549, of whom 394,730 (Protestants 87,326, and Catholics 307,402) paid for their education. The number of masters and mistresses in 1826 was 12,530, of whom 3098 professed the established religion, 1056 the Presbyterian, and 8300 the Catholic, while of seventy-four the religious denomination was not ascertained. Upon the whole, the proportion of school-attenders to the total population shows rather better in Ireland than in England; a fact probably attributable to the higher sense of the value of education which is allowed to prevail among the common people in the former country.

Such was the state of education in Ireland, when, in 1831, the government resolved to commence a national system, avoiding various errors which had operated against all former attempts. Perceiving that the usefulness of the Kildare Place Society had been much impaired by its introduction of the Bible without notes, to which there was a constantly increasing opposition on the part of the Catholic clergy, the liberal administration of Earl Grey determined that the religious part of education should be kept separate from the literary, and be entirely under the control of the various denominations of clergy. Among the books to be employed in the literary education, they contemplated such extracts from Scripture as all creeds could sanction; but the great business of religious instruction was to be prosecuted on one or two days of the week set apart for the purpose. A commission was appointed by the Lord Lieutenant, consisting of the Protestant and Catholic archbishops of Dublin, a Presbyterian clergyman of high character, and a few other individuals, who were to form a board of superintendence, and whose various creeds should form a guarantee for the liberal intentions of the government. As yet the scheme has been prosecuted only as an experiment; but it has met with considerable success even in that limited character, and this in the face of a vigorous opposition from the church-ascendancy party. From the report of March 3, 1834, it appears that, from January 1832, 1548 applications had been made for aid towards schools, of which 789 had been attended to. The schools now in operation afford the benefits of education to about 140,000 children. The members of the board have conducted the business in perfect harmony. They have published several class-books, two of which contain Scriptural extracts. One day of the week besides Sunday is set apart for religious instruction, which is conducted by such pastors as are approved of by the parents and guardians of the children. "It shall be, as it has ever been," says the report in conclusion, "our constant object so to administer the system of education committed to our charge, as to make it acceptable and beneficial to the whole of his Majesty's subjects; to train up and unite, through it, the youth of the country together, whatever their religious differences may be, in feelings and habits of attachment and friendship towards each other, and thus to render it the means of promoting charity and good-will among all classes of the people."

FRANCE.

Previously to the (first) Revolution in this country, there were, besides Episcopal seminaries and conventual schools, lyceums and colleges in the cities, where young persons were prepared, under a system of monastic discipline, for the higher seminaries. The government did nothing for the education of the people at large, and the clergy, though possessing so large a share of all the property in France, and having the instruction of the people under their especial care, left them in utter ignorance; whence the horrid outrages that disfigured the early part of the Revolution. Some elementary schools were supported, here and there, by religious orders, or private persons; but the instruction was scanty, and, in all the institutions of education, was behind the age. During the Revolution, the schools were declared to be under the care of the state, but no plan for their proper management was adopted. Napoleon established several military schools, and others for instruction in trades and arts, and an imperial university was created, to have the supreme direction of instruction in France. But the plan was on a military principle, and as little fitted to promote the true purposes of education as the monastic narrowness of former ages. It failed entirely, so far as primary or elementary education was concerned.

Since the restoration of public tranquillity in 1815, the business of education has been well attended to in France, though it is only now on the point of being fully and properly established. Public instruction is there a department of the business of the state, being entrusted to a train of officers of various ranks, who preside over its various divisions, and the chief of whom, under the title of the Minister of Public Instruction, has a seat in the cabinet. The elementary schools are placed under the superintendence of committees, one of which is established in every canton of the kingdom, and watches over the progress of instruction in that canton. The number of members composing each committee varies according to the population and extent of the district. The ex-officio members are the curé, the justice of peace, and the principal of the college, if there be one in the canton; the other members are chosen by the rector upon the approbation of the prefect. Elementary schools are of three degrees, according to the nature of the education given in them; and while some are supported upon the voluntary principle, others are maintained by associations, charitable and otherwise; but whatever be the nature of the school, it has hitherto been impossible for any candidate to obtain the mastership of it, without a patent, certifying his qualifications, which he can only obtain, after a severe examination, from a superior functionary. Within the last three or four years, normal schools have been established all over France, for the preparation of teachers according to a regular system. In March 1834, there were 62, which served for 73 out of the 86 departments, and the number of pupils was 1944. The whole annual expense of these institutions is £60,000, great part of which is defrayed by voluntary local assessment. The young men are accomplished in, 1, Moral and religious instruction; 2, Reading; 3, Arithmetic; 4, Linear drawing; 5, Elements of physical science, with a special view to the purposes of ordinary life; 6, Music; 7, Gymnastics; 8, Geography and history; 9, Gardening; 10, the preparation of the simpler legal forms and civil deeds. The systems of mutual instruction and of simultaneous instruction have been very extensively introduced in France, and with the best effects. In 1815, there were 22,348 elementary schools, educating 737,369 pupils; in 1819, the number of pupils had advanced to 1,130,000, or one for every twenty-five of the population. In 1828, there were 1,500,000 in the way of being instructed, being double the amount of 1815, though still very far short of the number which, according to the most approved calculations, ought to have been at school. The population of France was, in the latter year, above 30,000,000; and hence there ought to have been at least 5,000,000 at school. It is gratifying, however, to know that the number of the educated is increasing at a much more rapid rate than the population, and that the French government is not only making liberal grants for schools, but is about to establish a state system, which shall provide for the education of the whole community. When such a system shall have got into full operation, and the generation which has first experienced its benefits have entered into life, a great change may be looked for in the national mind of France. It has been calculated that a third of the population of this fine country—the proportion being greater in the south than in the north—are unable to read or write: when all are able to do so, and have undergone the moralising influence of literature, the French people cannot fail to exhibit an improved general aspect.

SPAIN.

There are few establishments in Spain for the diffusion of the first rudiments of knowledge. The lower classes seldom learn to read and write: those above them are seldom instructed in any thing but these two accomplishments, and the elements of arithmetic. Such as are intended for the learned professions attend a Latin school for three or four years. Since the expulsion of the Jesuits, these schools are not numerous. The Spaniards are among the most ignorant and bigoted nations in Europe.

DENMARK AND THE NETHERLANDS.

Denmark and Holland strive to keep pace with Germany. In the former country there have been normal schools for the last forty years; and the monitorial system has been recently introduced, and has met with surprising success. Out of a single monitorial school, founded in the early part of 1819, seven had sprung up before it closed; in 1820, the number had increased to 11; in 1821, to 15; in 1822, to 35; in 1823, to 244; in 1824, to 605; in 1825, to 1143; in 1826, to 1545; in 1827, to 2003; in 1828, to 2302; and at the end of 1820, to 2646! In Holland, one-fifth of the population is stated to be at school, and the elementary seminaries are placed under a good organisation. In Belgium, education is too much in the hands of the priests to be in a good condition.

SWITZERLAND.

In the Protestant cantons of Switzerland, elementary education is in a flourishing state, the schools being attended by from one-sixth to one-tenth of the population. In the Catholic cantons, chiefly through unfavourable local circumstances, education is not in so satisfactory a condition, and is chiefly in the hands of the clergy. In several of the cantons, the Lancasterian method has been adopted, and Sunday schools are now becoming common. The new systems introduced by Pestalozzi and de Fellenberg, both of whom were Swiss, and commenced their operations in this country, are also producing some visible benefit, especially the latter, which is exemplified at Hofwyl to 6000 students, not to speak of an academy for the instruction of teachers, conducted at the same place. In Switzerland, education is partly supported and superintended by the various local governments; and in several cantons there are public institutions for the training of teachers.

NORWAY.

In Norway there are public schools for the lower orders, of which each parish necessarily has one, the teachers being appointed by the bishops of their respective dioceses. Children are compelled by law to attend these seminaries, where they are instructed in reading, combined with intellectual exercises, religion and bible-history, singing from the psalm-book, arithmetic and writing. The period of attendance is from seven years till the time of confirmation, which generally takes place at about sixteen or seventeen; and parents who withdraw their children during that period are liable to a fine. The teachers are partly supported by a fixed piece of land, and partly from a fund raised by local taxation.

SWEDEN.

In Sweden, the schools are much on the same footing as they were in the seventeenth century among the German Protestants. The clergy, in the possession of the church property of their Catholic predecessors, show little disposition to apply a part of it to the public instruction; and the government is too poor and too jealous to admit many improvements from foreign countries.

ICELAND.

This remote country is literally a chain of immense rocks, the summits of which are covered with snow. Situated in a climate where the ground is frozen during the greater part of the year, and where the sun for a long period hardly appears above the horizon, it affords to the inhabitants comparatively little occupation out of doors, and they have betaken themselves for amusement to intellectual pursuits. Dr Henderson, who recently visited Iceland, gives the following statement:—"On inquiring into the state of mental cultivation in Iceland, we are struck with the universal diffusion of the general principles of knowledge among its inhabitants. Though there be only one school in Iceland, and that solitary school is exclusively designed for the education of such as are afterwards to fill offices in church or state, yet it is exceedingly rare to meet with a boy or girl who has attained the age of nine or ten years, that cannot read and write with ease. Domestic education is most rigidly attended to; and I scarcely ever recollect entering a hut where I did not find some individual or another capable of entering into conversation with me on topics which would be reckoned altogether above the understandings of people in the same rank of society in other countries of Europe."

POLAND.

Poland, where formerly the nobility only were instructed by the members of religious orders, had, before its partition, some gymnasia, founded towards the end of the eighteenth century, and some common and country schools, but no well-arranged school system. In 1830, the number of pupils in the elementary schools was calculated at only 28,000, in a population of nearly four millions! After the close of the late insurrection against the Russian power, the schools called gymnasia were re-organised; but there no longer exists an university, or any other institution for the higher branches of learning. Twenty-two district schools have been instituted, and in the system of education appointed for them great care has been taken at least to inculcate sentiments of loyalty to the imperial devastator of this fine country.

RUSSIA.

The government of the vast Russian empire has directed its attention to a system of schools for a hundred years past, before which there were only conventual schools for the clergy, and some institutions for the sons of the great, established—almost by force—by Wladimir the Great. According to the decrees of the Emperor Alexander, schools for the circles, districts, and parishes, were to be instituted throughout the empire, in order to strike an effectual blow at the deep ignorance of the Russian people. The circle schools exist at present on the pattern of the German gymnasia, in most of the capital cities of the governments; the district schools are found in some towns of a middling size; the parish schools, however, in very few villages; and the greatest and best part of this plan remains as yet unexecuted. Somewhat earlier, there existed, in the German provinces of Russia, good gymnasia, and some common and country schools; but the latter are still in a very low condition. The education of Catholic youth was attended to by the Jesuits, who were admitted by Catharine II. into White Russia.

PRUSSIA.

The provisions made by government for the instruction of the people in Prussia have justly attracted the admiration of surrounding nations, and are certainly far superior to those which exist in Britain. There is a minister of public instruction, whose duty it is to superintend the national education, the religious establishment, the secondary medical schools, all institutions relating to public health, and all scientific institutions—as academies, libraries, botanical gardens, museums, &c.—every thing, in short, which concerns the moral and intellectual advancement of the people. This minister is the head of a council or board for the whole kingdom; under it there are councils for every province, and under these are the parish committees, who superintend the primary schools. In Prussia, as in the other states of Germany, all parents are bound by law to send their children to the public elementary schools, or to satisfy the authorities that their education is sufficiently provided for at home. This regulation is of considerable antiquity. It was confirmed by Frederick the Great in 1763, and was introduced into the Prussian code in 1794, and finally it was adopted in the law of 1819, which forms the basis of the actual system of Prussia. The obligation extends not only to parents and guardians, but to all persons who have power over children, such as manufacturers and masters of apprentices, and applies to children of both sexes, between the seventh and fourteenth year. If the parents omit to send their children to school, the clergyman is first to acquaint them with the importance of the duty which they neglect; and if his exhortation is not sufficient, the school committee may summon and remonstrate with them severely. If all remonstrances fail, the children may be taken to school by a policeman; or the parents, guardians, or masters, brought before the committee, and fined or imprisoned in default of payment, or condemned to hard labour for the benefit of the commune or parish. Every commune is required by law to have a complete *elementary school*, and every town containing more than fifteen hundred inhabitants to have at least one *town school*. In order to carry this law into effect, it is enacted that the inhabitants of every rural commune shall, under the direction of the public authorities, form themselves into a society composed of all the landed proprietors, and all the fathers of families not landed proprietors, resident in the commune. In general, every village is required to maintain its school. Several villages, however, may have one in common, if each is unable to support the expense of a separate school; provided that the distance from the common school is not greater than two miles in a flat country, or one mile in a hilly country; that the communication is not interrupted by marshes or rivers impassable at certain seasons of the year; and that the number of children is not too large—that is, more than one hundred for one master. For the support of the schools, the law provides—1. A suitable salary to the schoolmasters and schoolmistresses, and maintenance for them when they become incapable of performing their duties. 2. A schoolhouse, properly constructed, kept in repair, and heated. 3. Furniture, books, pictures, instruments, and means requisite for instruction and exercise. 4. The aid to be given to needy scholars. The *first* provision is considered by the law as the most important of all, and the local authorities are enjoined to raise the schoolmaster's salary as high as possible. In regard to the *second*, schoolhouses are to be in a healthy situation, of sufficient size, well aired, &c.; hereafter, they are to be built and repaired in conformity to general models. Attached, must be a garden of suitable size, &c., and applicable to the instruction of the pupils; and, where possible, before the schoolhouse, a gravelled play-ground, and place for gymnastic exercises. The *third* provision comprises a complement of books for the use of master and scholar, according to the degree of the school; a collection of maps, geographical instruments, models for drawing and writing, music, &c.; instruments and collections for natural history and mathematics; the apparatus for gymnastic exercises; and, where instruction is given in the arts, the requisite tools and machines. In regard to the *fourth*, if there be no charity school specially provided, every public school is bound to afford to the poor instruction wholly or in part gratuitous, as likewise the books and other necessaries of education.

The object of these elementary schools is the developement of the human faculties—intellectual, moral, and physical—through an instruction in those common branches of knowledge which are indispensable or useful to the lower orders both of town and country. The *town* or *burgher schools* which the law has provided, carry on the child until he is capable of manifesting a desire for a classical education, or for a particular profession. The gymnasia, a still higher class of seminaries, continue this education until the youth is prepared either to commence his practical duties in common life, or his higher and special scientific studies at the university.

In every complete elementary school in Prussia, the branches taught are, religion; the German tongue, and in the Polish provinces the vernacular language; the elements of geometry and general principles of drawing; arithmetic; the elements of physics, of general history, and of the history of Prussia; singing; writing; gymnastic exercises; the more simple manual labours; and some instruction in the relative country occupations. Every pupil on leaving school receives from his master and the committee of superintendence a certificate of his capacity, and of his moral and religious dispositions. This is produced on approaching the communion, and on entering into apprenticeship or service.

Seminaries for the instruction of teachers, both in the knowledge to be afterwards communicated by them and in the practical art of communicating it, form a very important appendage of the Prussian system of education. Without a proper training of schoolmasters, all public institutions for instruction must be comparatively inefficient. In Scotland, unfortunately, the matter is wholly neglected. On this subject, Professor Pillans has the following pertinent remarks:—"It is a curious fact in the history of our country (and we might extend the observation to more countries than our own), that, while ample provision is made for professional training in every other line, it never seems to have occurred to those whose business it was to make it, that any such provision was required for that profession in which I conceive it is quite as important and indispensable as in any other. In order to qualify a man to be a practising physician, lawyer, or divine, a long probation of preparatory discipline is very properly required. He must study the theory of his profession, and he must witness and engage in the experimental parts of it, before he is admitted to practise it publicly. Nay, more; there is scarcely a handicraft the aspirant to which is not bound to serve an apprenticeship of several years, in order to make himself acquainted with its mysteries. The precautions we take to have our medicines well compounded—our books well printed and well bound—nay, our very shoes well made—we utterly neglect when the question is whether our children shall be well taught. A certificate from a professor of some university, that the youth who bears it has attended a Greek or Humanity class, accompanied with a clergyman's attestation that he has been a regular hearer in his church, and has led a quiet life in his parish, are deemed ample proofs of his fitness to be a schoolmaster; and upon no better evidence are raw lads appointed every day to this difficult and delicate task, of which they have never thought seriously but as a means of subsistence." In Prussia there were, at the close of 1831, thirty-three seminaries for the training of primary instructors. The course of preparation lasts three years; in the first is contained the previous primary education of the pupil; the second is devoted to the special instruction of a higher order; and the third to practical exercises in the annexed primary school, and other establishments of the place.

The universality of the operation of the Prussian law will appear from the following statement:—According to the newest census, the population of Prussia amounts to 12,726,823 souls. Of this number, there were, in the year 1831, 4,767,072 children up to the age of fourteen years complete. Now, it is reckoned, that, out of 100 children from one day to fourteen years old, about 43 are between seven and fourteen—the legal age for attendance at school. Consequently, if all children of the required age attend the public schools, the number would be 2,043,030. Now, it appears from official returns, that, in 1831, the number of children attending the public primary schools was 2,021,421; leaving a deficiency of only 21,609, to embrace boys educated at home or at private schools.*

GERMAN STATES.

Ever since the Reformation, elementary education has been a leading object in the Protestant states of Germany, but comparatively neglected in the Catholic. It has of late years received a great additional impulse, and is now established in Wirtemberg, Baden, and Bavaria, on much the same principles, and to nearly the same extent, as in Prussia. In 1807-8, the Bavarian government established, besides the gymnasia for classical education, seminaries called *Real-Instituten*, where young persons who intend to become merchants, apothecaries, manufacturers, artists, &c. are instructed in those branches of knowledge which are of most general utility—in history, religion, modern languages, mathematics, and the natural sciences. A final reorganisation of the Bavarian system of education took place in 1825. In this kingdom there is a particular department in the ministry of the interior, to superintend the subject of education, whose authority extends to all the various schools and institutions.

Austria possesses a national or state system of education, with the advantages of normal schools, and other establishments, for the instruction of teachers. The groundwork was here laid for elementary instruction among the common people at a much earlier day than in most of the European states. At the beginning of the last century, there were not more than three out of twenty children who enjoyed the advantage of public education; whereas their numbers, at the present moment, are equal to two-thirds of all the young persons who are susceptible of instruction. Of this class there are two millions of individuals in the Austrian states, exclusive of Hungary; and out of these two millions there are nearly one million and a half on the books of the national schools. Deducting 1500 schools of industry and girls' schools, as well as 6000 supplementary schools, which exist in the Hungarian provinces, there are altogether 13,000 elementary and superior schools in the Austrian empire; the average result of which is, that there is one school to every 275 families. In Austria Proper, and the district of Saltzburg, there are 244,382 children of a teachable age, and 231,749 of them are under tuition; in the Tyrol, there are 99,463 children taught, out of 105,250; in Moravia and Silesia, 230,563 out of 250,749; in Dalmatia, 1460 out of 2249; in Styria, Carniola, Carinthia, and Illyria, only 98,150 out of 231,310; and in Gallicia, but 51,129 out of 444,044.

The smaller states of Germany, as Nassau, Lippe-Detmold, Anhalt-Dessau, and the Saxon dukedoms, have done much for schools. All have institutions for teachers, which is perhaps the most cheering feature in the whole system. The great variety of accomplishments which are conferred in the superior schools of Germany, has of late years attracted much attention in Britain, which is no more to be compared to that country in this valuable class of institutions, than Germany is to be compared to Britain in political circumstances. Hence it has now become a prevailing fashion, and one that will probably increase, to send young persons who are destined for liberal though not exactly learned professions, to the German schools. The writer of this sheet was recently informed of a Scottish family consisting of two sons, one of whom has been reared in his native country for the church, and has passed through the narrow and antiquated course of instruction which has been appointed for such individuals; while the other, educated in Germany for a mercantile career, though two years younger, is not only a tolerable classical scholar (and his brother is little more), but can speak in the French and German tongues, reads Italian, is a first-rate mathematician, and possesses a fund of general knowledge and an expandedness of mind, forming the most striking contrast to the acquirements of his brother. Owing in a great measure to the diffusion of education in Germany, the people at large are remarkable for their peaceable and orderly habits. Mr J. C. Loudon, well known for his able works on gardening and other useful arts, visited Wirtemberg, Baden, and Bavaria, a few years ago, and, in a pamphlet published at Paris, gave a highly agreeable account of his observations. "After what I have seen in Wirtemberg," says he, "and what I have observed with respect to its population, I am inclined to regard it as one of the most completely civilised countries in Europe, and I am persuaded that the end of government is more perfectly attained than in Great Britain; because, with an almost equal degree of individual liberty, there is an incomparably smaller amount of crime, misery, and poverty, and much more of politeness and cordiality." In Bavaria the beneficial consequences resulting from the establishment of a system of national education have been more signal than in any other European country. Half a century ago, the Bavarians were the most ignorant, debauched, and slovenly people between the Gulf of Genoa and the Baltic. That they are at present patterns of morality, intelligence, and cleanliness, it would be going too far to affirm; but perhaps no people has ever made a more rapid advancement in the career of civilisation than they have made during the last thirty years. One-eighth of the entire population is at school.

ITALY.

The northern provinces of this country, which are under the sway of Austria, partake of the improved system of elementary education now flourishing in the German states, and are therefore more fortunate in respect of early tuition than the southern states. The schoolmasters have from 250 to 400 Austrian livres of fixed salary, and the schools exhibit a well-organised system of progressive education. It was found a few years ago that in the Venetian part of Lombardy, which contains a population of 1,894,000, there were 1402 elementary schools, attended by 62,000 pupils, besides 29 female schools, attended by 2390 girls.

In the continental territories of the king of Sardinia, popular education is in a very poor condition; but in the island of Sardinia, which contains about half a million of inhabitants, every village or commune has now, by a recent decree, a gratuitous school, for reading, writing, arithmetic, religious instruction, and the elements of agriculture, while there is a normal school for each of the ten provinces into which the island is divided. A very few years since, the learning of reading and writing was forbidden to all who did not possess a capital of 1500 lire; since those horrible times, the number of murders in the island has been reduced from 150 annually to 90.

Popular education in the Papal states is in the hands of the clergy, and hence, though it is widely diffused, it is conducted on narrow principles. The same thing may be said of Naples, though it is admitted that a decided improvement is there taking place. Some attempts have been made to establish Lancasterian schools in Naples, and normal schools are already in existence. In Sicily, a still better prospect is held out. There are in that island both primary and secondary schools, which are encouraged by the government; and the system of mutual instruction has actually taken root in the island.

GREECE.

Since the revolution in this country, a very eager desire of instruction has been manifested by the people. It was stated in 1831, that there were about 400 elementary schools in the Peloponnesus and islands, attended by nearly eight thousand scholars, who were chiefly reared upon the plan of mutual instruction. The means of instruction were, however, very generally inadequate to the end. In many places, the scholars had to meet in the open air, and in some schools of forty pupils there was not one entire book. An institution called the Orphanotrophion has recently been built at Egina, at the expense of government, for the education of the children redeemed by the French government in Egypt, and orphans of the country, as well as the offspring of indigent parents. Here, in 1830, about three hundred children were instructed in the elementary branches of education, and afterwards taught the mechanical arts under another roof. The ancient Greek language is a favourite branch of education in modern Greece, and mathematics are taught in several places. Much has been done for education in Greece by American missionaries, and it is probable that the King of Bavaria, father of the young sovereign recently appointed to rule the country, will not long allow it to want that blessing in its full extent, which he has so liberally conferred on his own subjects. The most promising feature, however, in the prospects of Greece, so far as education is concerned, is the enthusiastic desire of the people themselves to become an enlightened nation.

IONIAN ISLANDS.

In this British dependency, besides an university and a preparatory school, both of which are well attended, there are 125 schools of mutual instruction for elementary education, attended by 4555 scholars. There is a central school in each island, and two in Cephalonia, and the master of each of these institutions inspects the village schools every three months. Slates, pencils, desks, and benches, with a few books, are supplied by the public, under certain conditions.

EGYPT.

The present pacha, Mohammed Ali, among other schemes for the improvement of his country, has established some elementary schools, one of which, at Cairo, has 600 pupils of Turkish and Arabian lineage, who are instructed in their own and the Italian languages, drawing, arithmetic, and geometry, military exercises, and the art of printing. At Dgiaad-Abad, he has also established a military college for the education of officers, and a medical school for the education of surgeons and physicians, for his army. The branches taught in these institutions are almost exactly the same as those which obtain in similar schools in Britain. The object of Mohammed, however, is stated to be less the enlightenment of the people at large, than the improvement of his military resources.

* Many additional particulars of great interest, respecting education in Prussia, will be found in Mrs Sarah Austin's translation of the report made upon this subject by M. Cousin, to Montalivet, the French Minister of Public Instruction, lately published; and in the Edinburgh Review, No. 116, and the Foreign Quarterly Review, No. 24; from which our own knowledge of the subject is derived.

UNITED STATES OF AMERICA.

No country in the world has made such advances in universal education as the United States of America. The tone imparted by the early colonists of the New England states, who were intelligent, educated men, has never been lost; and the principle which they established, that the education of the community should be conducted at the common expense, has never been abandoned in the states that they planted, and has been successively adopted by the states lately incorporated with the Union. There are three descriptions of public seminaries in the States: The first consists of the free schools, at which the elementary branches are taught; the second are the academies, incorporated by law, for giving instruction of a higher kind; and the third are the colleges—three classes of schools forming altogether a routine very much like that of Scotland, and conducted on very much the same plan of instruction.

With regard to the extensive establishment of free schools, one of the chief advantages of the system is, that the whole population is made to take a direct personal interest in the business of education, and to carry it on in the way best suited to supply the general wants. The people in their town meetings vote the assessments for the support of the schools, by their committees spend the money which is collected from this or other sources, and, by their children, get the benefit of the outlay. The process is thus essentially popular, and as free of jobbing as possibly may be. Another great advantage is, that the schools are supported by a tax on property, although there are exceptions to this rule in some of the states, in which a public fund assists in bearing a proportion of the expense. But every where in New England, except in Connecticut, they are supported by a tax on the property of all. It is therefore an arrangement eminently beneficial to the poorer classes of the community. In most towns, one-fifth of the inhabitants pay at least one-half of the tax, and instead of sending one-half of the scholars, do not send one-sixth. Of course the school-tax is substantially a tax on the wealthy to educate the children of the poor. Thus, a mutual benefit flows to both poor and rich. The poor are assured by law that their children shall be educated, and thus preserved from the greatest temptation to crime; while the rich are assured that they shall live in a community where the universal diffusion of education shall keep the foundations of society safe. The schools are in this light a great moral police, to preserve a decent, orderly, and respectable population; to teach men, from their earliest childhood, their duties and their rights; and by giving the whole mass of the community a sense of character and a general intelligence, make them understand the value of justice, order, and moral worth. The mode in which this system of popular education is carried into effect is perfectly simple, and is one principal cause of its practical efficiency. The New England states are all divided into territorial communities called *towns*, which have corporate privileges and duties, and whose affairs are managed by a sort of committee annually chosen by the inhabitants, called *selectmen*. These towns are of unequal size; but in the agricultural portions of the country, which contain four-fifths of the people, they are generally five or six miles square; and upon them, in their corporate capacity, rests the duty of making provision for the support of free schools. In all but the smallest towns, one school, at least, is kept through the whole year, in which whatever goes to constitute a common English education in reading, writing, geography, history, &c. are taught under the immediate superintendence of the selectman, or of a special committee appointed for the purpose. This, however, would not be carrying education near enough to the door of the people, in agricultural districts, to enable them fully to avail themselves of it, especially the poorer classes and the younger children. To meet this difficulty, all the towns are divided into districts, varying in number, in each town, from four to twelve, or even more, according to its necessities and conveniencies. Each district has its district school committee, and receives a part of the tax imposed for education; sometimes in proportion to the population of the district, but oftener to the number of children to be educated. The committee of the district determine where the school shall be kept, select its teacher, choose the books that shall be used, or delegate that power to the instructor, and, in short, are responsible in all particulars for the faithful fulfilment of the trust committed to them; the general system being, that a school is kept in each district during the long winter months, when the children of the farmers are unoccupied, by a male teacher, capable of instructing in reading, writing, and arithmetic, English grammar, geography, and history; while, in the same school-house, during the summer months, schools are kept by women, to instruct the smaller children in knowledge even more elementary. In this way, for the population of New England, consisting of two millions of souls, not less than from ten to twelve thousand free schools are open every year, or, on an average, one school to every two hundred souls—a proportion undoubtedly quite sufficient, and larger than would be necessary, if the population were not in many parts very much dispersed.

With respect to the academies, they are a superior kind of schools established in the larger towns for communicating instruction in the ancient and modern languages, the lower branches of mathematics, and natural philosophy. They are generally incorporated by the legislature at the instance of an association of individuals desirous of procuring better teaching for their children than can be had at the free schools. They sometimes receive grants of money from the public authorities; they are also occasionally founded by charitable donations from private individuals, and are supported in part by the tuition fees of the pupils, which are remarkably moderate. These seminaries, which amount to about five hundred in the country, act as preparatory institutions for the various universities or colleges.

MAINE—POPULATION 399,437.

Every town in this state is required by law to raise annually, for the support of common schools, a sum equal at least to 40 cents for each person in the town,* and to distribute this sum among the several school districts according to the number of scholars in each. According to the reports made in 1826, there were, in the state, 2499 school districts; 137,931 children between the ages of four and twenty-one; of which 101.325 usually attended school; the sum required by law to be annually raised D.119,334 (dollars); annual expenditure D.1?7,875.

NEW HAMPSHIRE—POPULATION 269,328.

Common or free schools are established throughout the state, and for their support, a sum, amounting each year since 1818 to D.90,000, is annually raised by a tax. This state has, besides, a literary fund, amounting to D.64 000, formed by a tax of one-half per cent. on the capital of the banks. The proceeds of this fund, and also an annual income of D.9000 derived from another kind of tax on banks, are appropriated to aid the support of schools.

VERMONT—POPULATION 280,657.

The money raised by the general law of this state for the support of schools amounts to about D.100,000, levied by a process of taxation. Besides this sum, the state has a literary fund, derived principally from a tax of six per cent. on the annual profits of the banks. In 1829, this state had a school-debt of upwards of D.23,00·

MASSACHUSETTS—POPULATION 610,408.

Schools and academies are well supported in this enterprising state. According to the report of the school committee of Boston, in 1829, the number of public schools in that city was 80; pupils 7430; expense of tuition, fuel, &c. D.52,500; the estimated rent of schoolhouses D.10,000; making the whole expense amount to D.62,500. Private schools in the city, 155; pupils, 4018. Besides the Harvard College at Cambridge, there are 56 incorporated academies in the state.

RHODE ISLAND—POPULATION 90,000.

The attention to education in this small state is on the increase. The sum of D.10,000 is now raised annually for the support of free schools, each town receiving a portion of the money according to population.

CONNECTICUT—POPULATION 297,675.

This state possesses an important school-fund, which was derived from the sale of lands, reserved by Connecticut, in the state of Ohio, and which amounted, in the year 1829, to D.1,882,261. The income of this fund is appropriated to the support of primary schools. In one year, up to March 1829, the sum of D.72,161 was divided among the different free schools throughout the state. The number of children between the ages of four and sixteen, in 1828, was 84,899; and the dividends amounted to eighty-five cents to each child.

NEW YORK STATE—POPULATION 1,918,608.

By the report presented in January 1829 to the legislature of this populous and flourishing state, by an official entitled the Superintendant of Common Schools, it appears the school-fund then belonging to the state amounted to D.1,661,081, in stocks and other securities, and 869,176 acres of land; that the revenue actually received into the treasury on account of this fund, in 1829, was D.9?,?26; that there were in the several towns in the state 8872 school districts, and of this number 8292 had complied with the condition of the statute, by having schools kept at least three months by an inspected teacher, and by making returns to the commissioners; that there were in the districts from which reports had been received, 468,257 children over five and under sixteen years of age; and that, in the common schools of the same districts, 480,041 scholars had been taught during the preceding year. "Our system of school instruction," continues the reporter, "is based on the principle that the state, or the school-fund, will pay only a share of the expense, and that the towns, by an assessment upon property, shall pay at least an equal share. The total amount paid this year by the patrons of the common schools for teachers' wages was D.297,048, which, added to the public money, makes an aggregate of D. ,878, paid for teachers' wages alone. Thus it will be seen, that, where the state or revenue of the school-fund pays one dollar for teachers' wages, the inhabitant of the town pays, by a tax on his town, and by voluntary contribution in his district, more than four dollars for the same object. This latter sum of four dollars is made up in the proportion of one dollar assessed upon property to three dollars paid by the scholar."

PENNSYLVANIA—POPULATION 1,348,233.

The law of this state provides for the most extensive system of free elementary education; so much so that the children of every poor man are educated free of all charge. The expenses attendant on the school establishments are defrayed by the county commissioners. The schools are superintended by gentlemen who serve without compensation; and the teachers, who are well qualified for their duties, are liberally remunerated. Stephen Girard, a wealthy merchant of Philadelphia, who died in 1831, bequeathed two millions of dollars (or more if necessary) to build and endow a college or school in that city for the education of orphans; which bequest has been acted upon, and now provides board and education to 300 children, who are taught reading, writing, grammar, arithmetic, geography, navigation, surveying, practical mathematics, astronomy, natural, chemical, and experimental philosophy; and the French and Spanish languages. Principles of morality are also inculcated; but, in the terms of the founder's will, "no ecclesiastic, missionary, or minister of any sect whatsoever, shall ever hold or exercise any station or duty whatever in said college; nor shall any such person ever be admitted within the premises appropriated to the purposes of said college."

DELAWARE—POPULATION 76,748.

There is a school-fund in this state, amounting to D.170,000, the interest of which, together with a small tax levied on each school district of four miles square, at the will of the majority of the taxable inhabitants, is put aside for the support of free schools. It is arranged that no district shall be entitled to any share of the school-fund, that will not raise by taxation a sum equal to its share of the revenue of the fund.

In Maryland, in Virginia, and in the southern as well as in those states lying in the valley of the Mississippi, there appear to be processes of education all less or more similar to the foregoing. In Virginia and some others there are school-funds raised by the sale of escheated property, and lands forfeited for nonpayment of taxes, confiscations, &c. What has been detailed is sufficient to show that the great principle on which the free educational system is based in the states, is the protrusion of schools into the most minute sections of the country, so as to bring education home to the door of every one, and on such a magnificent scheme of liberality that the very poorest person may have his children educated in a way fit to render them useful and intelligent members of society. Our information regarding the mode and extent of instruction in the free schools of the states is much less distinct; but from a personal knowledge of the vast number of excellent elementary, moral, and instructive works, which are now issuing from the American press, and which certainly surpass the antiquated collections, spelling-books, and school treatises in this country, we are inclined to suppose that the minds of the young must undergo a training exceedingly creditable to teachers and parents, and undoubtedly advantageous to the rising generation themselves.

LOWER CANADA.*

This important colony, according to a census taken in the summer of 1831, contains a population of 368,449 souls, which number is receiving constant augmentations by means of emigrants from the United Kingdom. It is gratifying to learn that amid the prosperity which the province is now experiencing, the subject of education is not forgotten or neglected; but that, on the contrary, much of the attention of the colonists and a large share of their public funds are applied to this all-important purpose.

The Royal Institution for the advancement of education, a board incorporated by an act of the Provincial Parliament, has under its management eighty-one schools, attended by 3578 scholars. This institution is supported by an annual grant of the Provincial Legislature, and is placed under the management of the Bishop of Quebec as the principal. The largest of the seminaries thus supported are, the free schools of Quebec and Montreal, the former having 222, and the latter 221 scholars. The board does not enjoin the adoption of any particular course of instruction, but contents itself with selecting competent masters for each school, and leaves to their discretion the choice of the system to be pursued. In addition to these eighty-one schools, the Royal Institution has under its management two grammar schools, one in Quebec and the other in Montreal, where the course of instruction pursued is the same with that followed in the generality of grammar-schools in England. Each of these schools has twenty free scholars, for whose instruction the sum of L.200 is annually assigned out of the revenues of the estates formerly belonging to the order of Jesuits; a further allowance is made of L.90 at Quebec, and L.50 at Montreal, for rent of schoolhouses. Other scholars are admitted to these grammar-schools, upon payment of L.12 annually for each.

* To comprehend the value of these expenses it may be explained that a dollar is worth 4s. 6d. sterling; and the dollar being divided into 100 parts or cents, a cent is thus worth rather more than a British halfpenny

* For this and the following article, as well as for much information in other departments of the present sheet, we are indebted to a work of superlative utility, the Useful Knowledge Society's Journal of Education, published quarterly.

The Royal Institution was established by an act of the Provincial Legislature in the year 1800, and it is probable that the provision then made for the advancement of education in the colony was sufficient at that time. The rapid increase of the population during the last few years, and the moral wants of its new inhabitants, have, however, forcibly called the attention of the colonists to the subject. Under the provisions of a provincial act (9 Geo. IV.), upwards of 1000 schools have been established since 1829 throughout the province; and these schools, according to the most recent accounts, are attended by 45,558 scholars of both sexes. These schools are placed under the management of trustees, who are elected annually by the inhabitants of the township or parish in which each is situated. The sum of L.20 is granted to the teacher of each school, when it is attended by at least twenty scholars. No particular course of instruction is followed, but the British or Lancasterian system has been introduced into many of the schools.

Several colleges are established in different parts of the province in connection with the Roman Catholic church, as well as many private seminaries in which the higher branches of education are taught to children of the richer Protestant inhabitants.

UPPER CANADA.

This province, which is divided into eleven districts, had, in 1831, a population of 211,567 souls. For the purposes of education, each district has an annual grant from the Provincial Legislature of L.90 appropriated towards defraying the expenses of a classical school, in addition to L.250 voted for the support of common schools: this money is distributed by trustees appointed under an act of the legislature. Besides these common schools for daily instruction, there are numerous Sunday schools established in every district of the province; and as the best effects are seen to result from their establishment, these schools are fast increasing in number.

In 1829, the board of trustees for the advancement of education in the province, computed that about 20,000 children of both sexes were provided with some kind of education in the schools of the different districts, and that as many more were without any means of instruction, the public provision made for the purpose being wholly inadequate to the wants of the colony. Since that time, the population of Upper Canada has received an important accession to its numbers, from classes to whom assistance of this kind is most necessary. May we not hope that the example set to its legislature by that of the adjoining province will not be lost; but that the good effects which cannot fail to manifest themselves in the condition of the rising generation in Lower Canada, will stimulate those who possess influence in the upper province to a similar course of action?

York, the capital of the province, has a school, supported by government, where gratuitous instruction is given on the Lancasterian system; this school is managed by a master and two assistants. York also contains the Upper Canada College, and Royal Grammar School, which is under the management of a principal and vice-principal, one mathematical and two classical professors, besides instructors in French, writing, arithmetic, and drawing. The course of studies pursued in this college comprises "the classics, mathematics, English composition and history, writing, arithmetic, geography, and the French language."

WEST INDIES.

Education may be described as in a low state in the West Indies. The children of the planters are generally sent home to Britain to be educated; and hence there are few whites at school in any part of these colonies. It is only within the few past years that the prejudices of the planters would allow any of their slaves to be subjected to school instruction; and, even now, out of a total of 697,418, only 9930, or about 1 in 70, of this unfortunate class, are taught to read, while but a tenth part of these are permitted to acquire writing and arithmetic. Some of the islands, however, are much more liberal in this respect than others. Out of 29,839 slaves, or what were lately slaves, in Antigua, 4451 are at school; out of 19,310 in St Christopher's, there are 1876; while in Jamaica, out of 322,421, only 521 enjoy the blessings of education, of whom but 17 learn writing and accounts. In Tobago, where there are 12,556 unfree people, only 7 are instructed; in St Vincent, out of 23,589, only 138. A greater proportion of the free coloured people are instructed: in Montserrat, out of 814, exactly a half are at school; in Grenada, out of 3786, there are 480. The proportion of school-attenders among the whites appears much below that of any other civilised country: Of 1980 in Antigua, only 39; of 840 in Dominica, only 7; of 322 in Tobago, only 2. Of 32,000 whites and free blacks in Jamaica, 1496 are at school; a proportion apparently above the average. Out of the total West India population of 831,274, the total of scholars is 19,406, of whom only 5864 learn to write.

Though education be thus low in these important colonies, it is constantly rising, and will probably, in a short space of time, be in a much more flourishing state. The schools have as yet depended solely upon private enterprise and private beneficence, and the methods of instruction are not good. But the attention of Parliament has been directed to the subject, and it will probably be deemed a necessary precaution, in anticipation of the manumission of the slaves, that all should be instructed.

CONCLUDING REMARKS.

The present sheet, for the first time it is believed, gives an outline of the state of education over the whole civilised world. The purpose of bringing these facts into one place, was to show how partial and imperfect education has as yet been, and is—how deplorably insufficient both in amount and in method. We are thus enabled to see at a glance, that, even in nations of good character, the mass of the common people are in one of two conditions, either in that of utter unacquaintance with letters, or at the most instructed in nothing besides letters—so that, while the upper classes enjoy a certain reputation for moral and intellectual refinement, the great bulk of the lower are confined to the developement of little more than those parts of their nature which they possess in common with ordinary animals. If the writer has succeeded in making out this case, he trusts that the most of his readers will be inspired with the wish which inspires himself, and which is now gaining ground every where, that fair play should at length be given, by means of a moral, intellectual, and physical education, to the better qualities of the whole of the human race. In the present sheet there is little room to argue upon the subject; but we shall employ the small space that remains to us, in stating what we conceive ought to be done by all nations in respect of education.

Education ought every where to be a matter of state-policy, in order that proper methods and qualified teachers should be attainable. The elementary parts of it ought to be accessible to all orders of the people, without money and without price—payable, however, not out of the national exchequer, but by local assessments.

It should be the first duty of each government to form a proper code of instruction—one calculated to develope and exercise the moral, intellectual, and physical faculties—which should be rendered imperative in all the schools under its protection. To render the system efficient, schools should be established in every considerable district for the instruction of masters in the branches of knowledge to be taught, and in the business of teaching; and a diploma from such an institution should be an indispensable passport to every school, public or private. The normal schools, as these are called, should be supported in the first place by government, while such fees ought to be exacted as may fully or nearly cover the expense.

Elementary education, with moral tuition, ought to be entirely free, because by no other method can the *whole* of the community be brought to school, and because, without the whole community being educated, the great end of education, as a system of moral police, would be defeated.

As curiosity respecting the natural world is the first part of the mental constitution which is developed, and as the success of instruction must greatly depend on the advantage which is taken of the natural dispositions and capacities of the pupil, it would be proper to commence education by introducing the young to natural objects and their various properties, which can be done by means of lively graphic representations. This part of education must be entrusted to what are called infant schools, to which the young should be initiated at about three years of age. It is also possible, in infant schools, to acquaint the children with the elements of arithmetic, and various other branches of knowledge, by means of sensible objects. While mere knowledge is given, it might be made the means of conveying religious impressions also. From the *objects* of nature, the reference to the *God* of nature is easy; and by directing attention perpetually to not only the excellent nature of every thing, but the admirable fitness of all things for each other, the elements of natural theology would be effectually impressed. The pupils must be kept in the constant *exercise* of the virtues—benevolence in thought and action, justice in dealing, truth in speech; and unceasing efforts must be made to repress the inferior feelings and propensities—selfishness, coarseness, cruelty, and improbity. Thus, the pupils, seeing virtue invariably commended in practice, and vice as invariably condemned, will acquire habits which can hardly fail to attend them, in a greater or less degree, through their subsequent years.

At five or six, the infant school period ceases, and the pupils may be properly introduced to the elements of literature. Much of simple reading must depend on the memory. The forms of the letters, and the appearances of these when combined into words, must be impressed on that sense before any progress be made. There is certainly no need, however, to load the memory with any thing beyond the elements of reading: spelling can be learned through the mere impression which the words make upon the eye in the course of reading, and all exercises which consist in the learning of pieces of prose or verse by heart, are only so much lost time, forming, even in their highest success, but an useless wonder to impress parents and visitors with the idea that the children are rendered *clever*. As soon as reading is mastered, it should be immediately employed in its legitimate ends, the introduction of the pupils to the stores of useful and elegant literature, in the acquisition of historical and geographical knowledge, and in the study of the physical sciences.

For reading, the monitorial system will always be found the most convenient and advantageous in large schools. It should be conducted on what is called the intellectual plan, by which it is meant that the pupils must be made to understand every word that occurs. Pictures of objects would also be of service, in the conveying, at least, of substantive ideas. With regard to the teaching of writing, we have no improvements to suggest upon the methods usually adopted; but it may be hinted that arithmetic ought to be explained philosophically, at the same time that its rules are made the subject of regular progressive exercise.

All kinds of knowledge that do not chiefly consist in substantive ideas, should be left to the latter part of the course. In their earlier years, children are capable of understanding very little beyond what can be seen and touched; and it is therefore necessary to wait for the developement of the faculties before any attempt be made to convey abstract ideas. Almost all the physical sciences consist in sensible ideas, and hence, with proper exemplifications, the most of them can be taught to pupils under ten years of age. Children at that period of life can be easily taught chemistry, geology, mechanics, the elements of geometry, natural history, including animal and vegetable physiology; and they *ought* to be taught those sciences. Simple classbooks should be prepared for the purpose, and, so far as possible, experimental apparatus should also be provided. Here, in our opinion, terminates the education which should be at the public expense.

In a more advanced order of schools, the teacher ought to proceed to abstract studies. Among these we would be disposed to include grammar, which cannot be fully comprehended by children under eleven or twelve years of age. To this time of life ought also to be postponed the study of foreign languages, living and dead, so far as these might be deemed necessary for particular pupils. The more necessary studies of this period are natural theology, the higher branches of mathematics, political economy, the principles of the constitution under which the pupils live, and a few simple views of the nature of the human mind. The whole course could easily be arranged in such a manner as to terminate at the age of fourteen, when the pupil would be sent out to the world, not confused with a few Latin and Greek words, as the scholar of the present day generally is, but fully acquainted with the world in which he is to live, and with his own constitution, mental and bodily; qualified to judge clearly between right and wrong; capable of protecting his own health and interest, and inspired with the best feelings towards his fellow-creatures; in short, a being whose natural properties had all been trained and improved to the best advantage, in obedience to what appears to have been the will and design of his Creator. The remaining years of youth, where the calls of a profession did not interfere, might be employed in an extended course of private reading, and in attendance on such academic or other classes as seemed likely to be advantageous.

Such is a brief and imperfect outline of a system of education, which appears to us to combine the best ideas of the most enlightened inquirers into this subject. It may be long before existing circumstances and prejudices will allow such a plan to be followed very generally; but that it will be eventually followed every where throughout what is called the civilised world; and that it will in time raise the moral and intellectual nature of man far above what it has ever been supposed capable of, we have no doubt. If the industrious classes in our own country had a true perception of their interests, they would take up the question with far more fervour than they have ever displayed in either political or trades' unions, and their aid would be of much service in promoting the cause. It is the master-key to all the difficulties and distresses of their situation. If their interests have been in any instance sacrificed or neglected, if their blood has been shed in wars, and their physical strength overtasked in toils on behalf of their superiors, it has only been owing to their ignorance. If they desire that their rights should be efficiently protected, they must cause themselves to be instructed, in order that they may become their own protectors. The improvement of their condition rests almost entirely with themselves, and education is the means by which they may be enabled to work that improvement.

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PNEUMATICS, ACOUSTICS, AND AERONAUTICS.

PNEUMATICS.

PNEUMATICS is a term derived from a Greek word which signifies *breath* or *air*, and denotes the science which treats of the mechanical properties of elastic fluids, such as the air or atmosphere which we breathe. Reasoning by analogy, we conclude that all material substances are capable of existing in three different states, the solid, liquid, and aëriform; each state depending upon the quantity of heat which the body contains at the time. Thus, the liquid water, when deprived of a certain portion of heat, becomes the solid body ice; and when, on the other hand, a certain proportion of heat is imparted to it, it becomes the aëriform body steam. Steam, however, though a highly elastic body, and hence exactly similar in this respect to the aëriform fluids treated of under Pneumatics, differs from them in this, that it does not remain permanently elastic; that, in fact, at ordinary temperatures, it does not exhibit this form at all, but appears as the liquid water. The term vapour is usually applied to such bodies as are fluid at the ordinary temperature of the atmosphere, but can by natural or artificial heat be made to exist in the elastic form. To distinguish between fluids such as water and those similar to air, the former are sometimes called *inelastic*, and the latter *elastic*, fluids. But as water is compressible, and possesses the property of occupying the same space after the mechanical force by which it was condensed is withdrawn as it did before it was applied, these terms of distinction are in strict philosophical language incorrect. Air, or gas, which is a German word for air, differs from other fluids such as water in two circumstances, great lightness, tenuity, or thinness, and extreme elasticity. By extreme elasticity is meant that quality in virtue of which certain bodies are easily compressed into smaller bulk than they naturally possess, and as easily resume their former state when pressure is withdrawn from them. Indeed, so extremely compressible is common air in comparison with water, that did not the term inelastic, as applied to fluids such as water, convey an idea that it was impossible to make them occupy smaller space (they still of course retaining their liquid state), the words elastic and inelastic would admirably distinguish the two classes of fluids alluded to; and with this explanation we may occasionally employ them.

But there is another and a most important characteristic distinguishing fluids such as air from all others: it is, that the particles of which they are composed mutually repel each other. In water they are kept together by the attraction of cohesion; in the state of air there exists no cohesive attraction whatever, and the atmosphere is only prevented from dissipating itself throughout space, by the common attraction which each individual particle possesses for the earth. Elastic fluids differ materially in their chemical properties; but as atmospheric air exhibits all the mechanical properties which we shall have occasion to notice with reference to these bodies, our investigations are entirely confined to it.

THE ATMOSPHERE.

The atmosphere is that thin transparent fluid surrounding our globe to the height of about fifty miles. It is in this aërial medium that clouds, balloons, &c. float like light bodies in water, by which birds are enabled to fly, and of which we breathe. For its composition and chemical properties, see our number upon Chemistry. The air is sometimes said to be invisible, but this is not correct; it is an azure coloured fluid, as is proved when we turn our eyes to the firmament above us. The reason why we cannot perceive the atmospheric tint when we view only small quantities of air, is, that, from its extreme rarity, it reflects colour very faintly; and hence a great mass of the substance must be looked at before as many of the rays of light which it reflects can be concentrated upon the eye, so as to convey to it the sensation of colour. For instance, sea-water is green when we view an immense quantity of it, such as the German Ocean; but if we view it in a wine-glass, it appears perfectly colourless. On a dry clear day, the hills at only a few miles' distance appear of a bluish hue, not because they really are blue—for they are usually covered with green vegetation—but because they are seen through a blue medium; that is, the atmosphere.

Air possesses all those properties of matter which were described in Natural Philosophy; namely, impenetrability, inertia, gravity or weight, &c.

IMPENETRABILITY OF AIR.

The nature of this property was explained in Natural Philosophy; and that it is possessed by atmospheric air, is proved by numerous experiments. It is shown by a very simple one, in which a common tumbler is inverted over water. If this be done, the liquid will be found to rise a little in the inside of the tumbler; but it will stop there, and cannot be made to rise to the top, though it were sunk to the bottom of the Atlantic. If into a cylinder an air-tight piston be introduced, it can be pushed down to some extent, but no power or weight, however great, can compress it to the bottom. Before this could possibly take place, the cylinder would burst. These facts plainly prove that air is material, and that it possesses that property called impenetrability, by which it excludes every other body from the space which it occupies at any given time. It may be compressed to a great extent, but never into a space so small as to be below calculation. Additional proofs of the existence of this property will appear as we proceed with our subject.

INERTIA OF AIR.

It will be recollected that, by inertia, was meant that property of matter in virtue of which it requires a certain effort or force to produce motion if a body be at rest, and to destroy or modify that motion if it be not at rest. It was also stated, that, when one solid body puts another in motion, the former loses as much as the latter receives. The most familiar instance of the inertia of air is the wind, which is just air in motion. If a flat surface be presented to the wind, a power is exerted which will propel it forward in the direction in which the column of air is moving, the force being in proportion to the velocity of the latter. We see this illustrated in the case of ships, and also of balloons. However, where the surfaces are connected by arms with a moveable axle, as in the case of windmills, a rotatory motion is produced, and that, too, of a power sufficient to drive machinery of considerable extent. But the power exerted by air in motion, notwithstanding its extreme thinness, is evinced by the dreadful effects produced by hurricanes. These terrible visitations sometimes lay whole islands desolate. When the air is in a state of rest, the same fact is proved by moving forward in it a body presenting a broad surface. A degree of resistance is offered to its motion through it, which resistance is proportionate to the velocity with which the body moves. In walking at an ordinary pace on a calm day, this is not perceived; but those travelling with steam-coaches between Liverpool and Manchester, where the speed is very great, will readily distinguish it; and should the wind be blowing in a direction opposite to that in which the vehicle is moving, the resistance will be considerable. The observations which were made in the article Hydrostatics relative to the speed of steam-boats, are equally applicable to steam-carriages.

Before adverting to the weight or gravity of air, it will be necessary to treat of its elasticity.

THE ELASTICITY OF AIR.

By the term elasticity is signified that quality in virtue of which a body, when compressed into a smaller space than it naturally occupies, fills that space again when the power by which it was compressed is withdrawn. A small bladder of air may be squeezed between the hands so as to be considerably reduced in size; and on opening the hands again, and withdrawing the pressure, it will instantly resume its former bulk. If a metallic tube or barrel be fitted with a moveable plug or piston, which is made to work in it perfectly air-tight, the air which occupies the space between the top and the bottom of this barrel when the piston enters, can be compressed to a hundredth part, or even less, of its usual bulk. If the force, however, by which the piston is pushed down, be withdrawn, the air, by its elasticity, will force it up again with a power equal to that by which its descent was resisted. A uniform law governs the increase of elastic force, arising from the diminished bulk of the air, which is, that the elastic force, or the pressure exerted by the air against the sides of the vessel which contains it, is increased in precisely the same proportion as the space which it occupies is diminished. Thus, then, the remarkable law is established, that the elastic force of air is proportional to its density. This law, though generally true, is not found to be exact in extreme cases both of condensation and rarifaction. When a high degree of condensation is required, a greater degree of compressing force is found to be necessary than that which would result from the above law. If an external pressure of 15lbs. on each square inch be sufficient to confine atmospheric air in its ordinary state, it would only require a pressure of 150lbs. on the square inch to confine it when reduced to one-tenth of its bulk by compression; but by this law it is found to require a somewhat greater force. In other words, when a great degree of condensation is effected, the elasticity of air increases in a somewhat higher ratio than the density.

In like manner, we find that in high degrees of rarifaction the law is also not precise, highly rarified air having a less degree of elasticity than that which would be consistent with the law. This, indeed, is a necessary consequence of the former, or rather it may be considered as another way of expressing the same fact.

It must also be observed, that the above law can only hold true in cases where the temperature remains the same; for heat, whilst it decreases the density, increases the elasticity of air. Thus, a flaccid or partially filled bladder, if held to the fire, will expand so as to become perfectly filled, and have a tendency to burst. The elastic force of the air is beautifully illustrated by what is called the air-fountain.

Fig. 1.

There are two species of air-fountains. The most simple arrangement consists in employing the elastic force of the air compressed in a close vessel, and made to act on the surface of the water or in the pump. The second form is exhibited in the accompanying woodcut, and requires the aid of the air-pump to put it in motion. The receiver in which the fountain is seen to play must be made to fit air-tight on the ground brass plate beneath. The stopcock must then be screwed into the plate of the air-pump, and a vacuum formed. After turning the stopcock to prevent the entrance of the air, the lower extremity of the tube should be increased in a vessel of water, and, on again opening the communication, the water will be seen to rise in a continuous stream, forming a beautiful *jet d'eau*. The elevation of the water in this case is, it will be obvious, dependent on the pressure of the atmosphere. Other instances of the pressure of the atmosphere will occur as we proceed with our subject.

WEIGHT OF THE AIR.

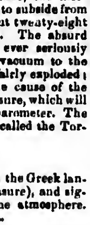
That the air possesses weight, and presses upon every object upon the surface of the earth with a certain degree of force, is a fact familiar to every one; but that, by means of this weight, some of the common mechanical phenomena are to be accounted for, is only of recent discovery. Amongst ancient philosophers, the idea was entertained that nature had an abhorrence of a vacuum; and that, when a vacuum was by any means formed, the air rushed in by virtue of this said repugnance of inert matter to the existence of a void space. The antipathy thus entertained by nature served the purposes of philosophy for two thousand years, when some engineers at Florence, in sinking pumps, had occasion to construct one to raise water from an unusually great depth. Upon working it, they found that the water would rise no higher than about thirty-two feet above the well. Galileo, the most celebrated philosopher of that day, was consulted in this difficulty, and it is said that his answer was, that "nature's abhorrence of a vacuum extended only to the height of thirty-two feet, but that beyond this her disinclination to an empty space did not extend." Some writers deny the fact of his having given this answer; others admit it, but take it to have been ironical. It has been more generally taken as a solution seriously intended. It appears, however, that Galileo, having his attention thus directed to the point, soon saw the absurdity of the maxim that "nature abhors a vacuum," and sought to account for the phenomenon in other ways. He attributed the elevation of the water to an attraction exerted upon that liquid by the piston. This attraction he considered to have a determinate intensity; and when such a column of water was raised as was equal in weight to the whole amount of the attraction, then any farther elevation of the water by the piston became impossible.

It is affirmed by some writers that Galileo, at the time when he was interrogated upon the subject, was aware of the true cause of the phenomenon, and only avoided a direct answer because he had not yet completed his investigations. This is generally supposed to be an unlikely circumstance. That he did not solve the problem, is certain; but that he had made some advances towards the solution of it, appears probable, from the fact that Torricelli, his pupil, directed his attention to the same subject, and came to the conclusion, that whatever be the cause which sustains a column of water in a pump, the measure and the energy of that power is the weight of the column of water; and that, if a liquid be heavier or lighter bulk for bulk than water, then the same force sustains a lesser or greater column of such liquid. He proved the fact by experimenting upon mercury, which, as is well known, remains fluid at ordinary temperatures, and is extremely heavy. A glass tube thirty inches in length, closed at one end and open at the other, he filled with mercury; and applying his finger to the open end to prevent the escape of the mercury, he plunged it into a cistern filled with the same fluid. No air was thus allowed to enter the tube, the mercury contained in which was observed to subside from the top and stand at the height of about twenty-eight inches, as Torricelli had anticipated. The absurd notion, therefore, if any such was ever seriously maintained, that nature abhorred a vacuum to the extent of about thirty-two feet, was fairly exploded; and Torricelli soon perceived the true cause of the phenomenon, namely, atmospheric pressure, which will be illustrated in the description of the barometer. The vacuum thus formed by Torricelli is called the Torricellian vacuum.

THE BAROMETER.

The term barometer is derived from the Greek language (*baros*, weight, and *metron*, measure), and signifies a measurer of the weight of the atmosphere. The following figure represents one:—

Fig. 2.



Let A B be a glass tube, upwards of thirty-two inches in length, closed at the extremity B, and open at the opposite end A. After the tube is carefully cleaned on the inside, let it be filled with mercury or quicksilver, which has been well cleansed, and freed from air by boiling. G H is a cistern also filled with mercury to the height C D. Let the finger be placed upon the open end A of the tube, which being turned downwards, is plunged into the cistern, and the finger removed when the orifice is below the surface of the liquid in the large vessel. The mercury in the tube will be found to fall to about the height of twenty nine or thirty inches, where, after a few vibrations, it will remain.

Now, the question arises, Why does the mercury in the tube not fall to the level of that in the cistern, instead of standing at the height E? The tube being closed at B, the space B E must be destitute of air or any other fluid, and is hence a vacuum. The column of mercury E P, therefore, presses with nothing but its own weight on the level C P D of the mercury in the cistern; for, since all air is excluded from the inside of the tube, there can be no atmospheric pressure. According to the universal law of hydrostatics, that pressure is transmitted in all directions, by the pressure of the column E P, exerted at P, it is transmitted to the whole surface, C P D, which accordingly has a tendency to rise with an equivalent force. But this tendency to rise is resisted by some other force which is exactly equal to the weight of the column of mercury. This is plainly the weight of the atmosphere which presses upon the surface of the quicksilver in the cistern, and prevents it from being elevated. An instrument constructed upon the above principles is a barometer.

If we suppose the base of the column P E to be equal to a square inch, it follows that the atmosphere presses on every square inch of the surface of the mercury in the cistern with a force equal to the weight of a column of mercury whose base is a square inch, and whose height is P E.

It might appear that in this experiment the weight of the column of mercury P E, suspended in the tube, must be equal to the total pressure on the surface of the mercury in the cistern, and that, therefore (supposing, as before, the base of the column in the tube to be equal to a square inch), this pressure being distributed over as many square inches as are in the surface of the mercury in the cistern, the proportion of pressure by which the ascent of each square inch must be resisted, is as many times less than the weight of the column P E, as the surface of the mercury in the cistern is greater than the base of the column. But this is not the case; for it is, as we have remarked, the peculiarity of fluids not merely to transmit pressure equally in every direction, but to transmit whatever pressure is exerted on any one part of its surface undiminished, to every part equal in magnitude with the first. That it is the weight of the atmosphere which, pressing on the surface of the mercury in the cistern, sustains the column of mercury in the tube, will be made manifest by breaking the upper end B of the tube, and admitting the air to press on the mercury E. The consequence will be, that the mercury in the tube will fall to the level P of the mercury in the cistern.

There is another very satisfactory proof that the weight of the atmosphere is the cause which sustains the mercury in the tube. If a tube of more than thirty-four feet long be immersed in a cistern of water, and the air be withdrawn from it, by means which shall be hereafter explained under the head Air-Pump, the water will rise according as the air is expelled, but the ascent of the water will be limited to about thirty-two perpendicular feet; at the same time it will be found that the column of mercury suspended in the barometric tube will be about twenty-eight perpendicular inches. If, then, the weight of the atmosphere be the cause which sustains both the water and the mercury, we may expect to find that a column of water thirty-two feet high, and a column of mercury twenty-eight inches high, ought to have the same weight when they have the same base. To determine whether this be the case, let equal measures of mercury and water be accurately weighed, and it will be found that the mercury is about thirteen and a half times heavier than the water. Hence we perceive that a column of water, whose base is a square inch, and whose height is thirteen inches and a half, will have the same weight as a column of mercury whose base is a square inch, and whose height is one inch. Hence it appears that columns of water and mercury with equal bases, will have equal weights, if the column of water be thirteen and a half times the height of the mercury. In the present instance, the height of the water is 32 feet, or 384 inches, and that of the mercury is 28 inches. If 384 be divided by 13½, the quotient will be nearly 28 inches. We may in general estimate the pressure nearly by allowing 1lb. for every two inches in the column; and thus, when the column is thirty inches in length, the atmospheric pressure is 15lbs. on every square inch.

In the construction of barometers, there are a few circumstances which must be attended to, in order to render the instrument a perfect indicator of atmospheric pressure. It is evident that the space E H, above the mercury in the tube, should be a perfect vacuum; for if it be occupied by any aërial fluid, the latter will of course press upon the mercury, and thus the real weight of the atmosphere will not be ascertained. To prevent this, the inside of the tube is made perfectly clean and smooth, and the mercury, before it is introduced into it, is boiled, for the purpose of expelling the air which it generally contains in its ordinary state. The tube is also freed from moisture by means of heat, and it will even contribute to the perfection of the instrument to boil the mercury in the tube. But notwithstanding every precaution and means employed to insure perfection in the instrument, even in the most perfect barometer an atmosphere of mercury occupies the upper part of the tube.

As the pressure of the atmosphere is subject to variations, the amount of pressure at any given time is determined by a scale marked upon the barometer; and this is one of the most interesting uses of the instrument. The weight of the superincumbent air is never less than what sustains a column of mercury at the height of twenty-eight inches, and never more than what supports one at the height of thirty-one inches. Indeed, the range of the fluid may be said to be confined to three inches. It is evident, that, as the pressure upon the surface P in the cistern is lessened, the mercury there will rise, and the top of the column E will fall; the surfaces of the two columns of mercury thus always moving simultaneously, and in opposite directions. Hence, if the scale by which the distance between these surfaces is measured be fixed, two observations would be necessary to determine the height of the column. This may be avoided to a certain extent by making the cistern large and the bore of the tube small, so that any change in the altitude of the latter can produce very little upon the level of the mercury in the former; but, for scientific purposes, several improvements have been made by which the inconvenience is obviated. Amongst these, the following may be noticed:—The glass tube containing the mercury is enclosed in one composed of brass, which has an opening at D E, fig. 3, sufficiently large to show the rise and fall of the mercury in the places where it is to be used. Upon this tube a scale is engraved for indicating the changes in the height of the column of mercury, and the whole is fixed in the cistern A B, which has a bottom B moveable by a screw V, by turning which, the level of the mercury in the cistern may be raised or depressed. An index of ivory is attached to the top of the cistern, furnished with a fine point P, for showing the level from which the divisions of the scale C F are measured. When observations are to be made, it is just necessary to turn the screw V, until the surface of the mercury meets the point P, and the divisions upon the scale C F represent the actual change of height in the barometric column. This is the usual form of a barometer mounted and provided with a scale. This scale C F may be furnished with a *vernier* or *nonius*, to give greater accuracy to the observation, and by which extremely small changes are indicated, as low indeed as the one-hundredth part of an inch.

Fig. 3.

The range of the mercury in the tube is sometimes increased by making it of a diagonal form, the diagonal bend of the tube commencing at a point rather lower than that which the mercury falls when it is at the greatest degree of depression, and rising to a height equal to that which it attains by ordinary atmospheric pressure. But the wheel barometer, another contrivance for enlarging the scale of the instrument, is more frequently used, and for common domestic purposes is attended with some convenience. It is represented in the following figure:—

Dr Lardner thus describes it:—"The barometric tube is here bent at its lower extremity B, and turned upwards towards E. The atmospheric pressure acts upon the surface F, and sustains a column of mercury in the tube B A, which is above the level of F. The bore of the tube being in this case equal in every part of its length, it is clear, that, through whatever space the surface E falls, the surface F will rise, and *vice versa*. Hence it is obvious that the variation in the height of the barometric column will always be double the change in the height of either surface E or F; for if the surface F fall, the surface E must rise through the same space. They are thus receding from each other at the same rate; and, therefore, their mutual distance will be increased by the space through which each moves, or by double the space through which one of them moves. In the same manner, if F rise, E must fall, the two points mutually approaching each other at the same rate; so that the distance between them will be diminished by the space through which each moves, or by double the space through which one of them moves. The change, therefore, in the height of the barometric column will always be double the change in the position of the level F. Upon the surface A F, there floats a small ball of iron suspended by a string, which is carried over a pulley or small wheel at P, and counterpoised by the weight at W, less in amount than the weight of the iron ball. When the surface F rises, the iron ball, being buoyant, will be raised with it, and the counterpoise W will fall; and when the surface F falls, the weight of the iron ball, being greater than the weight of the counterpoise, will cause it to descend with the descending surface, and to draw the counterpoise W up. It is evident, that, through whatever space the iron ball thus moves in ascending or descending, an equal length of the string will pass over the wheel P. Now, this string rests in a groove of the wheel, in such a manner that by its friction it causes the wheel to revolve; and, consequently, the revolution of this wheel indicates the length of string which passes over its groove, which length is equal to the change in the level of the surface F. Upon the centre of this wheel P, an index H is placed, which, like the hand of a watch, plays upon a graduated circular plate. Let us suppose that the circumference of the wheel P is two inches, then one complete revolution of this wheel will correspond to a change of two inches in the level F, and therefore to a change of four inches in the barometric column. But in one revolution of the wheel P, the hand or index H moves completely round the circle; hence the circumference of the circle corresponds to a change of four inches in the barometric column. Now, the circular plate may easily be made so that its circumference shall measure forty inches; consequently, ten inches of this circumference will correspond to one inch of the column, and one inch of the circumference will correspond to one-tenth of an inch of the column. In this way, variations in the height of the column, amounting to the tenth of an inch, are indicated by a motion of the hand H over one inch of the circumference of the plate. By further subdivision, a still greater accuracy may be obtained. In the form of the barometer, it is evident that the preponderance of the iron ball assists the atmospheric pressure in sustaining the column. This cause of error, however, may be diminished almost indefinitely by making the preponderance of the ball over the counterpoise W barely sufficient to overcome the friction of the wheel P. Again, when the atmosphere is diminished in weight, and when the

Fig. 4.

surface F has a tendency to rise, it is compelled to raise the ball—and there is the obvious limit to the indications of the instrument; namely, that a change so slight that the difference of pressure will not exceed the force necessary to elevate the ball, will fail to be indicated."

There are various other contrivances for enlarging the scale of the barometer, and insuring the accuracy of the results which it indicates.

WEATHER-GLASS.

From a long course of observation it has been found that changes in the atmospheric pressure are connected with changes of weather, and from this connection it has been attempted to establish rules by which *rainy*, *fair*, or *changeable* weather may be predicted, according to the variations in the altitude of the barometric column; hence the instrument has been designated a *weather-glass*. Perfect accuracy, however, cannot be looked for in these indications. The rule which seems most generally to obtain is, that the mercury is low in high winds; but even this often fails. Little attention is to be paid to the terms *rain*, *fair*, *changeable*, &c., usually engraved on the plates of these weather-glasses, for the changes of weather are not so much indicated by the actual height of the mercury as by its variations in height. We give the following as the most correct series of observations which have been made by means of this instrument:—

1. The barometer rising, may be considered as a general indication that the weather, comparatively with the state of it at the time of observation, is becoming clearer.

2. The atmosphere apparently becoming clearer, and the barometer above *rain*, and rising, show a disposition in the air for fair weather.

3. The atmosphere clearing, and the barometer above *changeable*, and rising, indicate fair weather.

4. The atmosphere clear, and the barometer near *fair*, and rising, denote continued fair weather.

5. Our prognostic of the weather is to be guided relatively, thus:—If, notwithstanding the sinking of the barometer, little or no rain follow, and it afterwards rise, we expect continued dry weather.

6. The weather for a short period—viz. from morning until evening—may commonly be foretold with a considerable degree of certainty. If the barometer has risen during the night, and is still rising, the clouds high and apparently dispersing, and the wind calm, especially if it be in or about the north or east points, a dry day may be confidently expected.

7. During the increase of the moon, there seems to be a greater disposition or effort in the air for fair or dry weather, than in the wane; but this disposition does not commence till three or four days after new moon, and ceases about four days after full moon.

8. The barometer should be observed occasionally—thrice in the day, or oftener, when the weather is changeable—in order to notice whether the mercury be stationary, rising, or sinking; for from this circumstance, together with the direction of the wind, and the apparent state of the air at the time, is information to be collected, and a continuance of the same, or a sudden change of the weather, to be foreseen.

Lastly, it is to be observed, that the higher the mercury stands in the scale in each instance, and the more regularly progressive its motion is, the stronger will be the indication. Likewise, the more the wind inclines towards the north or east points, the greater will be the disposition in the air for fair weather. It is obvious that the indications of rainy weather are the reverse of those which predict fair weather.*

MEASUREMENT OF HEIGHTS.

The barometer has been applied to the measurement of heights, and this is one of its most important uses. It is clear, that, as we ascend to great elevations, the pressure of the atmosphere will be diminished, there being a much less portion of it above us; and hence the altitude of the barometric column will be proportionally lessened. At the level of the sea, the medium height of the column of mercury is twenty eight inches; on the top of Mount St Bernard it is only the half of that; and in the balloon in which De Luc ascended, it fell as low as twelve inches. This elevation was upwards of 20,000 feet. A considerable degree of difficulty, however, attends the determining of heights by means of the barometer. If the atmosphere remained always in the same state, and, like water and other such fluids, had at all heights the same density, the experiment could be easily performed, and the barometer would become an accurate measure of the difference of level of two stations, or their perpendicular altitude above the level of the sea. But from the great compressibility or elasticity of air, each inferior stratum has a higher degree of density than that which is above it. Neither does this density increase or change according to any fixed and known law; for the temperature, which, as is well known, affects the density of bodies, is continually varying. Generally, the temperature decreases as the height of the station increases, but not according to any fixed rule. Thus, then, the irregular variation in temperature produces an irregular variation in density, and therefore produces an irregular variation in the change of the barometric column. Notwithstanding these irregularities, rules have been determined, by which the difference of level of two places may be computed when the heights of the barometer and thermometer at the two places are known.

We have already observed, that the atmosphere presses upon bodies with a force equal to 15lbs. for every square inch of surface. All bodies which exist at the surface of the earth are continually exposed to this pressure, and at first view it might be supposed that this great weight would produce very destructive effects. Thus, the body of a man, the surface of which amounts to 2000 square inches, sustains a pressure from the surrounding air (for like all fluids it transmits pressure in every direction) to the enormous amount of 30,000lbs. Such a weight, one would suppose without due consideration, would be capable of crushing him to atoms. But this we find is not the case, and men, as well as all other animals, move with perfect ease, and are for the most part scarcely conscious of the existence of an atmosphere at all. This is very easily accounted for. The internal parts of their bodies are filled with fluids, both in the liquid and gaseous states, which offer a pressure from within, exactly equivalent to the external pressure of the air. This is manifested by applying to the skin the mouth of a close vessel to which an exhausting syringe is attached. By this instrument the air may be confined in the vessel, and the atmospheric pressure consequently partially removed from the skin. Immediately the force of the fluid from within will swell the skin, and cause it to be sucked into the glass. This experiment may be performed by the mouth on the hand or arm. If the lips be applied to the flesh, and the breath drawn in so as to produce a partial vacuum in the mouth, the skin will be drawn or sucked into the mouth. This effect is produced in the same manner as in the former instance.

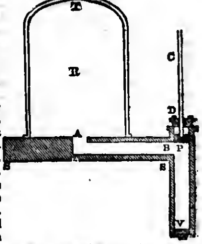
All cases of that class of effects which are commonly expressed by the word *suction*, are accounted for in the same manner. The flies and other insects which walk upon ceilings and other surfaces presented downwards, are enabled to do so from the peculiar formation of their feet, by which they form a vacuum. These act as suckers excluding the air between them and the surface with which they are in contact, and the atmospheric pressure keeps the animal in its position.

The effects of atmospheric pressure are presented to us in a great variety of natural phenomena, as well as artificial contrivances. In the act of breathing, the pressure and elasticity of the air are both engaged. The air enters the lungs on the same principle as it rushes into a vacuum. By the chest being expanded, an empty space is formed into which the external air forces itself; by a muscular action, the lungs again are compressed, so as to give the air a greater elasticity than the pressure of the external atmosphere. By the excess of this elasticity it is propelled, and escapes by the mouth and nose. The working of a pair of common bellows is precisely similar. The effect of atmospheric pressure is strikingly shown in the emptying of a cask filled with a liquid. It is well known that liquors are usually drawn off by a cock which enters the vessel near the bottom of one of the ends, and it is customary to make a vent-hole on the top of the cask, otherwise the liquid would not flow out so rapidly, and indeed would finally stop altogether; for as the cask empties, the air which may be confined in it becomes so rarified, that the external pressure upon the orifice of the cock counterbalances both the pressure of the column of water within, and also the confined air. When, however, the vent-peg is withdrawn from the hole, the external air rushes in. Thus, the pressure upon the orifice of the cock and the surface of the liquid in the vessel are equally balanced, whilst the weight of the column of the fluid upon the internal orifice of the cock forces the lower stratum forward, and thus the liquid escapes. It is upon this same principle that we see holes made in the tops of teapots, teakettles, and such like utensils. The gurgling noise which is produced in decanting wine and other liquors, arises from the pressure of the atmosphere forcing air into the interior of the bottle as it is emptied. What is termed the pneumatic trough used in the chemical laboratory, and the gas-holders or gasometers used in gas-works, depends upon atmospheric pressure. A vessel with its mouth upwards is completely filled with a liquid; the mouth is then stopped with a flat piece of glass or other smooth surface, and the vessel inverted, the mouth being plunged into a cistern filled with the same liquid. It is evident that although the body which covers the mouth of the vessel be withdrawn, provided the column of water within it do not rise to a height which more than balances the atmospheric weight, it will be retained in its place by the latter. The pneumatic trough is simply a large cistern filled with mercury, in which is placed, below the surface of the liquid, a shelf to support a receiver. If a vessel which has been plunged in the trough and filled be slowly raised, still keeping its mouth below the surface of the liquid, it will remain filled with mercury. The mouth may then be placed upon the shelf, and the greater part of the vessel remains above the surface. It is customary to introduce gases upon which chemists wish to experiment into vessels of this description. A flexible tube is introduced into the mouth of the vessel which is below the surface of the mercury; the gas flowing through this tube rises into the interior of the vessel, and, displacing the quicksilver, occupies its place. The gasometer used in gas-works is constructed on the same principles, but upon a different scale.

THE AIR-PUMP.

Air is capable of being either condensed or rarified to an almost indefinite extent. The methods by which rarifaction and condensation are effected we shall now explain. The air-pump is exhibited under various forms, each of which is attended with particular advantages, according to the purposes to which it is applied. There are, however, some general principles in which all modifications of this interesting machine agree, which we shall first explain. Let R, fig. 5, be the section of a glass vessel, closed at the top T, but open at the bottom, and having its lower edge ground smooth, so as to rest in close contact with a smooth brass plate, of which S S is a section. When the receiver R is thus placed upon the plate S S, it will, with the assistance of a little unctuous matter previously rubbed on the edge of the glass, be in air-tight contact. In the plate is a small aperture A, which communicates, by a tube A B, with a cylinder, in which a solid piston P is moved. The piston-rod C moves in an air-tight collar D, and a valve V is placed in the bottom of the cylinder, opening outwards.

Fig. 5.



Let the air in the receiver R, the exhausting tube A B, and the barrel S V, be first supposed to have the same density as the external air. Upon depressing the piston, after it has passed the aperture B, the air in the barrel S V will be compressed by the piston; its density, and therefore its elasticity, will be increased, and will become greater than that of the external air. This superior elastic force will open the valve V, through which, as the piston descends, the air in the barrel will be driven into the atmosphere. When the piston has reached the bottom of the cylinder, the valve V will be closed by a spring or otherwise, and will be pressed into its seat also by the atmospheric pressure. When the piston has thus arrived at the bottom of the barrel, the air which before filled the receiver R, and the exhausting tube A B, will have expanded by its elastic property, and diffused itself also through the barrel above the piston. But, upon again raising the piston, it will be forced back into its former bounds, until the piston has passed the aperture B. As the piston ascends, it leaves beneath it a vacuum, into which the external air is prevented from entering by the valve V. When, therefore, the piston has been raised beyond the aperture B, the air in the receiver R, and the exhausting tube A B, will expand once more, and also fill the barrel S V. Upon a second depression of the piston, the air which fills the barrel will be discharged, and similar effects will follow its ascent, and so the process may be continued at pleasure.—*Library of Useful Knowledge.*

After very slight consideration, it must appear evident that it is impossible to form a *perfect vacuum* by this means, for some air, however small the quantity may be, must necessarily remain in the receiver after every depression of the piston. When the elasticity of the air in the receiver is no longer sufficient to open the valve V, it is clear that no farther rarifaction can take place. Besides, it is to be observed, that, however accurately the piston when it is down may close upon the valve, yet a space, small indeed, but capable of containing air, must exist. The valves, also, have to open against atmospheric pressure, which the elastic force of the air in the receiver must soon fail to counterbalance. We can, however, attain a vacuum sufficient for merely practical purposes. The air-pump has been constructed in a great variety of ways; that in common use has two barrels and two pistons, the rods of which are furnished with teeth, and a wheel which works in them. By a half turn of this wheel one of the pistons is raised to the top of its barrel, and the

* There is one circumstance which must tend materially to invalidate the indications of the weather-glass, namely, the attraction of the moon. Since the moon has an influence upon water, a dense and heavy body, so as to cause great elevations in the sea at one part, and depressions at others, it will readily be conceded that so light a body as air will be considerably affected by it in the same manner. Thus, where the aerial tide is at the full, the barometer situated under it will be pressed by a column of air higher and heavier than it is pressed with when the moon is attracting another part of the earth's surface. These tides are certainly produced, and they are independent of temperature. The effect which they will have in rendering uncertain the indications of the weather-glass is obvious. For, at the time of this additional pressure, the mercury would rise, thus indicating that the weather was clearing; was, in reality, the very reverse of this may be the case. May the attraction of the moon, as exercised over the atmosphere, be the cause of that mysterious influence which our satellite ... over the weather itself? That, by drawing up the air in ... wave, as it were, in certain parts, it will destroy the ... of density, and thus cause the vapours which exist ... shape of clouds to change their relative position, ... to descend or to rise according to circumstances. The moon will also influence the clouds themselves, ... it may be, by attracting some of them, and drawing them into ... positions, perhaps in some degree attenuating ... rapid and almost unaccountable changes of ... experience. The position assumed is, that it ... by the moon over the atmosphere and many of the minor changes of weather.

other is depressed to the bottom of its barrel; thus a continual discharge of air goes on. There is also commonly a barometer made to communicate with the receiver, by which the degree of rarifaction obtained is estimated.

EXPERIMENTS WITH THE AIR-PUMP.

The various properties of air are capable of being strikingly illustrated by means of the air-pump. If an *egg*, having a small hole pierced in it, be placed beneath a receiver, and the air withdrawn, the contents of the egg will be seen to exude through the hole like gum from a tree. This arises from the air contained in the egg becoming more elastic when the external pressure is withdrawn (for it communicated with it by means of the perforation), and thus forces the matter out of the shell. Fruit, when dried and shrivelled, contains particles of air; and if placed beneath an exhausted receiver, these expand in the same manner; and where there is no opening in the skin, they will burst it. A shrivelled apple placed in these circumstances will appear to grow suddenly ripe, and a bunch of raisins will be converted into a bunch of ripe grapes. The experiment of the Magdeburgh hemispheres may be performed by means of an air-pump.

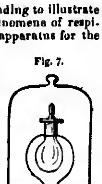
Fig. 6.

Two hollow hemispheres, *b d*, constructed of brass, as represented in fig. 6, are so formed, that, when placed mouth to mouth, they shall be in air-tight contact. They are furnished with handles, *c d*, one of which may be screwed off. In the neck to which this handle is screwed, is a tube furnished with a stopcock. The handle being screwed off, let the hemisphere be screwed on the pump plate, and the other hemisphere being placed over it, let the stopcock be opened so as to leave a free communication between the interior of the sphere and the exhausting tube of the air-pump. The pump being now worked, the interior of the sphere will form the receiver, from which all communication with the external air is cut off, and rarifaction will be produced in it to any degree which may be desired. This being affected, let the stopcock be closed, and let the sphere be detached from the pump plate, and the handle screwed upon it. If, then, the two handles be drawn in opposite directions, so as to pull the hemispheres from one another, it will be found that they will resist with considerable force. If the diameter of the sphere be 6 inches, its section through the centre will be about 28 square inches. The hemispheres will be pressed together by a force amounting to 15 pounds for every square inch in the section. If 28 be multiplied by 15, we shall obtain 420, which is the amount of the force with which the hemispheres will be held together. If one of the handles be placed on a strong hook, and a weight of 400 pounds be suspended from the other, the weight will be supported by the pressure of the atmosphere.

This is one of the earliest experiments in which the effects of atmospheric pressure were exhibited. Otto Guericke, the inventor of the air-pump, constructed, in 1654, a pair of such hemispheres one foot in diameter. The section through the centre of these was about 113 square inches, which, multiplied by 15, gives a pressure amounting to nearly 1700lbs. If the exhaustion were complete, the hemispheres would be held together by this force; but, even though incomplete, they were still able to resist a prodigious force tending to draw them asunder.

Another beautiful experiment, tending to illustrate the use of the air-pump and the phenomena of respiration, may now be noticed. The apparatus for the purpose is shown in fig. 7.

Fig. 7.



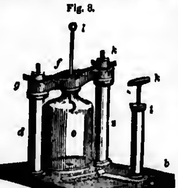
It consists of a receiver placed on the pump plate, and enclosing a globular-shaped glass vessel, within which is contained a bladder. Now, in the ordinary process of respiration, a partial vacuum is formed in the chest by the elevation of the ribs, and the air passing down by the ordinary passage of the mouth, enters the lungs. In the little apparatus above referred to, a vacuum is formed by the air-pump, and the bladder immediately expands; on the re-admission of the air, it returns to its original dimensions; so that a series of expansions and contractions may readily be produced very analogous to the operations of nature.

The fact that in a vacuum a piece of gold and any light substance, such as a feather, will descend with equal degrees of rapidity, is proved by dropping these bodies from the top of an exhausted receiver. That the presence of air is necessary for the production of sound, is also strikingly illustrated by means of the air-pump. If a bell be placed in a receiver in such a manner as to admit of being rung easily from the outside, without admitting air into the inside, whilst the receiver is full of air the sound of the bell will be distinctly heard; but after the receiver has been exhausted, and although the bell be struck with the same force, the sound will be inaudible, or nearly so. If a small portion of air be admitted, it will be faintly heard, and it will gradually increase, according to the quantity of air which is allowed to enter the receiver. The farther examination of this subject belongs to Acoustics, which see.

THE CONDENSER.

The condenser is the opposite of the air-pump, and a necessary accompaniment to it. It consists of a flat table *a b*, supporting a brass plate, and a glass receiver *c*. The columns *d e*, perpendicular to the table, serve, by the aid of a cross bar *f*, and screws *g h*, to hold the receiver down to the plate, and prevent the escape of air. The upright syringe *i*, with its piston and handle *k*, is used to inject air into the receiver *c*. In this instrument the valve opens *inwards*. Each time the piston is depressed, as much air is forced in as is equal to the internal dimensions of the tube. When it is raised, the valve opening inwards admits air into the piston, which being alternately raised and depressed, throws into the receiver an immense quantity of air. The wire and hook *l* serve to communicate with the interior during the performance of experiments. There is a guage at one side, to show the amount of condensation.

Fig. 8.



MACHINES FOR RAISING WATER.

After what has been stated respecting atmospheric pressure, the principle upon which all those machines called *pumps* are wrought will be easily understood. In our number of this work upon Hydrostatics, a variety of these engines were described, and it is unnecessary in this place to introduce accounts of any more of them. Water, we have more than once observed, rises to the height of about thirty-four feet, and cannot by any means be raised higher with an ordinary pump. The reason is, that a column of water of that height is exactly equal in weight to a column of air of the same diameter, but of the height of the atmosphere, and hence they equalise or balance each other. The pump-box or piston, it is well known, works air-tight in the pump; and when it is raised, a vacuum is created below. The pressure of the air upon the water without, forces the latter into the lower orifice of the pump, to fill the void space; and pressing upon a valve which opens upwards, and hence does not admit of its descent again, is thus raised to the height of thirty-four feet, by the alternate ascent and descent of the piston.

AIR-GUN.

The air-gun is an instrument for projecting balls and other missiles by the elastic power of highly condensed air. It will be easily understood from a short description. By means of a condenser, such as has been described, air is condensed in a strong receiver provided for the purpose, and furnished with a valve which opens inwards. This magazine of compressed air is affixed to the stock of the air-gun, in such a manner as to admit of a communication between the barrel and the condensed air, by opening a valve, by mechanism provided for the purpose. A bullet being placed in the barrel, the valve is opened, and the compressed air rushing out with great force, impels the missile forward with considerable velocity. The best air-gun is Martin's. It is furnished with stock, lock, barrel, ramrod, &c., similar to a common fowling-piece. The magazine for condensed air is a strong hollow copper ball, in which air is condensed by a syringe. If the air be highly condensed, this instrument will impel a ball sixty or seventy yards. A number of balls may be discharged in rapid succession without any further condensation in the magazine being required.

FIRE-ENGINE.

It is by means of condensed air that water is thrown upwards to a great height by fire engines, those machines so useful in checking conflagrations. They are subject to a great variety of forms, which all, however, agree in principle. They generally consist of a double forcing-pump, communicating with the same air-vessel, and, instead of a force-pipe, they are furnished with a flexible leather tube, which can easily be turned in any direction required. By means of the two forcing-pumps, the water, usually brought in buckets, and emptied into a reservoir or trough, is forced into the receiver, in which a portion of air is confined. Into this vessel the leather tube enters, and descends near to the bottom. As the water is injected by the force-pumps, and the vessel fills, the confined air becomes greatly condensed, and exerting a high degree of elastic power, impels the water upwards through the tube with great velocity and force. It is upon the principle of the simple pressure of the atmosphere that syphons work, as was explained in our article upon Hydrostatics.

ACOUSTICS.

The term Acoustics is derived from two Greek words which signify *I hear* and *an art*, and therefore designates that branch of natural philosophy which treats of the nature of sound, and the laws of its production and propagation. The sensation of sound is familiar to every one, and the sense of hearing is one of the most important of those links which connect matter and spirit—the thinking principle of man with the external world. A certain organisation is necessary before it is possible to communicate this sensation. For instance, we cannot hear with the arm or the hand, but only with the ear, which is constructed after a very peculiar manner. It was early observed, that when a sounding body was struck, a trembling or vibration, very often sensible to the touch, was observable. But that this same vibration communicated to the animal organ called the ear, whose structure is admirably adapted to be affected by the concussions or tremblings of surrounding objects, and that upon this circumstance depended the sense of hearing, was reserved for modern discovery. That an agitation or concussion takes place in bodies which are struck or from which sound issues, is a familiar fact. Every noise or sound is accompanied by such an action. The report of a cannon, the fall of the cataract, the rush of the wind or a wave upon the sea-shore, the thunder peal, or the blow of a hammer upon an anvil, the rattling of carriages, and an infinite diversity of other sounds which arise in general from the percussion of one body against another, all go to prove that a sensible and sometimes violent agitation takes place in the bodies from which the sounds proceed. In musical instruments, which are of a more delicate nature than any sounding body yet mentioned, the same fact is observable. If, for instance, we touch a harp-string which has been struck, a sensible tremor is communicated to the finger.* The question arises, by what means is this agitation or vibration in the particles of bodies communicated from a great distance to the ear, which is the organ of hearing? Simply through the medium of the atmosphere, which is an immense aërial ocean, in which all bodies at the surface of the earth are immersed. That this is an undoubted fact, is demonstrated by the experiment already alluded to, that a bell struck in the exhausted receiver of an air-pump will communicate no sound whatever, or at least one so faint as scarcely to be audible; the report of a gun on a lofty mountain top, and the sound of human voices, are much less loud than they are at the foot of the elevation; and in the condensed atmosphere of a diving-bell, a whisper is heard aloud.

Let us now consider by what means the surrounding atmosphere communicates sound. Let us take for illustration a series of balls arranged in a line upon a table, or suspended together by threads. If at one end of the line we take a ball, and impel it with force against that which is next to it, the effect is observed at the opposite extremity of the line; of course, the degree of effect produced must depend upon the length of the line, the number of balls, and the force employed to agitate them. In general, the ball which is at the extremity of the one receiving the impact, flies off from the rest, and leaves them almost stationary. Thus, the intermediate balls serve merely to transmit the impulse from the one end to the other of the series. In the same manner it is, that the agitation or impulse from which sound arises is transmitted in the air. This fluid, like every other body, consists of an infinite number of little particles, a single series of which may be represented to us by the balls in the above example. These particles are not even in contact with each other; they are separated by minute intervals, but are yet connected together by attractive and repulsive forces, which tend to retain them perpetually in equilibrio.

In every case, therefore, there is in reality a chain of such particles reaching from the sounding body to the ear. The former, by its agitation, strikes that particle which is next to it; the intermediate ones serve to convey the impression; and the last one flying off, strikes the sentient organ of hearing. The process is exactly similar to that of impulse along a series of balls; only that in the case of the air, the intermediate particles, instead of remaining at rest, move each of them backwards and forwards by a very minute interval—the first communicating its motion to the second, the second to the third, and so on to the last—each performing a slight oscillatory movement, which advances from the beginning to the end of the series. We thus see that the propagation of sound is not instantaneous; it requires time to advance from the sounding body to the ear, as is daily observed and illustrated in the discharge of fire-arms. If the distance be at all considerable, a sensible interval is always observed to elapse between the flash and the report. The light flies almost instantaneously, but the report is retarded according to the distance—a fact observable in many other cases which leave no doubt that sound advances only at a certain rate, and invariably requires time for its propagation; and the reason is, that each aërial particle in the chain of communication must have a certain time—minute, no doubt, but still definite—in which to perform its oscillation, and communicate its motion to the rest; and thus the advance of

* The reader has probably seen what is called by musicians a tuning or pitch-fork, a metallic instrument consisting of prongs, which, when struck, sound a certain note, from which the singer pitches his tune. If when the pitch-fork is vibrating the point of the finger is brought into contact with the fork, a singular sensation, similar to that of a very slight electric shock is communicated. We do not mean to infer from this that the pitch-fork is an inanimate torpedo, which gives an electric shock when touched; but may not at least part of the effects which electricity produces arise from the violent agitation into which it throws the particles of the body? This would certainly account for the resemblance of sensations to which we have alluded, and the conjecture seems by no means

the agitation and of the sound is retarded, and only sweeps with a regulated progression along the line.

It is not through one series of particles merely that the oscillatory motion is communicated. The sounding body having every part of it in a state of agitation, generally acts all round; but even though only one particle were originally affected, so intimately are they all connected together, and united into a system by their mutual attractions and repulsions, that this cannot advance in any degree forwards without affecting the particles on each side; these affect what are before and around them; and thus the impulse is communicated, and diffuses itself on all sides. These lateral impressions would appear to be necessarily somewhat enfeebled; yet it is one remarkable characteristic of such oscillatory movements, that, like the vibrations of a distended cord, or the oscillations of a pendulum in a cycloid, they are all performed in the same time, however minute, or however extended. The lateral impressions, therefore, though ever so feeble, are yet transmitted with the same rapidity as the direct; the sound may be weakened, and we often observe it so. A speaker, for example, is always best heard in front; the report of a cannon is also loudest in that direction, but still the sound is heard at the very same instant all round. It is owing to this diffusion of the agitation in all directions, the original impression being spread out, not merely in concentric circles, like the little waves in a pool when a stone is thrown into it, but expanding continually, if we can conceive it, into a wider and wider concentric sphere —it is owing to this that every sound decreases so rapidly as we recede from it, and at last dies away altogether in the distance of a mile; yet the guns of Edinburgh Castle have been heard at the distance of twenty miles. That this diffusion of the agitating impression is the true cause of the diminution of the sound, is proved in a remarkable manner by confining the air on all sides, as in a tube. M. Biot, in his Traité de Physique, gives an account of some very interesting experiments made by himself in the train of cast-iron pipes used for the conducting of water into Paris, and which extended about 2860 feet, thus including in their interior a cylindrical column of air upwards of half a mile in length; at which distance, a person standing at one end of the pipes, and speaking within, could be easily heard at the other. "The lowest voice," says he, "was heard at this distance, so as to distinguish completely the words, and to establish a continued conversation. I wished to ascertain at how low a tone the voice ceased to become audible, and I could not reach it. Words spoken as low as when one whispers in the ear of another, were heard and appreciated; so that, if we wished to speak so as not to be understood, there was only one way of doing it; and that was, not to speak at all." It is on this principle that depends the effect of those tubes which are now in such general use as modes of communication between distant apartments in houses and public offices. Hence, also, are performed many amusing tricks with statues or busts situated in different parts of a room, answering questions and speaking to one another; the figures being connected by tubes concealed under the walls or floor, or communicating with an apartment below, in which a speaker is stationed.

In regard to the actual velocity with which the impulse of sound advances, it appears, from the most accurate experiments on the discharge of pieces of ordnance, and marking the interval between the flash and the report, at a distance carefully measured, that in ordinary circumstances this amounts to no less than 1130 feet each second, which is nearly equal to the velocity of a cannon-ball the moment it issues from the piece. This last is very speedily retarded by the resistance of the air, but sound advances with undiminished velocity. Hence it will travel a mile in a little more than four seconds and a half, or 12$\frac{3}{4}$ miles per minute. On this depends an easy method of determining in many cases our distance from objects, and which may often prove useful, particularly in military operations. We have only to observe in seconds the interval between the flash and report of the cannon or musket, and allow 4$\frac{1}{2}$ seconds to every mile, or 1130 to every second.

It is remarkable, also, that all kinds of sounds, strong or weak, acute or grave, advance with the same velocity; and this arises from the circumstance already noticed, that all the oscillatory movements in the air, however minute, or however extended, are performed each in the very same interval of time. This effect was distinctly proved in the experiment made by Biot in the cast-iron pipe already noticed, by playing different airs on the flute at one of the extremities of the tube. Now, it is well known that a musical air is adapted to a certain measure or time, which regulates very nicely the intervals between the successive notes; consequently, if any of these were propagated more rapidly or more slowly than others, by the time they reached the ear these would have been confounded with what preceded or followed them; and the air would have appeared quite altered, in place of which it was uniformly regular, and in its natural time; whence it clearly followed that all sounds are propagated with equal velocity.*

All sounds, however, although they travel with the same velocity, do not travel to the same distance. Thus, in approaching an organ which is playing, the first tones heard are the bass notes, which, as is well known, are the lowest in a harmonised piece of music. The grave or low notes, therefore, are heard to a greater distance than those which are acute or high.

The loudness of sound depends upon the violence with which the sonorous body is struck; for we can produce from the same body sounds having very different degrees of loudness, by simply striking it gently or with force. Two bodies, composed of the same substance, and of a like figure, but differing as to the quantity of matter which they contain, if subjected to the same shock, give out sounds differing in their degree of loudness—that which has the greater mass sounding louder than the other. Again, bodies of like size and figure, but unlike in substance, generate sounds of different loudness when struck with the same degree of force. In this case, the loudness depends upon the quantity of elasticity possessed by the bodies. From these facts, it may be inferred that loudness depends upon the quantity of motion or sonorous vibration in which it originates. Its acuteness or pitch depends upon the frequency with which the concussions or vibrations of the sonorous body succeed each other. The frequency of vibrations in strings depends upon their shortness, lightness, and tension, and thus sounds are divided into classes; the slow vibrations being called *bass*, *low*, or *grave* notes, and the quick vibrations being termed *sharp*, *acute*, or *high* notes. In a long or heavy string, there is a greater mass of matter to be moved, and hence there is a slower motion; and in a string which is slack, the force of elasticity which pulls it from any deviation back to the straight line is so much the less, thus giving rise also to a low note. It is found that a string of half a given length, or of one-fourth of a given weight, or of quadruple tension, vibrates twice as fast as on any one of these accounts.

These facts are familiarly illustrated in the violin, in which instrument, whilst all the strings have the same length, they differ in thickness and quantity of matter, the acute notes being generated by thin strings and the grave ones by thick strings. Their pitch can also be varied by means of the pins to which they are attached at one end, these increasing or decreasing their tension according to circumstances.

MUSIC.

All continued uniform sounds result from a repetition of similar vibrations. Hence, in the series from grave to acute, there is, with respect to the number of beats in a given time, a relation similar to that existing between the numbers 1, 2, 3, 4, &c. It is evident that between two sounds, one of which has twenty beats in a given time, and the other only half that number in the same period, there will be a coincidence at every alternate vibration of that which beats quickest; and where the relations of the beats are as twenty to thirty, there is the same coincidence at every third vibration of the quicker, and so on. Sounds which have these simple relations to each other are remarkably agreeable to the ear, whilst those in which the coincident beats are either farther apart or less regular, are not so agreeable; nay, sometimes where the irregularity is great, they are found to be positively harsh to a musical ear. There is a remarkable fact connected with this part of the subject, which is, that the coincident or double pulses of any two concordant sounds generate a third sound, which is always heard with them, and is denominated their *grave harmonic*.

Relative to this fact, Dr Arnott observes, "If a long musical string be made to sound, and the number of its vibrations in a given time be ascertained, we find that half of it, used as a whole, will vibrate twice as fast; a fourth part, four times as fast; and so on, producing the sounds of tones most nearly related to each other. A fine illustration of this is afforded by the string of a violoncello, when made to vibrate by a bow moved very gently across it; near the bridge, there is then heard not only the sound or note belonging to the whole length of the string, but also more fully the subordinate notes belonging to its half, its third, its fourth, &c. beautifully mingling with the first sound, and forming with it a rich harmony. Often, in such a case, the subordinate sounds swell with such a force as to overpower for a time the fundamental note; and then, if the string be carefully examined, it will be found to be vibrating, not as a whole, but in two, three, or four distinct fractions, with points of rest between them, on which points little pieces of paper thrown will remain, while similar pieces are shaken off from every other part. The same harmonic sounds may be produced still more certainly, while drawing the bow across the string, by touching the string lightly with the finger at the points where we wish it to divide. The sounds thus belonging to a single cord or string, and produced by its spontaneous division into different numbers of equal parts, constitute, when heard together, or in succession, the simple music of nature herself. It is produced pleasingly, as just described, by the single string of a violoncello, but in the most perfect manner by the instrument called the Æolian harp."

It is well known that the strings of an Æolian harp are generally tuned in perfect unison with each other to the same pitch, except one, which serves as a bass, being thicker than the others, and vibrating one-half as fast. By the varied undulations of the breeze, these are all thrown into motion, and each generates a sound, or rather a series of such sounds as have been mentioned, corresponding to the force of the current of air which sweeps the strings. Thus, nature herself generates the simple major scale or chord, a scale which has arisen in all nations, however remotely situated, and into which the most untutored individual naturally falls in ascending from any given note, provided he possesses a musical ear. The relation between the chords is such, that any notes in the principal beat thrice, whilst the corresponding notes in the low chord beat twice; and the notes of the high chord beat thrice, whilst the corresponding notes of the principal beat twice; and in the complete scale, the principal chord begins five notes above the lower, and five notes above the higher. The diatonic major scale has eight notes, the first and the last of which are in unison, and called *octaves*, the upper note vibrating twice as fast as the lower one. However far the musical scale may be extended, it is only a repetition of the notes succeeding that from which we began; these, including that note, are eight in number, and are called, according to their relation to the initial or key-note, *second*, *third*, *fourth*, and so on.

KEY-NOTES, &c.

The human ear is capable of perceiving a note so low that it beats only thirty times in a minute, and the highest which it is capable of appreciating has thirty thousand beats in the same space of time. The intervals between the notes in any musical octave are not all alike; two of them are only half as large as the others; and whatever note we begin from, these invariably lie in the major scale between the third and fourth, and the seventh and eighth, and are called *semitones*. Did these semitones not exist in the octave, there would be no use for any signature (that is, a flat or sharp at the commencement of the stave); neither would there have been any necessity for fixing upon one note of the scale as a fundamental note, or what is vulgarly and most inappropriately called the natural note, that is C; for an instrumental performer could have chosen any one as such. To the vocalist all are alike, for his ear leads him to strike the half notes naturally, and without effort; it is only where additional semitones are introduced that he is as it were compelled to deviate from the natural path for a moment; but striking off upon a new bias, he changes the position of the semitones only with regard to the key-note from which he has departed; in the key-note into which he has modulated, they still retain the same relative position, and they are immediately taken by him with the most perfect ease. It will not be difficult to show the propriety of what is called sharpening and flattening the scale, in order to insure both melody and harmony in the execution of any piece of music. One note, C, has been fixed upon as the fundamental note upon which all the other key-notes are formed, not because it possessed any inherent quality or virtue more than other notes, but because, since it was necessary to fix upon one note as a fundamental one, it was found to be the most convenient, suiting the compass of voices and instruments best, and being in the middle of the scale. It is usually termed the natural key-note, and there is a prejudice which prevails not only amongst the uninitiated in musical science, but is even found to obtain countenance amongst those who should know better, that there is something mysterious connected with C; that it is the note most natural to the human voice, and is hence the one upon which the untutored ear and the wild savage will pitch his strain of triumph or love. Nothing can be more absurd. No note of the gamut is more natural than another. D, B, A, or any other note, might have been taken with equal propriety as far as that goes, but C was chosen for the reasons assigned. A tune in the major mode which has no signature, that is, without any sharp or flat attached to it, is upon the key of C. But it would be inconvenient to set every piece of music upon this key; hence, notes above or below it are fixed upon as key-notes, and they have all one or more sharps or flats placed between, or upon, certain lines at the beginning of each stave. The reason of this will appear obvious by a short explanation. In the key of C the semitones lie between the third and fourth, that is, technically, E and F, and the seventh and eighth, that is, B and C. Now, suppose we wish to set the tune upon a higher key than C, say D, it is evident, that, since the semitone lies between E and F in the fundamental key, if the key-note be D, it will lie between the second and third instead of the third and fourth; and in order to place it there, F must be sharpened, that is, raised half a tone. Accordingly, upon the F line, a sharp is placed in all tunes in the key of D where sharps are employed, for the purpose could be effected by flats equally well. In the fundamental key, the other semitone lies between B and C, the seventh and eighth; but in the key of D, the interval between B and C is evidently not the seventh and eighth, but the sixth and seventh, so that, in order to place it there, C must be sharpened, which will be found invariably the case in pieces of music having D as their key-note. By this means the semitones are placed in their proper relative position in the octave. Upon the same principle all the other key-notes are formed. The purpose can be effected by means of flats, but this does not alter in the slightest degree the rules laid down. In the minor mode, the semitones lie between the second and third, and sixth and seventh, in ascending, and the fifth and sixth in descending; and the signatures in this, as in the major mode, are so placed as that, in every key upon which a piece of music is set, they shall retain the same relative posi-

* Encyclopædia Britannica, vol. i., p. 111.

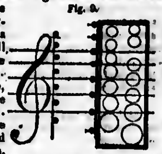
tion. The fundamental note in the minor mode is A. It is impossible in this place to enter farther upon the subject, but the above description will be sufficient to convey an idea of what is technically called transposition, and which is too often by empirical professors of the science enveloped in a cloud of mystery.

MUSICAL INSTRUMENTS.

With regard to musical instruments, and other parts of our subject, we shall avail ourselves of a portion of the article Acoustics, in the British Cyclopædia, written, we believe, by Professor Partington.

Glass vessels of different dimensions are capable of being arranged so as to form a regular musical scale: "The arrangement of the glasses, as originally suggested by Dr Arnott, is shown in fig. 9. The small, open circles represent the mouths of the glasses standing in a mahogany case, and the relation of the glasses to the written musical notes is shown by the common music lines and spaces which connect them.

Fig. 9.



The learner discovers immediately that one row of the glasses produces the notes written upon the lines, and the other row the notes between the lines, and he is mentally master of the instrument by simple inspection. This arrangement also renders the performance easy, for the notes most commonly sounded in succession are contiguous; and the relations of the notes forming a simple air are so obvious to the eye, that the theory of musical combination and accompaniment is learned at the same time. The set of glasses here represented has two octaves, and the player stands at the side of the case, with the notes ascending towards the right hand, as in the pianoforte.

The vibration of plates differs from those of rods in the same manner as the vibrations of membranes differ from those of chords, the vibrations of which cause the plate to bend in different directions, being combined with each other, and sometimes occasioning singular modifications. These vibrations may be traced through wonderful varieties by Professor Chladni's method of strewing dry sand on the plates, which, when they are caused to vibrate by the operation of a bow, is collected into such lines as indicate those parts which remain either perfectly or very nearly at rest during the vibrations. Dr Hooke had employed a similar method for showing the nature of the vibrations of a bell, and it has sometimes been usual in military mining to strew sand on a drum, and to judge, by the form in which it arranges itself, of the quarter from which the tremors produced by countermining proceed.

It usually happens that the vibration of a cord deviates from the plane of its first direction, and becomes a rotation or revolution which may be considered as composed of various vibrations in different planes, and which is often exceedingly complicated. We may observe this by a microscopic inspection of any luminous point on the surface of the chord; for instance, the reflection of a candle in the coil of a fine wire wound round it. The velocity of the motion is such, that the path of the luminous point is marked by a line of light, in the same manner as when a burning coal is whirled round; and the figures thus described are not only different at different parts of the same chord, but they often pass through an amusing variety of forms during the progress of the vibration; they also vary considerably according to the mode in which that vibration is excited.

A very useful instrument for ascertaining the effects of length and pressure, with reference to a vibrating string, is shown in fig. 10. The string is firmly attached at one extremity to the projecting arm, and passing over a bridge somewhat nearer to the centre, is strained by the weight and pulley at the opposite end. A second moveable bridge is seen near the pulley by which the length is regulated.

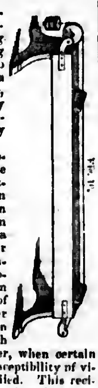


Fig. 10.

The resonances of sound, or reciprocated vibrations of columns of air, have been fully examined by Mr Wheatstone, and we cannot do better than give the result of his observations on this interesting part of acoustics. An elastic body may be made to assume a vibratory state in two ways; either immediately by any momentary impulse, which, altering the natural positions of its particles, allows them afterwards to return by a succession of isochronous oscillations to their former state; or, secondarily, by means of an immediately sounding body, which causes it to reciprocate to the latter, when certain conditions, on which depends its susceptibility of vibrating in such a manner, are fulfilled. This reciprocation to which, where the effect is referred to, the term *resonance* is applied, is effected by means of the undulations which are produced in the air, or in any fluid or solid medium, by the periodical pulses of the original vibrating body; these undulations being capable of putting in motion all bodies whose pulses are coincident with their own, and consequently with those of the primitive sounding body. Gallileo observed, that a heavy pendulum might be put in motion by the least breath of the mouth, provided the blasts be often repeated, and keep time exactly with the vibrations of the pendulum; and this remark affords a correct explanation of the phenomenon.

Some of the most obvious cases of resonance are—the vibrations of a string when another tuned in unison with it is made to vibrate; the resounding of the drinking-glass to the sound of the voice, or of a musical instrument; the reciprocated vibrations of a sounding-board, communicating immediately with a vibrating string or tuning-fork, &c. In the last-mentioned instance, though the string and the fork are the original vibrating bodies, the audible sound is dependent on the resonance of the sounding-board.

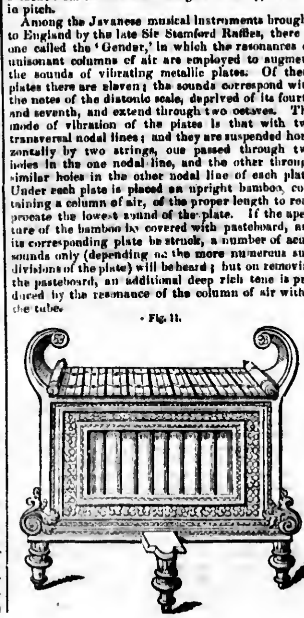
If one of the branches of a vibrating tuning-fork be brought near the embouchure of a flute, the lateral apertures of which are stopped so as to render it capable of producing the same sound as the fork, then the feeble and scarcely audible sound of the fork will be augmented by the rich resonance of the column of air within the flute. The sound will be found greatly to decrease by closing or opening another aperture; for the alteration of the length of the column of air in such case renders it no longer proper to reciprocate perfectly the sound of the fork. This experiment may be easily tried on a concert flute, with a C tuning-fork. To ensure success, it is necessary to remark, that when a flute is blo... ...n to with the mouth, the under lip partly covering the embouchure, renders the sound about a semitone flatter than the sound when the embouchure is entirely uncovered; and as the latter must be in unison to that of the tuning-fork, it is necessary, in most cases, to finger the flute for B when a C tuning-fork is employed.

A similar effect may be produced by substituting for the column of air in the flute, the alterable volume of air contained within the cavity of the mouth. Mr Wheatstone found the sounds of tuning-forks reciprocated most intensely by placing the tongue, &c. in the position for the nasal continuous sound of *ng* (in song), and then altering the aperture of the lips until the loudest sound is obtained.

A column of air may also reciprocate a sound originally produced by a wind instrument, as the following experiment will show. Place two concert flutes on a table, parallel to and at a short distance from each other; on the one which is nearer, sound C sharp (all the lateral apertures being open), and draw out the tube of the second flute, so that it shall be about a semitone flatter, to make it equivalent to the flattening of the first flute by the partial closing of the embouchure by the lip; a material difference will then be distinguished in the intensity of the tone, by alternately closing and opening the first hole of the more distant instrument, thereby rendering it incapable or capable of reciprocating the original sound. That this effect is occasioned solely by the transmission of the sonorous undulations, and not by any wind actually blown into the second flute, is evident from the difference being in intensity, and not in pitch.

Among the Javanese musical instruments brought to England by the late Sir Stamford Raffles, there is one called the 'Gender,' in which the resonances of unisonant columns of air are employed to augment the sounds of vibrating metallic plates. Of these plates there are eleven; the sounds correspond with the notes of the diatonic scale, deprived of its fourth and seventh, and extend through two octaves. The mode of vibration of the plates is that with two transversal nodal lines; and they are suspended horizontally by two strings, one passed through two holes in the one nodal line, and the other through similar holes in the other nodal line of each plate. Under each plate is placed an upright bamboo, containing a column of air, of the proper length to reciprocate the lowest sound of the plate. If the aperture of the bamboo be covered with pasteboard, and its corresponding plate be struck, a number of acute sounds only (depending on the more numerous subdivisions of the plate) will be heard; but on removing the pasteboard, an additional deep rich tone is produced by the resonance of the column of air within the tube.

Fig. 11.



The Gender from which the above drawing was taken is at present in the museum of the Honourable East India Company, and there is another specimen in the possession of Lady Raffles.

If a rod be firmly fixed at one end, and allowed to vibrate freely through its whole length, tones of a very peculiar kind are found to result. Thus, a rod only two feet in length will give a tone as deep as that of the bell employed in the church of St Paul; and the Parisian clockmakers have availed themselves of this fact, in the construction of their ornamental chimney clocks, which by this means cost less, and strike without the sharp and dissonant tinkle common to light bells.

A very pretty instrument, called a 'Kaleidophone,' has been contrived by Mr Wheatstone, of which the accompanying cut is a representation. It consists of four vibrating rods, on which variously formed bodies are placed, and very beautiful and vivid figures produced by merely drawing either of the rods out of the perpendicular, and then allowing them to vibrate freely. Quicksilvered glass beads reflect the light of a lamp or the sun-beams better probably than most other objects; but Mr Wheatstone showed the editor the letters on a common address card, and which, when attached to a bent rod, produced two most elegant compound figures. The white lines in the figure beneath show the paths of a series of these rods.

Fig. 12.

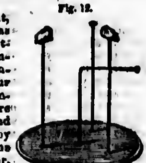
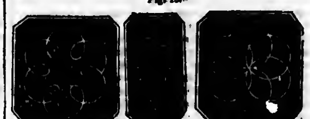
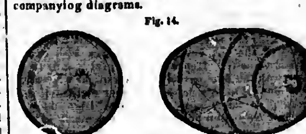


Fig. 13.



If a sound or wave be reflected from a curved surface, the new direction which it will assume may be determined either from the condition that the velocity with which the impulse is transmitted must remain unaltered, or from the law of reflection, which requires that the direction of the reflected pulse or wave be such as to form an angle with the surface, equal to that which the incident pulse before formed with it. Thus, if a sound or wave proceed from one focus of an ellipsis, and be reflected at its circumference, it will be directed from every part of the circumference towards the other focus; since the distance which every portion of the pulse has to pass over in the same time, in following this path, is the same, the sum of the lines drawn from the foci to any part of the curve being the same: and it may also be demonstrated that these lines form always equal angles with the curve on each side. The truth of this proposition may be easily shown by a simple experiment on a basin of water; the curvature of a circle differs so little from that of an ellipsis of small eccentricity, that if we let a drop fall into the basin near its centre, the little wave which is excited will be made to converge to a point at an equal distance on the other side of the centre. The effects of these reflections are perfectly illustrated in the accompanying diagrams.

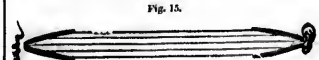
Fig. 14.



An umbrella held in a proper position over the head may serve to collect the force of a distant sound by reflection, in the manner of a hearing-trumpet; but its substance is too slight to reflect any sound very perfectly, unless the sound fall on it in a very oblique direction. The whispering gallery of St Paul's produces an effect nearly similar by a continued repetition of reflections. Mr Charles's paradoxical exhibition of the Invisible Girl has also been said to depend on the reflection of sound; but the deception is really performed by conveying the sound through pipes ingeniously concealed, and opening opposite to the mouth of the trumpet from which it seems to proceed.

The speaking and hearing horns owe their operation to the reflection of sound. The reader has already seen how capable a continuous pipe is of transmitting the waves or pulses of the air. This is also, to a certain extent, accomplished by a trumpet-mouthed vessel, and a second apparatus may be employed to collect the pulses which have thus been transmitted.

Fig. 15.



The above figure shows at one view the joint effects of both forms of the trumpet."

WIND INSTRUMENTS.

Wind instruments produce their effect by the vibrations of a column of air confined at one end, and either open or shut at the other. The length of the sounding column determines the nature of the vibrations; but along with the fundamental tone, there are interior and subordinate vibrations. The whole column divides itself into regular portions equal to the half, the third, and so on, of the longitudinal extent, in the same manner as we showed was the case in stringed instruments. We may observe something similar to these vibrations in the contraction and expansion of a long and very elastic string, to one extremity of which a ball is attached. A spiral spring also shows, and perhaps more clearly, the repeated stretching and recoil. If suddenly struck at one end, it will exhibit not only a vibration throughout its whole extent, but likewise partial ones, which wind vermicularly along the chain of elastic rings. If the air be struck with great force, the subordinate vibrations sometimes predominate, and yield the clearest and loudest tones. This may be observed in the dying sounds of a bell, which rise one or two octaves, and expire in the acutest note. Upon the degree of force with which the instrument is blown, depends the performance of the bugle horn, whose compass is very small, consisting only of the simplest notes. In other wind instruments, the nature of several notes produced depends upon the length and size of the tube, or the positions of the holes in its sides. In the organ there is a pipe for each note, and wind is admitted from the bellows to the pipes by the action of keys similar to those of a piano-forte. The organ may be played also by a barrel made to turn slowly under the keys, and to lift them in passing, by means of pins projecting at certain determinate intervals from the surface of the barrel. In wind instruments which are furnished with reeds, the tone depends on the stiffness, weight, length, &c. of the vibrating plate or tongue of the reed, as well as on the dimensions of the tube or space with which it is connected.

A very singular effect is produced in the vibrations of a column of air, contained within a tube open at both ends, by means of hydrogen gas, used in the following manner. Professor Leslie thus describes the experiment:—"A phial, having a long narrow glass pipe fitted to its neck, being partly filled with dilute sulphuric acid, a few bits of zinc are dropped into the liquid. As the decomposition of the water embodied with the acid now proceeds, the hydrogen gas thus generated flows regularly from the aperture, and is capable of catching fire, and of burning for some considerable time with a small yet steady round flame. This very simple arrangement, frequently styled the philosophic lamp, is in reality of the same nature with the combination, on a large scale, of the gas lights. A glass tube being passed over the exit pipe, the burning speck at its point instantly shoots into an elongated flame, and creates a continued sharp and brilliant musical sound. This effect is not owing to any vibrations of the tube itself, for it is nowise altered by tying a handkerchief tightly round the glass, or even by substituting a cylinder of paper. The tremor excited in the column of air is therefore the sole cause of the incessant tone, which only varies by a change in the place of the flame, or a partial obstruction applied at the end of the tube. But still it is not easy to conceive how the mere burning of a jet of hydrogen gas within the cavity should produce such powerful vibrations. The exciting force must necessarily act by starts, and not uniformly. The length of the flame might seem to prove that the hydrogen gas is not consumed or converted into aqueous vapour as fast as it issues from the aperture. A jet of it catches instantaneous fire, but is immediately followed by another, the succession of the inflamed portions being so rapid as entirely to escape the keenness of sight. The column of air contained within the tube would thus be agitated by a series of incessant strokes or sudden expansions."

SPREAD OF SOUND.

That water is a vehicle of sound as well as the air is proved by various circumstances, particularly by the fact that a bell wrung under water can be heard; and if the head of the auditor be also under water, it will be still more distinctly heard. The sound which the sonorous body produces, however, is graver than that which it gives forth in the air. Indeed, the law is, the rarer the medium in which bodies sound, the sharper will be the tone. Solids convey sounds more perfectly than air, of which fact the following are instances:—A scratch of a pin at one end of a wooden log is heard by the ear applied to the log at the opposite extremity, although through the air it is not at all audible. If a cannon be discharged on ice, the report will be carried much farther by the ice than by the air around. Savages, it is well known, are in the habit of putting their ear to the ground, in order to discover the proximity of enemies, or of beasts of prey. The awful sound of the earthquake is merely the muttering of subterranean explosions, communicated from immense distances by the solid strata of the earth.

The property of solids to convey sounds much more perfectly than air, has been applied to useful purposes in medicine. Dr Laennec of Paris has invented what he calls a *stethoscope* or *chest inspector*, which is simply a wooden cylinder. One end of this instrument is applied to that part of the surface of the body opposite to the part which we wish to examine, and the ear rests upon the other end. By this means the actions going on in the chest, and the nature of the diseases there, can be detected by the difference of the sounds conveyed. The results of the use of this instrument have in many instances been important.

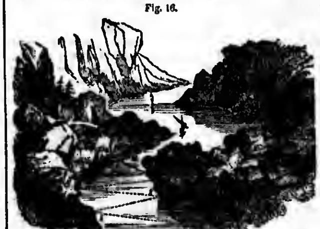
REFLECTION OF SOUND.

When a wave of water strikes a wall, it is thrown back with a degree of force proportioned to its mass, and the velocity with which it came into collision with the wall. It is in the same manner that the pulses or waves of sound are reflected or thrown back from flat surfaces, thus producing what is termed an *echo*. It is evident that the smoother the surface which reflects the sound, the more perfect will be the echo. An irregular surface, by throwing back the wave of sound at irregular intervals, will confound and distract it, that no distinct or audible echo will be reflected. On the contrary, a regular concave surface will reflect sound in such a manner that at a certain point the reflections from each part of the concave surface will be concentrated into a focus capable of producing a very powerful effect. The concentration of sound in this manner produces many remarkable effects both in nature and art. Some of these have been already noticed.

The velocity with which an echo returns to the spot where the sound originates, depends of course upon the distance of the reflecting surface; and since sound travels at the rate of about 1130 feet in a second, a rock situated at half that distance will return an echo in exactly one second. The number of syllables which we pronounce in a second will in such a case be repeated distinctly, while the end of a longer story would blend with the commencement of the echo. Where there is an echoing surface on the opposite side of a river, its breadth could be determined by ascertaining the time which transpires before an echo is returned. Dr Arnott observes, "There is a curious effect of echo which both illustrates the nature of the phenomenon, and proves that a tone or musical sound is merely a repetition of pulses following each other very quickly. Iron railings are generally formed of square bars, of which individual bars any side, therefore, is a plane surface, and may produce an echo. Now, a sound, such as the sharp blow of a hammer, occurring on one side, and near the end of such a railing, is echoed to a corresponding place on the other side by every bar in it; and as the echoes do not return all at once, but in regular succession, according to the increasing distance of the bars, the consequent regular succession of slight pulses, with uniform and small intervals, affects the ear, not as the echo of a single blow, but as a continued musical tone, the pitch of which depends on the distance of the bars from each other."

One of the most singular and distinctly marked illustrations of the reflection of sound forming a natural echo, occurs on the banks of the Rhine nearly Lurley. By referring to the accompanying picturesque illustration, the reader will readily understand how the reverberations of sound are produced.

Fig. 16.



P is considered as the phonic centre, the primary point of radiation for the sound, and the waves striking at the first series of numerals are reflected to twenty, and so on through the series of reflecting points.

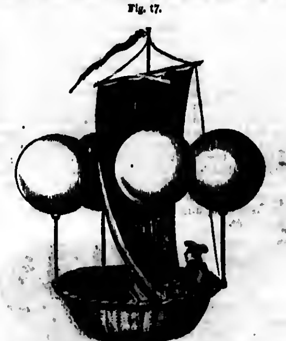
THE ANIMAL EAR.

Beautifully as the ear is adapted to the purposes of life, its mechanism is exceedingly simple. There is first externally a wide-mouthed tube or ear-trumpet, which collects the undulations of sound. It is differently formed in different animals, but always admirably adapted to their circumstances and habits. It is moveable in many animals, so that they can turn it in the direction in which the sound comes. In man, it is close to the head, and so constituted as to collect the sounds with great accuracy; in other animals it is more simple, but in general much larger, having the appearance of an oblong funnel; and this gives them a greater delicacy of hearing, which their situation and manner of life require. The sound concentrated at the bottom of the ear-tube falls upon a membrane, stretched there like the top of an ordinary drum, over the tympanum or drum of the ear, and causes it to vibrate. On the opposite side of this membrane, there is a small cavity hollowed out in bone, which is termed the barrel of the tympanum. Between this part of the ear and the external atmosphere there is a passage to the back part of the mouth, by which the air enters, and thus equipoises the pressure of the atmosphere on the other side of the membrane. Deafness ensues when this tube is obstructed. Across the cavity there is extended, though by no means in a straight line, a series of small bones, the exterior one of which is attached to the membrane we have just mentioned, the most internal of the set being firmly connected with another membrane, which, in conjunction with it, shuts up the entrance to a still more deepened cavity called the labyrinth of the ear. This complex inner apartment, over which the nerve of hearing is spread as a lining, is full of water; and, therefore, by the law of fluid pressure, when the force of the moving membrane of the drum, acting through the chain of bones, is made to compress the water, the pressure is instantly felt over the whole cavity, the same as in a hydrostatic press. The labyrinth consists of the vestibule, a hollow space, and three semicircular canals, imbedded in the hard bone, and a winding cavity called the cochlea, convoluted somewhat like a snail's shell, in which fibres, stretched across like harp strings, constitute the lyra. All the passages are lined by a membrane, on which the sentient extremity of the auditory nerve is expanded in different shapes; from these it is collected into one trunk, and goes on to join a particular part of the brain, and thus completes the communication between the external agent and the sensorium. Such is the mechanism of the ear. For a more detailed account of it, anatomical works must be consulted.

AERONAUTICS.

Aeronautics is the art of sailing in or navigating the air. In remote ages, the idea of rising in the atmosphere by a machine was entertained, but never realised until modern times, when gases lighter than air were discovered. Francis Lana, a distinguished Jesuit, in the year 1670, was the first who attempted to construct scientific apparatus for navigating the aërial ocean. The following cut represents it. He

Fig. 17.



proposed to raise his vessel by the aid of four balls exhausted of air. The inventor argued that the diminished weight of the balls would buoy up not only themselves, but the aëronaut and his vessel; but it is evident that, before balls capable of withstanding the external pressure of the air could be constructed, the materials employed being necessarily of a strong nature, they would turn out to be bulk for bulk heavier than the air. Thus the scheme was abortive. The discovery of inflammable air, or hydrogen gas, suggested to Dr Black, the distinguished chemist, the idea of filling a bladder with it; and leaving it to itself, he correctly concluded that it must ascend in the atmosphere. In 1782, Cavallo made some experiments, in which the fact was proved; and in the same year, the two brothers Montgolfier constructed a machine, and ascended in it the year following. The attention of philosophers being now drawn to the subject, several experiments were made with success. It was also found, that, if a fire be placed under the aperture of a very thin bag, and thus rarify the air within, the bag will ascend. Thus there were two species of balloons discovered. The process of filling balloons on the small scale for this species of aërial navigation, will readily be understood by a reference to the accompanying sketch, in which a simple condenser is employed. The common mode is to generate hydrogen gas in a bottle, by pouring dilute sulphuric acid on granulated zinc; but the hot and moist vapour from the acid speedily destroys the balloon. To prevent this, the experimenter has only to employ a second bottle containing water, and carry a bent pipe from the first bottle through a cork in the second; it dips beneath the surface, and is condensed, and the pure hydrogen ascends by the second pipe to the balloon.

Fig. 18.

It is unnecessary to enumerate all the ascents made by different individuals at different times subsequent to the successful one of Montgolfier in 1783. Associated with them are the names of Pilatre de Rozier, Charles, Robert, Lunardi, Blanchard, and others. The latter individual rendered an essential service to aëronauts by the invention of the parachute, which they can safely descend with in cases of emergency.

Fig. 19.

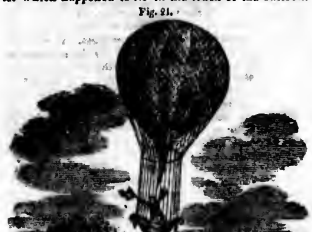
In the right-hand figure, M. Garnerin's apparatus is seen as it ascended from St George's Parade. A cylindrical box, about three feet in height, and two in diameter, was attached by a straight pole to a truck or disc at the top, and from this was suspended a large sheet of linen somewhat similar to an umbrella. The form it assumed on the descent of the aëronaut is shown in the next figure. When first cut from the balloon, it descended with amazing velocity, and those who witnessed its progress considered the destruction of the aëronaut as certain; but after a few seconds, the canvass opened, and the resistance was so great, that the apparatus diminished in its speed, till, on its arrival near the earth, it was not greater than would have resulted from leaping a height of two feet.

Amongst the unfortunate aëronauts we may place Major Money, who ascended from Norwich, under the full impression that the aërial current would take the balloon in the direction of Ipswich. Scarcely, however, had he attained an altitude of one mile, when a violent hurricane, operating in a new direction, drove the balloon towards Yarmouth. Several small row boats immediately put out from that port, and endeavoured to keep pace with the balloon, but without success, and Major Money first touched the sea about nine miles from land, and more than three from any means of assistance.

Fig. 20.

The above illustration shows the critical situation of Major Money, about ten minutes after he had parted with a portion of his clothes and instruments. He was fortunately picked up in an exhausted state by a cutter which happened to lie in the track of the balloon.

Fig. 21.



The preceding illustration exhibits a very picturesque view of the ascent of that veteran, Mr Green, from the Park, on the occasion of the coronation of his late majesty, George IV. The balloon itself, the form of which is similar to but infinitely more beautiful than a pear, is composed of strips of variegated silk, the harmony of which has a particularly pleasing effect on the eye. Over this is thrown an envelope of network, which passing down serves as a support to which the car is attached.

It must be confessed that aëronautic experiments are not of very great practical utility. However, several eminent philosophers have ascended in balloons, and ascertained various interesting scientific facts. MM. Biot and Gay Lussac some years since rose to a considerable elevation, and having provided themselves with a number of philosophical instruments, such as barometers, hyrometers, electrometers, &c., they were enabled to determine several points of importance. After they had risen to the height of about 6500 English feet, they began their experimental operations. The magnetic needle was attracted, as usual, by iron; but they found it impossible at this time to determine with accuracy its rate of oscillation. A voltaic pile, consisting of twenty pairs of plates, exhibited all its ordinary effects. By rejecting some more ballast, they had attained the altitude of 8940 feet, but afterwards settled to that of 8600 feet. At this great elevation the animals which they carried with them appeared to suffer from the rarity of the air. They let off a violet bee, which flew away very swiftly, making a humming noise. The thermometer had fallen to 56·4° by Fahrenheit; yet they felt no cold, but were, on the contrary, scorched by the sun's rays. Both of them had their pulses much accelerated; but notwithstanding this, they experienced no sort of uneasiness, nor any difficulty in breathing. What perplexed them the most was the difficulty of observing the oscillations of a delicately suspended magnetic needle. But they soon remarked, on looking attentively down upon the surface of the conglomerated clouds, that the balloon slowly revolved, first in one direction, and then returned the contrary way. Between these opposite motions there intervened short pauses of rest, which it was necessary for them to seize. Watching, therefore, the moments of quiescence, they set the needle to vibrate, but were unable to count more than five, or very rarely ten oscillations. A number of trials, made between the altitudes of 9500 and 13,000 feet, gave 7″ for the mean length of an oscillation, while at the surface of the earth it required 7 1-20th″ to perform each oscillation. A difference so very minute as the hundred and fortieth part could be imputed only to the imperfection of the experiment; and it was hence fairly concluded that the force of magnetic attraction had in no degree diminished at the greatest elevation which they could reach. The direction of this force, too, seemed, from concurring circumstances, to have continued the same.

At the height of 11,000 feet they liberated a green linnet, which flew away directly; but feeling itself abandoned in the midst of an unknown ocean, it soon returned, like the dove to the ark, and settled on the stays of the balloon. Then mustering fresh courage, it took a second flight, and dashed downwards to the earth, describing a tortuous yet almost perpendicular track. A pigeon which they let off under similar circumstances afforded a more curious spectacle. Placed on the edge of the car, it rested a while, then launching into the abyss, it fluttered irregularly, and seemed at first to try its wings on the thin element; till, after a few strokes, it gained more confidence, and, whirling in large circles or spirals, like the birds of prey, it precipitated itself towards the mass of extended clouds, where it disappeared.

It was difficult, in those lofty and rather humid regions, to make electrical observations. However, they let down from the car an insulated metallic wire of about 250 feet in length, and ascertained that the upper end indicated resinous or negative electricity. This experiment was several times repeated; and it seemed to corroborate fully the previous observations of Saussure and Volta relative to the increase of electricity met with in ascending the atmosphere. The diminution of temperature in the higher regions was found to be less than what is generally experienced at the same altitude on mountains.

The hygrometer, or rather hygroscope, of Saussure, advanced regularly towards dryness, in proportion to the altitude which they attained. At the elevation of 13,000 feet it had changed from 80.8° to 30°. "But still," says Professor Leslie, from whom the account of this ascent is principally taken, "the conclusion, that the air of the higher strata is drier than that of the lower, we are inclined to consider as fallacious. In fact, the indications of the hygroscope depend on the relative attraction for humidity possessed by the substance employed, and the medium in which it is immersed. But air has its disposition to retain moisture always augmented by rarefaction, and, consequently, such alteration alone must materially affect the hygroscope. The only accurate instrument for ascertaining the condition of the air with respect to dryness is founded on a property of evaporation." These are the principal experiments which the French aëronauts performed, and their ballast being exhausted, they descended. M. Gay-Lussac afterwards ascended alone. Scarcely had the observer reached the height of 3000 feet, when he observed spread below him, over the whole extent of the atmosphere, a thin vapour, which rendered the distant objects very indistinct. Having gained an altitude of 9950 feet, he set his needle to vibrate, and found it to perform twenty oscillations in 83″, though it had taken 84.33″ to make the same number at the surface of the earth. At the height of 12,680 feet he discovered the variation of the compass to be precisely the same as below; but with all the pains he could take, he was unable to determine with sufficient certainty the dip of the needle. M. Gay-Lussac continued to prosecute his other experiments with the same diligence, and with greater success. At the altitude of 14,480 feet he found that a key, held in the magnetic direction, repelled with its lower end, and attracted with its upper end, the north pole of the needle of a small compass. This observation was repeated, and with equal success, at the vast height of 20,150 feet; a clear proof that the magnetism of the earth exerts its influence at remote distances. He made not fewer than fifteen trials at different altitudes, with the oscillations of his finely suspended needle. It was generally allowed to vibrate twenty or thirty times. The mean result gives 4.22″ for each oscillation, while it was 4.210″ at the surface of the earth; an apparent difference so extremely small as to be fairly neglected.

The ascents performed by MM. Biot and Gay-Lussac are memorable for being the first ever undertaken solely for objects of science. It is impossible not to admire the intrepid coolness with which they conducted those experiments, operating, while they floated in the highest regions of the atmosphere, with the same composure and precision as if they had been quietly seated in their cabinets at Paris. Their observations on the force of terrestrial magnetism show most satisfactorily its deep source and wide extension. The identity of the constitution of the atmosphere to a vast altitude was likewise ascertained. The facts noted by Gay-Lussac, relative to the state of the thermometer at different heights, appear generally to confirm the law which theory assigns for the gradation of temperature in the atmosphere; but many interesting points were left untouched by this philosopher. It is to be regretted that he had not carried with him the cyanometer, which enabled Saussure to determine the colour of the sky on the summits of the Swiss mountains, and also that he was not provided with an hygrometer and a photometer of Leslie's construction. It would have been extremely interesting, at such a tremendous height, to have measured with accuracy the feeble light reflected from the azure canopy of heaven, and the intense force of the sun's direct rays, and hence to have determined what portion of them is absorbed in their passage through the lower and denser atmosphere.

Since that time, numerous ascents have been performed in different countries, generally by adventurers guided by no philosophical views, nor leading to any valuable results. It would therefore be superfluous to recount such repeated attempts.

Balloons have at different times been thought capable of useful application. It has been even proposed to employ their power of ascension as a mechanical force. This might be rendered sufficient, it was believed, to raise water from mines, or to transport obelisks, and place them on great elevations. We can easily imagine situations where a balloon could be used with advantage; such as to raise, without any scaffolding, a cross or a vane to the top of a high spire. But the power would then be purchased at a very disproportionate expense. It would require $4\frac{1}{2}$ pounds of iron, or 6 of zinc, with equal quantities of sulphuric acid, to yield hydrogen gas sufficient to raise up the weight of one pound.

But to a skilful and judicious application of balloons, we may yet look for a most essential improvement of the infant science of meteorology. Confined to the surface of this globe, we have no direct intimation of what passes in the lofty regions of the atmosphere. All the changes of weather, which appear so capricious and perplexing, proceed no doubt from the combination of a very few simple causes. Were the philosopher to penetrate beyond the seat of the clouds, examine the circumstances of their formation, and mark the prevailing currents, he would probably remove in part the veil that conceals those mighty operations. It would be quite practicable to reach an elevation of seven miles, where the air would be four times more attenuated than ordinary. A silk balloon, of forty feet diameter, if properly constructed, might be sufficient for that enormous ascent, since its weight would only be eighty pounds, while its buoyant force, though not more than a quarter filled with hydrogen gas, would amount to $533\frac{1}{3}$, leaving $453\frac{1}{3}$ pounds for the passenger and the ballast. The balloon could be safely charged, indeed, to the third part of its capacity, on account of the contraction which the gas would afterwards suffer from the intense cold of the upper regions; and this gives it an additional buoyancy of 177 8-9th pounds. The voyager would not, we presume, suffer any serious inconvenience from breathing the very thin air. The animal frame adapts itself with wonderful facility to external circumstances. Perhaps the quickened pulse and short respiration, which some travellers have experienced on the summits of lofty mountains, should be attributed chiefly to the suddenness of their transition, and the severity of the cold."

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PRESERVATION OF HEALTH.

ALL mankind will readily agree that the preservation of health is of the utmost importance to every person; for without that blessing there can be no enjoyment in life. The greatest riches, the highest rank, the most highly-gifted genius, cannot purchase an immunity from sickness, which, with all its train of miseries, enters alike the palace gate and the cottage door. The nobleman lounging in his drawing-room or park, the merchant busy in the pursuit of his daily occupations, the peasant labouring in the open fields, are in this respect placed on the same level; but, unhappily, the majority of men are apt to be insensible of the good health which they enjoy, and, by trifling with their constitutions, not unfrequently entail sufferings on themselves and distress upon their families. Indiscretions of this kind never fail to be afterwards deeply regretted; for the season of sickness in every household is one of great affliction. For this reason, every family should be in possession of a CODE OF HEALTH, the precepts of which should never be forgotten. Thus might parents be better enabled to secure the health of their children, and every individual learn to manage his constitution in such a manner as to enjoy permanent health. It is with this view that we now proceed to lay before our readers a body of information concerning the means of preserving health, which we trust will be found acceptable in every domestic circle.

AIR.

A constant accession of fresh and pure air is essential to the existence of human life, and upon this principle, that it is the means of purifying the blood, and rendering it fit to circulate through the body. Hence, if the supply of air be cut off—as in cases of hanging, drowning, smothering, &c.—the blood stagnates in the lungs, the heart does not receive a sufficient quantity of this fluid to stimulate it to action, and death ensues. In breathing, we perform two actions; first, the act of inspiration, whereby the air enters the lungs; second, the act of expiration, by which the air is again expelled from them. This being premised, it is necessary to remark, that the expired air differs from the air inspired, inasmuch as, while in the lungs, in the act of purifying the blood, it loses a portion of its stimulating, and acquires noxious properties. Accordingly, crowded apartments—such as nurseries, hospitals, and the rooms of large manufactories—should be well ventilated, otherwise the children or persons living in them will suffer materially, from constantly breathing a vitiated atmosphere. To prevent this, ventilators, or small movable wheels, made of sheet-iron or brass, should be fixed in some part of the windows, which will allow the heated air of the apartment to escape, and the external air to enter. In respect to bedrooms which have more than one bed, the doors should be furnished with similar ventilators; and during the summer months the windows should be kept partially open during the night and day. Furthermore, as Dr Darwin observes, the fireplace should not be stopped up at any season of the year by a chimney-board or bag of straw, as many rooms are made to shut up so close that this is the only aperture by which fresh air can be admitted. To this should be added, that the bed-curtains should never be drawn close round the beds, which confine the air spoiled by frequent respiration, and the perspirable matter, like a noxious atmosphere, over the sleeper. At the same time, none of the beds should be placed very near either to an open window or to an open chimney, as a current of air should always be avoided. In many manufactories, where deleterious gases arise during certain chemical operations, it is of most vital importance that the rooms should be so well ventilated as to permit their free exit. In Hencke's Journal we read, that in some of the hat manufactories in Petersburg, the workmen experienced fatal accidents and diseases from the inhalation of nitrous acid fumes, occasioned by their dissolving mercury in nitric acid during the process of their business. It is much to be feared that, even in our British manufactories, sufficient attention is not paid to the ventilation of the workrooms; and to this subject, therefore, we would earnestly call the attention of the masters or directors.

The air we breathe may prove injurious to the constitution in two ways: first, by its being loaded with poisonous matters, such as marsh miasm; and, secondly, by its surrounding us with a sudden vicissitude of temperature. In many districts in England, Germany, Italy, France, and North America, a marsh miasm arises from the soil, which gives rise to severe intermittent fever. During the time the wind blows from the Campagna di Roma over the city of Rome, the inhabitants of that city shut up their houses which are exposed to the current, and retire to another part of the city, in order to avoid inhaling the miasm by which the disease is produced. The nature of this miasm, which is of so subtile a nature as to defy all analysis, has been a matter of much speculation. By some it is presumed to be a gas which arises from the earth; by others it is supposed to be a diseased secretion of plants, which become so diseased from the effects of the standing water by which they are surrounded:—whichever theory be adopted—and neither admits at present of any satisfactory demonstration—it is certain that when such marshy soils are drained, the air of the district becomes purified, and intermittent fever disappears. This was the case in Edinburgh. Before the North Loch was drained for the purpose of laying out the present beautiful gardens in Prince's Street, intermittent fever was common in the town; but since that improvement has been made, the disease has almost entirely disappeared. For this reason, dwelling-houses in the neighbourhood of lakes, fens, and marshes, should be avoided; indeed, the most healthy situation to build a house is on a rising ground, upon a chalky soil, in an open and dry country, neither exposed to the severest degree of cold in winter, nor the highest degree of heat in summer. Trees, also, with heavy and thick foliage, ought not immediately to surround the windows of a house, because they interrupt the free current of air, have a tendency to make the rooms damp, and during the evening or night exhale odours that are often extremely injurious to health.

In large and populous cities the free ventilation and cleanliness of the public streets are imperatively required; otherwise, the most frightful and fatal diseases will be generated. There is indeed every reason to believe that the great plague of London, in the year 1665, was occasioned by the negligence which prevailed in these respects. By referring to the writers of that period, we find that London was then an extensive plain, from which effluvia of every kind were generated; dirt of all kinds was suffered to lie in the streets, the drains were choked up, and every description of excrementitious matter thrown into them; the floors even of the middle ranks were covered with straw and hay, beneath which, though occasionally renewed, grease, fragments of meat, and every kind of filth, were permitted to remain unmolested; the houses, too, were high and irregular, the streets narrow, and every obstacle that could prevent a free current of air was offered. Breathing such a polluted atmosphere, it is assuredly not surprising that the inhabitants of a city so infested should fall victims to the plague. At this very period, the city of Oxford, to which the court retired, having had its streets cleaned, and its drains and rivers cleared, was so healthy, that, says Dr Quincey, "the sickness (*i. e.* the plague), in 1665, never visited any person there, although the terms were there kept, and the court and both houses of Parliament did there reside." The public authorities of every town and village should bear these facts in recollection; and every householder, however humble may be his dwelling-place, should remember that free ventilation and cleanliness are the best safeguards against such fearful visitations. If any more recent fact were wanting in confirmation of this assurance, it would be found in the circumstance of the late epidemic cholera having been so manifestly checked in Edinburgh by the precautions adopted in that city, which consisted principally in clearing away every species of dirt out of the courts and alleys, and fumigating the houses of the poor.

Enough, however, has been now said concerning the morbific impregnations of the atmosphere; let us next attend to the transitions of its temperature, which so frequently give rise to severe and often fatal maladies. The powers of endurance in the human body are so considerable, that, provided the change be made by degrees, man can live either beneath the burning rays of a tropical sun, or in the icy regions which surround the north pole. The change, however, from the extreme of heat to the extreme of cold, must be gradual; for it is only by degrees that his system can accommodate itself to such opposite conditions. That which is true in respect to his transferring himself thus from the coldest to the hottest region of the globe, is also true in respect to his suddenly passing from an over-heated into an extremely cold apartment. Indeed, the air of crowded public meetings, and that which is met with in ball-rooms and theatres, is often of as high a temperature as in the equatorial regions; and the transition into the cold midnight air does not offer a less severe shock to the constitution than were the individual suddenly transported from the equator to the snowy shores of Baffin's Bay. By this imprudent conduct, many a young person in the bloom and beauty of life has been hurried to the tomb. But in vain does the medical philosopher raise a warning voice; society still demands the sacrifice; and the most cautious are continually tempted to transgress. Under these circumstances, it remains for us to explain the precautions which should be adopted to prevent the ill effects of such exposures. The condition of the body, on going out into the open air, requires attention; it should be as warm as possible, short of perspiration. It is a bad practice to linger about the halls and doors, under an idea that the body should be cool before venturing out. Many lives are annually lost by this ill-judged caution; for in this state the body is highly susceptible of the baleful influence of the night air. It is better to go forth with some degree of perspiration, than wait until we are chilled. The greater degree of animal heat we are in on going out, the less injury are we likely to sustain. To protect the system as much as possible from the air, the body, especially the throat and chest, should be protected by warm clothing; such as are made of woollen, cotton, &c. A large net or comforter should also be folded loosely round the face, which will receive a portion of heat from the breath at each expiration; and this being communicated to the current of air entering the mouth at each inspiration, will impart to it some degree of warmth before it enters the delicate structure of the lungs. Persons who have carriages in waiting should adopt the same precautions; for, before the steps of the carriage can be put up, and the door closed, a cold blast of air may enter, sufficient to produce that chill which is so carefully to be guarded against. Those who return on foot should proceed along at a brisk pace, in order to keep up the animal heat of the body with which they set out. As the transition from the heated apartment into the cold night air must have in some degree checked the perspiration, it is prudent, on arrival at home, to take a little of some stimulating liquid—wine and water, or spirits and water, whichever may be preferred; and if there be any disposition to shivering, or apprehension of cold having been taken, the feet, on going to bed, should be immersed in hot water, with a view to restore the perspiration of the skin. By these means the evil effects which are apt to arise from exposure to the night air, may perhaps be averted; but let not the invalid, nor young persons affected with delicate constitutions, rely on any such hope; for in their cases it will in all probability prove fallacious; and they will be left, when too late, to repent that they allowed themselves to be tempted, by the attractions of a transitory scene of pleasure, into an indiscretion by which they may bring upon themselves an illness which no medical skill may be able to check.

From the observations we have already made, it will appear obvious that young persons ought not to be accustomed to small and heated apartments; indeed, the more children are allowed to play in the open air during the day-time, provided the weather be not inclement, the better. Persons who live much in the open air, for the most part enjoy very vigorous constitutions. The old Romans, and many other nations of antiquity, were accustomed to live continually in the open air; but it is in this country the pernicious custom with many persons to live in apartments, the atmosphere of which is heated above the natural temperature of our climate; and when, therefore, they venture into the open air, they run the most imminent risk of taking cold. Besides this, there are many ladies who habituate themselves to living almost exclusively in the house: they fancy themselves so delicate that they apprehend the slightest breath of wind will wither their beauty and destroy their constitution; but the truth is, and this should ever be remembered, that there can be no grace, beauty, or dignity of the human frame, unless every limb and feature be lighted up with the expression of conscious health, which is a blessing the victims of such artificial habits cannot enjoy: their tasselled couch yields to them a less comfortable rest than the humblest cottage chair renders the hardy peasant, and their studied repast is less welcomed than the rudest fare of the cottage table.

DIET.

Instinct leads the inferior animals to select the food which is best adapted for their nourishment, but the majority of men are apt to transgress the dictates of nature, and by converting their necessary meals into feasts of luxury, impose duties on the digestive organs which they are not able to perform; hence arises a host of maladies which the most skilful physician is often unable to conquer. Let every person, therefore, who is anxious for the preservation of his health, attend strictly to his diet. The human body, and indeed the body of every animal, is constantly undergoing a certain waste, and requires a certain repair. The old particles even of the most solid textures—such as the bones—after a time become useless, and are ejected from the system, and new particles are deposited in their stead. These new particles are derived from the nutritious portion of the food which is eaten; and this renovation is the great object of digestion. It is evident, therefore, that such food should be chosen as will supply the requisite nutrition; and this nature has amply provided. The kind of food which every animal should eat, is in a great measure indicated by the structure of the body. Thus, carnivorous animals, or those destined like the lion to live on flesh, have a short and straight intestinal canal, in order to allow a quick passage for the food; herbivorous animals, or those destined to feed on different descriptions of herbs, have on the other hand this canal very long and complicated, for such food does not so readily part with its nutrition, and requires to be detained longer in the digestive canal. In the horse, the large intestines are of enormous size, and dilated into small sacs; in the ram, the intestinal tube, which is termed the alimentary canal, is twenty-seven times the length of the body. The shape of the teeth and jaws, also, bears obvious reference to the kind of food which animals are destined to live on. The teeth of carnivorous animals—such as the lion—are long, sharp, and pointed, and those of the lower shut within those of the upper jaw; the teeth of herbivorous animals are not thus calculated for seizing and lacerating prey, but present broad and flat surfaces; and the jaws, instead of being able only to move upwards and downwards, command a motion from side to side, so that they are able to give the vegetable food on which they live that more perfect comminution which it requires. The structure of the human body shows that man has been ordained to live both on animal and vegetable diet. His teeth and jaws associate him with the monkey tribe, his stomach with the lion, his intestines with the ourang-outang. He is truly, therefore, an omnivorous animal, and may adapt his diet to almost any peculiarity of habit, situation, or climate. The ancient Britons lived entirely on flesh and milk; and vegetables, which now grow in our kitchen gardens, were not in England cultivated until the time of Catharine of Arragon. The Romans, during the time of their campaigns, lived almost entirely on vegetables very simply dressed; and many Italians, even at the present day, support themselves almost entirely on bread, fruits, and the produce of the earth. In a savage state, some nations live almost entirely on fruits and roots, others on raw animal flesh of the coarsest description. Dogs are eaten in the South Sea Islands, horses in Tartary, and many African tribes are said to feed on dead lions and hippopotami. The Hindoo supports himself on rice and maize; the wandering Moor on gum seneca; the Greenlander eats the flesh of the whale; the Esquimaux that of the walrus; and the Kamschadales feed on coarse fish oil, made into a paste with sawdust. When pressed by hunger, men have been known to swallow large quantities of earth, and even devour with avidity the flesh of their fellow-creatures. This dreadful means of appeasing hunger is said to have been had recourse to on the raft of the French frigate Medusa, when wrecked on the coast of Africa; and also on a rock in the Mediterranean, where the Nautilus frigate was lost. Man, however, is not the only omnivorous animal: the swine, and many insects, as the ant, are also omnivorous. Among the inferior animals, eccentricities in the choice of food, and extravagances when urged by hunger, have been committed, as remarkable as those above narrated. In some tracts in the East, the horse is fed on fish; and Dr Tyson, in the Philosophical Transactions, states that he knew a horse that would stand at a tavern door and eat oysters, crunching the shells and swallowing them with their contents. On board of a ship, a lamb had been fed on flesh until it refused grass. In like manner, the hawk has been fed on bread; pigeons on meat; and sheep, when the earth has been covered with snow, have eaten the wool off each other's backs.

While it has been clearly demonstrated that man is naturally an omnivorous animal, it has been also ascertained that he cannot enjoy health if limited to one kind of food; the reason of which is, that the digestive organs require a certain degree of stimulus; and if the same substance be always presented to them, they become so accustomed to it that it no longer continues to be sufficiently stimulating. It appears by the bills of mortality in London, that, before the vegetables now used at table were cultivated in England, the scurvy raged to a prodigious extent; and probably, for the same reason, on board a ship, where, during a long voyage, men are confined to the same food, this disease is apt to appear. A certain variety of food is necessary, therefore, for the preservation of health. The errors, however, that are apt to be committed in respect to diet will be better understood by explaining the nature of the digestive process; and in so doing we shall explain the reason for laying down certain precautions which ought to be observed.

The food, animal or vegetable, is in the first place introduced into the mouth, where it undergoes what we may term the first stage of the digestive process. It is there masticated and mixed with the saliva. This, which many persons consider an act of little consequence, is in reality one of great importance. The saliva is a fluid similar in its properties to the gastric juice of the stomach; and if the food be not well broken down and softened with it, when transmitted into the stomach, it will not be properly digested. There is a case recorded, in one of the medical journals, of a gentleman, who, in consequence of a stricture in the gullet, required that his food should be introduced by an aperture made externally into that tube. In consequence, however, of its not being properly mixed with the saliva, he suffered considerably from indigestion. There is also a curious case recorded of a criminal, who, to anticipate the punishment of his crime, cut his throat with a razor while in prison. The parts retracted so as to prevent them being reunited; and the criminal, who survived the attempt at suicide, was fed with little inconvenience, his food being introduced into the gullet by means of a tube. In this case it was observed, that, immediately after every meal, there was a profuse discharge of saliva from the mouth, amounting to from five to six or eight ounces, and the quantity was always increased when the food was hot. A very intimate relation, therefore, exists between the stomach and the glands which secrete the saliva, sufficient to show how essential is its agency in the digestive process. Hence, minced meats, jellies, and substances that pass rapidly into the stomach, for want of being properly saturated with the saliva, are difficult to digest. The manner of eating, therefore, should be deliberate; and young persons should be prevented from bolting their food, or swallowing it without sufficient mastication. There is another reason for eating slowly; namely, that the action of the stomach is slow, and persons eating hurriedly are not apt to regard the time when their appetite is appeased. Accordingly, the stomach is inadvertently overloaded. The man of business who swallows his meals thus hastily, finds, on returning to his counting-house, an oppression at the pit of the stomach; a sure sign that he has eaten too much, or in an improper manner.

The food having been properly masticated, is, by the action of the tongue, thrown into the gullet, in passing along into which a fleshy curtain, which hangs at the back of the palate, is carried backwards and upwards, so as to close the passage into the nostrils. The windpipe is immediately before the gullet, the entrance into which is protected by a very curious contrivance. It is covered with a little lid, which, as the food passes over it, is shut down so completely as to prevent the entrance of any extraneous matter. Sometimes, however, substances have found their way into this passage; but, in general, where this does happen, the matter is quickly ejected by a violent expiration. The alimentary mass having entered the gullet, now descends into the stomach, not by its own gravity, but by its being urged along by the contractions and motions of the gullet itself. That it does not descend by its own gravity, is evident, for we may swallow in any position. Tumblers or mountebanks, for the amusement of ignorant people, often exhibit the feat of swallowing a glass of water or piece of bread while standing on their head. The anatomy of the gullet shows very clearly the manner in which these contractions and motions take place. It sometimes happens, in swallowing, that a piece of food or bone sticks in the passage; the best way to overcome which, is to swallow immediately a large piece of bread, after which a glass of water, in order that it may be propelled down into the stomach. This failing, a probang—that is, a piece of whalebone with a knot of Indian rubber at the end—may be fearlessly plunged down the throat, in order to displace it. The food, we are to presume, has now passed into the stomach, which may be considered as an expansion of the gullet, or that part of the alimentary canal. It is, in fact, a membranous pouch or bag, very similar in shape to a bagpipe, having two openings, the one by which the food enters, the other that by which it passes out. It is into the greater curvature of the bag that the gullet enters; it is at its lesser where it opens into that adjoining portion of the canal into which the half-digested mass is next propelled.

When food has been introduced, the two orifices close, and that which we may term the second stage in the process of digestion commences. The mass already saturated with saliva, and so broken down as to expose all its particles to the action of the gastric juice, is now submitted to the action of that fluid, which, during digestion, is freely secreted by the vessels of the stomach. This gastric juice in its healthy state is neither acid nor alkaline, but very similar in its properties to the saliva of the mouth. Its solvent power is, however, prodigious.

The food having thus entered the stomach, the secretion of this fluid becomes more copious, and acts from the circumference to the centre of the mass. The original food, by its action, is converted into a soft, grey, pultaceous mass, called chyme, which, by the muscular contraction of the stomach, is urged on into the adjoining part of the alimentary canal, which is called the duodenum. This is generally completed in the space of two or three hours; but the period will vary according to the nature and volume of the food taken, and the mastication and insalivation it has undergone. It is desirable, during this stage of digestion, that a person should remain at rest; indeed, exertion after taking a full meal may prove very injurious. An experiment on this subject was made some years ago by Professor Harwood worth relating. He caused a pointer, after a full meal, to be hunted, and another dog of the same kind, after a full meal, to lie down in his kennel; both were killed after an equal lapse of time, when it was found that, in the quiescent dog, the digestion of the food was far advanced, while in the hunted dog it had scarcely commenced.

The alimentary mass having been reduced into chyme, and propelled into the duodenum (which is so called on account of this intestine measuring twelve inches in length), there becomes intimately mixed and incorporated with the bile and pancreatic juices; also with a fluid secreted by the mucous follicles of the intestine itself. The bile is a greenish, bitter, and somewhat limpid fluid, secreted by the liver, which occupies a considerable space on the right side of the body, immediately under the ribs. From this organ the bile, after a portion of it has passed up into the adjacent gall-bladder, descends, through a small duct about the size of a goose-quill, into the duodenum. The chyme, when mixed with these fluids, undergoes a change in its appearance; it assumes a yellow colour and bitter taste, owing to the predominance of the bile in the mass; but its character varies according to the nature of the food that has been taken. Fatty matters, tendons, cartilages, white of eggs, &c., are not so readily converted into chyme as fibrous or fleshy, cheesy, and glutinous substances. Sir Astley Cooper made various experiments on the digestibility of different substances, by feeding dogs on different kinds of meat, and opening their bodies at the end of a certain time, whereby he ascertained how far in each case the digestive process had proceeded. He found that pork was the most rapidly digested; then followed mutton, then veal, and lastly beef, which seemed to him the least digestible of all. In some cases the pork and mutton had entirely disappeared, while the beef remained untouched. By other experiments he found that cheese and fish are also very digestible substances. The potato appeared to be less so, and boiled veal two-thirds more digestible than the same substance roasted. It is evident from these facts that much attention should be paid to the nature or digestibility of the food that is taken, and to this important subject we shall immediately recur. In the meantime, we may observe, that the chyme, having undergone the changes adverted to, is urged by the peristaltic motion of the intestines onwards through the alimentary canal. This curious motion of the intestines is caused by the contraction of the fibrous coat which enters into their structure, and one of the principal uses ascribed to the bile is that of stimulating them to this motion. If the peristaltic motion be diminished, owing to a deficiency of bile, then the progress of digestion is retarded, and the body becomes constipated. In such cases, calomel, the blue pill, and other medicines, are administered for the purpose of stimulating the liver to secrete the biliary fluid, that it may quicken by its stimulating properties the peristaltic action. But this is not the only use of the bile: it also assists in separating the nutritious from the non-nutritious portion of the alimentary mass, for the chyme now appears to be mixed with a fluid termed *chyle*, which is in reality the nutritious fluid eliminated from the food. The chyme thus mixed with chyle arrives into the small intestines, and there we notice a beautiful provision of nature, for on the walls of the intestines will be found a series of exquisitely delicate vessels ramifying in every direction. They may be compared to an inverted tree, the branches of which are spread out on the coats of the intestines, and are found leading to a parent trunk, which ascends in the abdomen along the side of the backbone, and opens into the right side of the heart. Here, then, we may trace—and the course is very simple—the chyle from the alimentary mass into the circulation. Thus it takes place: The mouths of these vessels having the mixed chyme and chyle above them, absorb or take up the chyle, leaving the rest of the mass to be ejected from the body; the chyle thus taken up by them is carried into little bodies or glands, where it is still farther elaborated, acquiring additional nutritious properties; after which, corresponding vessels emerging from these glands carry along the fluid to the parent trunk, called the thoracic duct, which pours it into that side of the heart to which the blood that has already circulated through the body returns. Here the chyle is intimately mixed with the blood, which fluid is now propelled into the lungs, where it undergoes, from being exposed to the action of the air we breathe, the changes necessary to render it again fit for circulation. Thus, then, do we trace the chyle into the circulation; but after it has entered the lungs, it cannot as a separate fluid be again detected. It is in this organ, therefore, that the process of digestion is completed; the blood has now acquired those nutritient properties from which it secretes the new particles of matter adapted to supply the waste of the different textures of the body. That the chyle which is eliminated from the food we eat does in reality supply the blood with its nutritious properties, is clearly proved; for in those cases where the chyliferous vessels have been obstructed by disease, persons have emaciated and died. It sometimes happens in children that those little bodies called glands—situated in the mesentery, which is a membrane connected with the bowels, in which we have stated that the chyle acquires additional nutritive qualities—become diseased; and in these cases the little patient often wastes very rapidly away, and dies. It may also be observed, that in old people these glands become frequently, as was shown by Cruickshank, obliterated, which may in like manner explain the reason of their becoming emaciated. In both cases, the chyle, not having undergone the necessary change in these glands, does not supply the blood with the nutritious elements necessary for renovating the system. Thus, then, from the preceding remarks, it will appear that the digestive process proceeds in the following manner:—The first stage is the mastication of the food in the mouth, and its proper saturation with saliva; the second is its conversion into chyme in the stomach; the third is the separation of the chyme from the chyle in the intestines; and the fourth is the transmission of the chyle into the blood, and its admixture with that fluid.

ANIMAL FOOD.

It has been already shown that mankind is destined to live on a mixed diet, that is, both on animal and vegetable food; the different kinds of which now claim attention. The animal food commonly used in this country consists of the flesh of quadrupeds, birds, fishes, and amphibious animals. Among the former may be included the flesh of oxen, sheep, pig, deer, hare, and rabbit; the history and nutritious qualities of each of which kinds of food we shall now proceed to consider.

FOOD DERIVED FROM QUADRUPEDS.

Beef and Veal.—The flesh of oxen is extremely nutritious, and easily digested by persons who are in good health; it is not, however, so easy of digestion as mutton, although, when digested, it is equally nutritive. Indeed, for strong and hard-working men it affords a most serviceable diet, but persons who are very plethoric, or of full habit, should partake of it sparingly. Although generally boiled, beef and also veal are rendered more digestible and nutritive by being roasted, in which case the jelly between the interstices of the meat escapes, whereas, when boiled, it remains there and becomes converted into a substance by no easy means very digestible. The flesh of all young animals is of a softer texture than that of old animals; this arises from the quantity of loose cellular texture and fatty matter, which in them is interposed between the fibres of the muscles; but as age advances, this is absorbed; and the fibres approaching each other more closely, the flesh is rendered denser and more compact. For this reason veal affords more jelly than beef, and, consequently, makes an excellent broth for persons affected with chest complaints, and who, in consequence of their cough, require soft and soothing liquids. The fluid, however, which remains after boiling beef, called beef-tea, is far more nutritive, and of great service in restoring strength to those who have been debilitated by sickness. This state of young meat is limited to a certain period of the growth of the animal; it is in veal when the calf is under two months old; for after that, the muscular fibre becomes more distinguishable, and the whole substance less tender. The stringy nature of young meat, and the quantity of gelatinous matter interposed, renders it generally difficult of digestion; hence veal, although tender and nourishing, is by no means easily digested. It requires, particularly in delicate persons, the addition of some stimulant, as the condiments which enter into the stuffing, or vegetable acid, as lemon juice or vinegar; besides which, the disposition of fat in the bodies of old and young animals renders the flesh of the latter more indigestible than that of the former. In old animals the fat is collected in masses or layers external to the muscles; in young, it is interspersed between the fibres of the muscles, whereby the meat is rendered throughout fatty and rich; and fat is known to be a substance scarcely soluble in the human stomach. It is not, therefore, to mere fastidiousness of appetite that children reject fat; it is the natural antipathy of the stomach against a substance it cannot digest; therefore, nothing is more absurd than for parents to force children to eat that which will injure the digestive organs.

Mutton and Lamb.—No meat is more digestible and nutritious than mutton, which, however, is a species of food not to be found good in many parts of the world. Britain is remarkably fortunate in respect of its breeds of sheep, especially the small black-faced kinds which are reared on the Welsh and Scottish pastures. The Spanish may appear to possess a larger and finer fibre, but neither the flesh for eating, nor the wool for manufacturing purposes, is found equal to that yielded by the British breeds. Much of the quality of mutton depends on its being reared on dry pasture-grounds; and its digestibility is greatly affected by its age. Under two years of age, mutton is certainly less digestible than when older; at the age of five it appears to attain its greatest perfection. With respect to lamb, it may be said that if the animal be allowed to live upon its mother's milk for six months, it will then afford a more nutritious and digestible aliment than lamb of the same age weaned at two months. For the reasons, however, above described, the flesh of the lamb is not so eligible a substance of diet as the flesh of the same animal at a more advanced age. It is also more digestible when roasted than when boiled, and its fat is said to be more indigestible than the fat of any other kind of animal.

Pork.—Sir A. Cooper has shown, by the experiments above detailed, that pork is more easily and rapidly digested than mutton, beef, or veal. It does not follow, however, that because a substance is very digestible, therefore it will be very nutritious, for undoubtedly pork affords less nutrition than beef or mutton. The flesh of the young suckling pig is in general esteemed a great delicacy; but it is very rich, and not adapted for persons in a delicate state of health. A moderate quantity of bacon is very digestible, and is the principal article of diet among the labourers in Herefordshire, and some other counties in England. A very indigestible preparation, called brawn, is made from this species of food; it consists chiefly in the fatty layer being so closely compressed, that much of the oily part escapes into the cellular texture, and unites with it so closely as to form a half-transparent substance. This few stomachs can easily digest. Formerly the flesh of the wild boar was considered a very great luxury. The wild race of these animals is, however, entirely extinct, although the tame boar is still occasionally used, and bears salting well. Salted and smoked hams are common in all families, being chiefly eaten as an adjunct, or stimulant, with other milder kinds of food, as with poultry; but the operation of salting and smoking certainly impairs the digestibility of the meat. It is true, as we shall presently show, that a certain proportion of salt, with the food, is essential to healthy digestion; but, in the process of salting, a chemical combination between the animal fibre and the salt takes place, by which the texture of the fibre is so changed as to be rendered much less nutritive and digestible. In the process of smoking, the heat of the chimney assists this combination; and, by drying the fatty matter between the interstices of the muscles, the meat is rendered much less soluble in the stomach. Accordingly, this kind of food is only advantageously used to stimulate the palate, and is not to be relied upon as affording nutrition to the body.

Deer.—Food derived from animals of the deer kind has been always in this country esteemed a luxury, probably on account of their being objects of the chase, and therefore well adapted to adorn the tables of the great. To this kind of food the term venison is applied. There are three species of deer thus employed in this country, viz. the stag, the fallow-deer, and the roebuck. The stag in its wild state is now extinct in England; therefore, when this beautiful animal is hunted, it is turned out of some gentleman's park, to be pursued and killed in the open country. The flesh of the stag is of a firmer texture than that of the fallow-deer, which is by far the most digestible and nutritious. The fallow-deer, although allied, are a species distinct from the stag; they are smaller and less robust, and their horns, instead of being round, are flattened or palmated. They do not afford so good a chase as the stag, but their flesh is more delicate. The roebuck is the smallest of the deer kind known in our climate, and their flesh is still more delicate than that of the fallow-deer; but owing to its abounding with more fat, it is often on this account less digestible.

Hare and Rabbit.—The hare and rabbit, though resembling each other, are different species of the same genus of animals, and both are yet subjects of the chase. The ancients considered the flesh of the hare to be a luxury, and Pliny in particular dwells on the circumstance of its muscles being free from any fat. It may be here observed, that the flesh of animals that have been hunted always possesses a peculiar tenderness; hence, the hare which has been run down by a long chase presents us with more delicate food than that which has been suddenly killed. The muscular fibre of the hunted hare having been long kept on the utmost stretch, undergoes, when death occurs, a corresponding degree of relaxation, so that the rigidity of its texture is thus effectually overcome. A lingering death has the same effect; and hence there was an old and very cruel law, that no bull beef should be exposed for sale, unless the animal had been previously baited. It is stated by Dr Paris that the action of vinegar, administered to an animal some hours before killing it, renders the flesh less tough; and therefore it is a common practice in the country to give a spoonful of this acid to poultry, when they are intended for the immediate service of the table. The flesh of the young hare or leveret is more digestible and nutritious than that of the older hare. Venison, hare, and other kinds of game, are in general kept a long time before they are eaten; they are preserved until they have become what is called *high*—that is, until the putrifactive process has commenced. Singular as it may appear, the effect of this process is to overcome the rigidity of the animal fibre, and thereby increase the tenderness of the meat. Even beef and mutton, unless kept some days—the number of which must be determined by the season of the year—will not eat tender. The flesh of the rabbit is extremely white and very dense; and unless the animal be killed very young, its flesh is by no means digestible.

Minor Parts of Animals.—It remains for us to speak of the different parts of the above animals which are occasionally served at table; as the brain, marrow, liver, lungs, &c. The brain of the calf and sheep is often served up in the form of sauce or brain-cakes; but in consequence of the quantity of fatty matter contained in the substance of the brain, these are apt to disagree with tender stomachs. The brains of the hare and rabbit are, however, very delicate eating. The marrow is a soft and very soluble substance, and may, in very small quantities, be eaten with impunity. It is, as we have elsewhere premised, the reservoir of nutrition for the bones; and little or none is found in the bones of cattle that have been overdriven, or suffered from privation of food. The tongues of different animals, particularly of the calf and sheep, when salted, form an excellent stimulating adjunct to the milder kind of meats, as to poultry; but the objection urged against salted hams here also applies; and hence, although stimulating to the palate, it is not a food easy of digestion. The roasted heart, particularly of the calf, is often brought to table; but in consequence of the density of the fibres of this organ, it is very slowly digestible. The liver of birds, particularly of the goose, was formerly esteemed a great luxury; and by confining these birds, and feeding them on a certain kind of food, particularly milk, this organ increased to a prodigious size, which considerably enhanced its value. The livers of animals afford very little nutriment; and the same may be said of the lungs, kidneys, and pancreas or sweet-bread, and spleen. Many persons are very fond of tripe, which is entirely composed of gelatin, and certainly not very digestible. It was considered so great a luxury by the Romans, that they often killed oxen for the sake of the tripe, not caring for the flesh of the animal. The gizzards of birds are, it is to be observed, exceedingly dense, and very indigestible. The feet of many animals, as of the calf, sheep, &c., afford vast quantities of jelly, in consequence of numerous ligaments and tendons which enter into the construction of this part of the body.

FOWL.

The birds which are used for purposes of diet may be divided into the domesticated, such as the hen, duck, goose, and pigeon; and the wild, such as the partridge, pheasant, woodcock, snipe, and blackcock. It may be laid down as an established principle, that white meats afford a less stimulating chyle than meats of a darker colour. The flesh of veal is less stimulating to the system than that of venison; that of chicken less stimulating than that of partridge or grouse. Although more easily digested, the flesh of birds is not so nutritious as that of quadrupeds. It affords, therefore, one excellent diet for persons who are disposed to be plethoric, or likely to be attacked by apoplexy. In consequence of its digestibility, also, it is well adapted for weak and irritable stomachs; and hence Dr Johnson, in his admirable work on the "Morbid Sensibility of the Stomach," recommends chicken as the least irritating and most easily digested aliment after farinaceous food; such as sago, arrowroot, tapioca, &c. The different parts of birds vary in their degrees of digestibility; thus, the wings of birds whose principal exercise is flying, and the legs of those that are accustomed principally to running, are, in consequence of the effect of the exercise in thickening and increasing the bulk of the muscular fibre, rendered less digestible than other parts of the body. The woodcock is obliged to fly much about, while the partridge runs more and flies less; hence, the wing of the woodcock is very tough, while that of the partridge is very tender; and, on the contrary, the leg of the woodcock is very tender, while that of the partridge is very tough. Hence the doggrel distich—

"If the partridge had but the woodcock's thigh,
He'd be the best bird that e'er doth fly."

The effect of advancing age in diminishing the digestibility of the flesh of all birds, is notorious. The common fowl is best about a year old, after which time its flesh becomes more and more indigestible. Of the domesticated birds, the flesh of the chicken is by far the most digestible; then follows that of the guinea-fowl, turkey, pigeon, pheasant, duck, and goose, which increase in indigestibility according to the order in which they are here arranged. Of wild birds, the woodpigeon, woodcock, and snipe, afford an aliment which is very delicate and easy of digestion. The flesh of the blackcock is said to be more easily digested than that of the partridge, and the flesh of the partridge is more digestible than that of the quail. Of the class of birds which may be designated sea-birds, it may be observed, that, in consequence of their living upon fish, their flesh is very tender and easy of digestion; but it often possesses a rank fishy taste, which to many stomachs proves insuperably offensive. This is the case with the solan goose, which, although esteemed by some persons as a luxury, is by many rejected as being altogether unpalatable.

Eggs, which should properly be considered in this place, are, in point of nutriment and digestibility, to be classed next to milk; but their qualities will greatly depend on the manner in which they have been cooked. When raw, they are not so easily digested as when lightly boiled, so as to coagulate slightly their albumen, or the white fluid which envelopes the yolk; but if boiled too long (beyond three minutes), the whole becomes converted into a hard mass, which is very indigestible. The qualities of the egg, the taste and colour of the yolk, and even the nourishment it affords, depends on the food given to the hen. The best eggs are those from hens fed with wheat; next to that, on rice, barley, and potatoes. How far the qualities of the eggs of different birds may differ from each other, does not appear to be well ascertained. "I am certain," observes Dr Cullen, "that, in many instances, the peculiar odour and taste of the flesh of the bird is in no degree communicated to their eggs; for example, in certain sea-fowl, whose flesh is of the rankest odour and taste, their eggs are as free from taste and smell as the eggs of our domestic fowl. Even in the latter we can observe some difference in the taste of the yolks, and in the density of the whites, which seems to depend on the food the bird lives on."

FISH AND AMPHIBIOUS ANIMALS.

Fish is more digestible, but less nutritive, than beef and mutton. It is evident from the texture of its muscular fibre, that the flesh of most fish is very tender, and therefore easily soluble in the stomach; but it affords the body little stimulus, and even the pulse is not strengthened after a repast on this kind of food. Hence, owing to its want of stimulating power, it requires the assistance of some condiment—as salt, pepper, or some stimulating sauce. The whiting is the most tender and delicate fish, and may be given to the weakest stomach; the haddock resembles it, but is of firmer texture. The sole and flounder, for tenderness and delicacy, rank next. Trout and salmon-trout then follow, and are more digestible than cod, the flesh of which has been not inaptly called the "beef of fish." The salmon, which attains its highest perfection, or comes into season, some time previous to its spawning, affords an aliment which is very nutritious, but by no means easily digested. To assist its digestion, it requires the addition of some stimulating sauce, or Cayenne pepper, or vinegar; the lobster sauce generally eaten with it loads the stomach, and contributes to impede the digestive process. The same may be said of turbot as of salmon; it is very nutritious, but not easily digested; and often the ill effects which arise from eating it are aggravated by the sauce taken with it. It may indeed be observed, that all fish that is of an oily nature is difficult to digest; and this is particularly the case with eels, and also with skate, which, when taken, should always be qualified with vinegar, or some other stimulant. Many persons are very fond of mackerel and herrings, both of which are excellent articles of diet, but the former is less digestible than the latter. The pike is also a delicate and excellent fish; but great care should be taken in eating it, lest any of the bones, which are small, sharp, and jagged, be swallowed.

Shell-fish are all comparatively indigestible, and should never be eaten without some accompanying stimulant, such as vinegar or pepper. The oyster is said to contain a considerable quantity of nutritious matter; but when cooked, in consequence of its albuminous matter being coagulated, it is rendered still more indigestible. The substance of the lobster and crab is very similar; and it is only perhaps in consequence of its more elegant appearance that the former is a greater favourite at our tables than the latter. The shrimp is the most delicate, and perhaps the most easily digested of any of the shell-fish above enumerated. The mussel is reported in many instances to have given rise to noxious effects; and certainly the food derived from this class of fish often gives rise to eruptions of the skin, and is peculiarly apt to disagree with the stomach.

From the amphibious tribe of animals, few are selected as articles of food; the most noted are the turtle and the frog. The flesh of the turtle, though by no means easy of digestion, is said to be very nutritious; but the process of cooking which it undergoes in this country renders it still more indigestible. The flesh of the frog, which is esteemed a luxury in France, was analysed by Geoffroy, who states that its qualities are very similar to the flesh of the turtle, but somewhat less gelatinous.

THE COOKERY OF ANIMAL FOOD.

The legitimate object of cookery is not to pander to the taste of the gourmand, by presenting him with a variety of "dishes tortured from their native state," but to render the food which nature has supplied digestible and nutritious. The fact has been ascertained, that meat, boiled, roasted, and even putrid, is more digestible than meat in a raw state; and hence, as Fordyce observes, in all countries, however savage, where fire can be procured, the inhabitants use heat for the preparation of their food. The changes which animal substances undergo during the process of cooking are either mechanical or chemical. Thus, by overcoming the rigidity of the muscular fibre, the meat is reduced to a certain texture, which renders it more easy of digestion; this may be said to be a mechanical change. Again, according to the experiments of Hatchett, by the process of boiling, animal substances are converted into gelatin; and this may be said to be a chemical change, for, according to this view, free gelatin does not exist in the bones, or in any other of the animal tissues, but is produced by the process of boiling, during which the material particles arrange themselves in a new position, and thereby give rise to a new substance. When authors speak of the gelatin of meat that is uncooked, they merely mean that animal substance which is most easily reducible into gelatin. Let us now, then, attend to the different processes of cooking, and the effect which they severally have in rendering animal substances more digestible and nutritious.

Roasting is of all others the best process of cooking, for by the application of dry heat in an open space, the fat between the interstices of the meat is dissolved and escapes, while the nutritious matter remains. Roasted beef, mutton, veal, poultry, &c., are far more digestible and nutritious than the same food boiled. At the same time that the fat escapes, and the watery part of the meat exhales, the meat becomes at first brown, then scorched, and requires to be frequently moistened with dripping or butter. The reason of this is, that the outer surface becomes at first condensed, and it is necessary to keep it moistened, in order that the heat may penetrate into the interior of the joint. When meat is exposed to a very intense fire, and this treatment neglected, the outer surface becomes condensed and scorched, while the inner parts still remain undone, or in a raw state.

Boiling is a less preferable operation, because it deprives the meat of those nutritious matters which are soluble in water. The solution of the gelatinous matter, and of a peculiar principle called *osmazone*, converts the liquid in which the meat is boiled into broth or soup, which contains the nutritious principles which the meat formerly possessed, and which now is reduced to a mass of dry hardened fibres. The osmazone is a very peculiar animal principle, which gives soup its characteristic taste and odour. Its odour, indeed, is very peculiar: it is that remarkably fragrant odour which rises with the steam from the kitchen windows of cook-shops and hotels. Both in the process of roasting and boiling, the heat ought never to be very intense, for it has been clearly ascertained that, in order to be well cooked, all kinds of food should be cooked very slowly. Count Rumford made many very curious and interesting experiments on this subject. He showed that a leg of mutton, boiled in water only just boiling, is more juicy, and much higher flavoured, than the same kind of meat cooked in water kept constantly on the boil. The fragrant steam which arises during the process of boiling or digesting meats, is in fact loaded with the nutritious part of the food, which is thus carried away and dissipated by the injudicious rapidity and intensity of the heat that is applied. It is also to be observed, that if meat be overboiled, it is rendered very indigestible. In this case, if it contain albumen, that substance is converted, like the white of an egg, into a hard indigestible mass, which may be observed, as is the case with overboiled beef, congealed between the interstices of the muscular fibre. So also the gelatinous matter with which young meat—such as veal—abounds, becomes converted, by being overboiled, into a substance by no means easy of digestion. When only a little water is applied, and the heat continued at a gentle temperature for a long time, the process is called that of *stewing*, which, for the reason just assigned, has the effect of rendering the meat very tender and sapid.

Baking differs from roasting, inasmuch as the meat, although exposed to a dry heat, is confined in an oven or limited space; the consequence of which is, that the exhalations being confined, the meat never fails to acquire a very disagreeable smell and taste. It is true that the retention of the juices thus occasioned may render the meat more tender, but the muscular fibre, as it were, soddens in fat which does not escape, and thereby such meat is rendered difficult of digestion.

Broiling is an operation which consists in subjecting the meat to the application of a naked fire, whereby, from the intensity of the heat, the surface of the meat becomes browned and hardened before the heat penetrates the entire mass. Hence it is a kind of cookery adapted only to meat cut into slices, and which may be eaten a little underdone. In this state the meat is particularly nutritive; hence this form of diet is considered the most eligible for persons who are desirous of strengthening themselves, whether for the recovery of health, or in the art of training.

Frying is a culinary operation, in which slices of meat cut are placed in a pan or vessel interposed between the meat and naked fire; but as the surface of the meat in contact with the bottom of the vessel would become suddenly heated, and thereby scorched, it is always found necessary to interpose some fluid matter. Fat or butter is generally had recourse to for this purpose, and, being of an oily nature, such matters, when exposed to a strong heat, soon become empyreumatic, and the meat so saturated is very liable to disagree with the stomach.

To the cooking of fish considerable attention should be paid, as upon this their digestibility mainly depends. The process best adapted to render them wholesome is that of boiling. Fried fish and stewed fish prove particularly injurious to weak stomachs. The same objections as those to salted meat apply to salted fish, which, however, may be eaten with a due admixture of potatoes and parsnips, but with no other vegetable.

VEGETABLES AND FRUITS.

The vegetable diet, which so well diversifies the nature of the food on which we subsist, is derived from the seeds, roots, stalks, leaves, blossoms, juices, and fruits of plants. The seeds of certain grasses, as of wheat, rye, barley, and oats, contain a quantity of starch or farina, which renders them particularly nutritious. Sago, which is prepared from the pith of an East Indian palm-tree; arrow-root, which is obtained from the root of an Indian plant called the *Maranta arundinacea*; tapioca, which is prepared from the root of another plant called the *Jatropha manihot*; and the common potato, owe their nutritious qualities to the presence also of this farina: wherefore they are called farinaceous aliments. The first process for converting farinaceous seeds into food is that of grinding them into powder; and the meal so produced, when separated from the husk of the seed or bran by sifting, presents us with the powder denominated flour. When this flour is mixed with water, it forms a paste or dough, which is by no means digestible. If, however, it be allowed to remain for some time, its component ingredients react upon each other, and that spontaneous change which is called *fermentation* commences; carbonic acid, acetic acid, and alcohol, are set free; and if the mass be now baked, it becomes light and porous, and pleasant to the taste. The old paste is called the *leaven*; and if mixed with the new-made paste, the fermentation commences more readily. Instead of this leaven, however, the ferment which collects on the surface of fermenting beer, and which is called *barm* or *yeast*, is used in this country. In consequence of the quantity of gluten in the seed of the wheat, the flour of the wheat makes by far the finest and best bread.

There are three kinds of bread made from the wheat which are commonly used in this country—white, wheaten, and household. In the first, all the bran is separated, and the bread is made of pure flour; in the second, only a part of the bran is separated—so that this wheaten bread is a mixture of flour and bran; in the third, none of the bran is separated—so that household bread consists of a mixture of the coarse bran with the flour; it is, in fact, composed of the whole substance of the grain. The distinctions here pointed out are of importance, in as much as the tendency of starch upon the bowels is astringent; that of bran laxative, owing, says Dr Paris, to its exerting a mechanical action on the intestines, and thus exciting them into action. Accordingly, the tendency of the bread made of the whitest flour is to produce costiveness; therefore, persons of this habit of body should prefer the wheaten, or even household bread. It is said by some persons that bread made of different kinds of grain is more wholesome than that made of only one sort; and certainly this is the case with what is commonly called brown bread, which is made of a mixture of wheat and rye flour: the former being of a more starchy nature, is apt to produce costiveness, the latter laxativeness; so that a due proportion of each furnishes a desirable compound.

Among the class of farinaceous aliments, the potato is held deservedly in high estimation. The plant is a native of Peru, and was first extensively cultivated by the Irish, whose peasantry still subsist almost exclusively on this article of diet. The digestibility and nutrition which the potato affords depend on the kind that is used, and the method of cooking which is adopted. The waxy kind of potato, as it is termed, is very indigestible; the mealy kind, however, if properly boiled, readily yields to the powers of the stomach, and affords a healthy nutriment. Count Rumford, in his zeal to promote the culinary art, insists at great length on the necessity of understanding the proper method of boiling potatoes, and on this subject cites the directions which were given by the Board of Agriculture in their report, from which we make the following extract:—"The potatoes should be as much as possible of the same size, and the large and small ones boiled separately. They must be washed clean, and, without paring or scraping, put in a pot with cold water, not sufficient to cover them, as they will produce themselves, before they boil, a considerable quantity of fluid. They do not admit of being put into a vessel of boiling water, like greens. If the potatoes are tolerably large, it will be necessary, as soon as they begin to boil, to throw in some cold water, and occasionally to repeat it till the potatoes are boiled to the heart (which will take from half an hour to an hour and a quarter, according to their size), otherwise they will crack and burst to places on the outside, while the insids will be nearly in a crude state, and, consequently, very unpalatable and unwholesome. During the boiling, throwing in a little salt occasionally is found a great improvement; and it is certain that the slower they are cooked, the better. When boiled, pour off the water, and evaporate the moisture by replacing the vessel in which the potatoes were boiled once more near the fire, which will make them remarkably dry and mealy." Such are the directions given by this report for preparing this very valuable article of diet, and attention to them, we have no doubt, will improve its digestibility, and the amount of nutrition it will yield. That the nutritious quality of the potato is increased by being properly cooked, there is no doubt. Hogs fatten on dressed potatoes more rapidly than when fed on potatoes in their raw state. The esculent roots of plants used as articles of food consist of the carrot, which is very nutritive and slightly laxative; the turnip, which ought to be well boiled, and separated from its watery parts by pressure; the parsnip, which is also very digestible and nutritious; and others that possess peculiar stimulating qualities, as the radish, onion, leek, shallot, &c., all which are useful in exciting the tone of the digestive organs, and correcting the tendency to flatulence. The esculent herbs of which the stalks and leaves are eaten consist of what are termed greens and salads, and include the cabbage tribe—asparagus, lettuce, water-cress, &c. The central and upper leaves of the cabbage are the tenderest part of this plant, which, for the purpose of cooking, should be plucked when very young. Cabbages, by their colour, are distinguished into two kinds—the white and the red, of which the latter is found to be of the sweetest and tenderest kind. The species, however, of this plant, called the cauliflower and broccoli, are to be preferred, as being most tender and easy of digestion. It is, however, to be remembered, that all the cabbage tribe is liable to produce flatulency; they should therefore even in health form only a small portion of our diet; and by those who suffer from indigestion they should be carefully avoided. This class of vegetables, it may be observed, possess a certain essential oil, which gives cabbage-water its peculiarly offensive smell; and to get rid of this noxious ingredient, this vegetable should be boiled in two successive waters. The asparagus is a very delicate vegetable, and one easily digested, even by weak stomachs; the lower part of the stalks, however, should never be eaten. The lettuce and water-cress are both agreeable articles of food; the former contains a narcotic principle, which some persons appear to be more affected by than others. It is stated that Galen, being subject in the decline of life to sleeplessness, cured himself by eating a lettuce every evening. The water-cress acts as an aromatic; it stimulates the stomach, corrects flatulency, and should therefore be always eaten with other raw vegetables.

Fruits, allowing the term its conventional meaning, are in this country rather esteemed as luxuries than as essential articles of diet. The ripening of fruit is a kind of fermentation by which the acids they contain are converted into saccharine matter; consequently, if eaten when in their unripe state, they will disagree even with the strongest stomach. The small-seeded fruits are more digestible than the larger stone-fruits. The strawberry, raspberry, gooseberry, &c., are more easily digested than cherries, plums, nectarines, &c. Care should be taken, however, not to swallow the skins of fruits, which are universally indigestible, and remain acting as irritants against the coats of the stomach and bowels. The skins, the seeds, the husks, and the fibres of fruits (says the celebrated Dr Armstrong), are all irritants; and again and again you may trace the rise of inflammation along the alimentary canal to the irritation of fruits, especially among children.

DRINK.

Having so fully explained the precautions which should be observed in taking solid food, it remains for us to consider those which should be observed in respect to the liquid portion of our diet. Ill health, misery, and all those misfortunes which await with unerring certainty indiscretion and vice, are perhaps more apt to be incurred by the abuse of liquid than of solid food; for the former is more immediately exhilirating than the latter; and when men meet together in society, anxious to please and be pleased, the wine, spirits and water, or whatever other cheer be afforded, stimulates their senses to forgetfulness of the ordinary cares of life, and surrounds them with so much social enjoyment, that, in the midst of their dreamy pleasure, they overstep the boundaries of prudence, and commit excesses which they themselves afterwards have cause to regret; for the higher and more felicitous the excitement, the deeper and more painful is the depression which succeeds. In the whole code of health there is no law more imperious than that uniform temperance should be observed under all circumstances and in all conditions of life, and the transgressor of this law will himself be universally the sufferer. It is to be observed, that the transgression may be made by drinking, even in small quantities, fluids which are of a strong or pernicious quality, or by drinking, in large quantities, fluids which, although much diluted, are still of a stimulating description. Accordingly, we should attend in particular to the quality and the quantity of the fluids we drink. Spirits of every description, taken in an undiluted state, are exceedingly pernicious; and those who indulge in the vicious habit of drinking brandy, whisky, hollands, and rum, in this state, invariably contract diseases which are beyond the cure of the physician. The immediate action of such fluids on the coats of the stomach must evidently destroy their healthy condition. The blood-vessels on the internal coat of this organ thereby become so excited, as to appear involved in one complete mass of inflammation, while at the same time the nerves experience a shock from the over-excitement, which is immediately transmitted to the rest of the system. The use of ardent spirits, under all circumstances, should be studiously restricted, and in no case should they be drunk in an undiluted state. With respect to the choice of spirits, it may be observed, that brandy acts more immediately as a tonic than whisky or hollands. It is less liable also to turn acid on the stomach, for which reason, for invalids or persons troubled with weak digestion, when diluted with water, it is preferable to wine. When pure, whisky diluted with water may be occasionally taken with impunity; but certainly it does not agree with persons in the south of England, as well as with those in the north, or in Scotland. The reason seems to be, that the air in these northern parts is drier than in the south; consequently the perspiration from the surface of the body more readily escapes. In the south, however, the air is more loaded with moisture, and consequently less favourable to the escape of the perspiration. For the same reason, in the Highlands of Scotland, and in ascending high mountains, being surrounded by a drier atmosphere, the traveller takes his whisky and water with more impunity than he would do under other circumstances. It is well known that hollands, which is a light spirit, acts as a diuretic, and in certain cases is preferable either to brandy or whisky. The common gin which is sold in London and other towns of England is often adulterated with the most pernicious ingredients. It is drunk in the shops—which are fitted up in London at an enormous expense to tempt the street passengers into them—in large quantities, and generally in a raw state, and deplorable are the effects thus induced. The diseases of the body, the demoralisation of the mind, engendered by gin-drinking in the metropolis, are indeed almost incredible; and all establishments in which this pernicious practice is encouraged, may most truly be described as temples set apart for the performance of human sacrifice.

The wines commonly used in this country are very numerous; some are called dry and light, such as Hock, Moselle, Burgundy, Claret; others dry and strong, such as Port, Sherry, Madeira; some, again, sparkling or effervescing; and others sweet, such as are home-made. It is a singular fact observed by dietetic writers, that the stomach is often outraged by a wine to which it is not accustomed; and it is equally true, that a mixture of different wines is a common source of indigestion. Of all the wines which are used, Claret is considered to be the most beneficial; on account of the small quantity of spirit as well as extractive matter which it contains, it is more salubrious than Port. Hock combines the effects of an acid with those of a spirit; but on account of its acid effects, we have seen it disagree with invalids. Burgundy contains a large quantity of spirit, and is more heating than any other kind of wine. Although the wines of Burgundy were prescribed in the time of Louis XIV. in affections of the chest, no physician of the present day would advise them to be used by any persons of an inflammatory habit. Port wine, it is well known, has a tonic and astringent effect; a glass or two daily to persons of weakly constitution may be taken with advantage. It is observable, however, and the fact is curious, that men accustomed to take Port wine freely after dinner, are apt, if they have recourse to an occasional excess of Claret, to be affected by gout; which arises from the transition from the Port to the Claret causing derangement of the digestive organs.

The malt liquors commonly drunk are ale, porter, and small beer, the qualities of which vary according to the mode in which they are manufactured. In ale there is certainly the narcotic principle of the hop; therefore it disposes to sleep. If the malt of which it is made be slenderly dried, it is of a pale colour; if it be roasted or high-dried, then it is of a brown colour. Porter is made from high-dried malt, and differs very considerably according to the proportion of the ingredients which enter into its composition. Malt liquors give a greater degree of fullness to the blood-vessels than any other species of drink; and thus, by imposing on the heart a greater quantity of blood to propel through the body, disturb the circulation, and often induce disease of the heart, and apoplexy.

While the abuse of spirits, wines, malt liquors, &c. gives rise to the most distressing maladies, their utility, under proper management, is nevertheless very considerable; under which circumstances they may unquestionably be considered as preservatives of health. It is evident, however, that water is the most natural, and, when pure, the most healthy, beverage that man can drink; but it is to be remembered that its qualities differ according to the source whence it is obtained. When collected in fields, at a distance from any town, rain-water is the purest natural water; but if collected in a town, in consequence of having fallen through a smoky atmosphere, or dripped from the roofs of houses, it is apt to become contaminated, and should in such cases never be used without being previously boiled and strained. It may be observed concerning the origin of rain-water—for it is always interesting to associate the facts and phenomena observable in nature—that from the surface of seas and lakes vapours are constantly rising into the higher regions of the atmosphere; they are thence wafted by the winds over distant countries, and being condensed by a cold current of air, fall in drops of rain. Accordingly, rain-water is produced by a natural distillation; and when it has fallen in this way to the earth, it descends or filters through the crevices of rocks, pores of soil, &c., and accumulates below its surface. These accumulations of water are termed *springs*. In thus descending, the water dissolves the soluble materials contained in the rocks or soil through which it passes, and hence spring-water is always impregnated with a quantity of saline materials. In particular, there is one salt—the sulphate of lime—which imparts a quality of hardness to the water, which renders it unfit for domestic or medicinal purposes. It is called, therefore, *hard* water; and it is well known that in it, soap, instead of dissolving, decomposes and curdles on its surface. Cooks, knowing from experience that this kind of water will not dissolve vegetable matters, never use it in processes of cookery; and the brewer also rejects it, knowing that it will not dissolve the extractive matter of his malt. The water not impregnated with this salt, and which, in contradistinction, is called *soft* water, is always preferred. It may be added, that hard water, when drunk often, gives rise to a sensation of uneasiness or heaviness in the stomach. As above stated, besides the quality, the quantity of the fluids we drink is a matter of importance; for if the stomach be overloaded with fluid, the digestion of its contents must be impeded, owing, in the first place, to the bulk of the fluid stimulating the organ to contract too rapidly, and thereby expelling the food before it has undergone the necessary changes; and in the second, to its diluting the gastric juice so much as to prevent its acting upon the food with its wonted solvent powers. It is for these reasons objectionable to drink immediately before taking any meal, but a little quantity of fluid taken during a meal will rather assist than impede digestion. Moderation in the quantity which we eat and drink is of serious importance in the preservation of health; and hence there was much wisdom in the reply of an Eastern dervis, who, being asked by a Mahometan of what service was his order, answered, "If you were more cautious and temperate in your meals, if you would learn to govern your passions and desires by a due attention to abstinence, you all might be sages, and have no occasion for dervises among you; but your *appetite* and *aliment* impair your understanding."

EXERCISE.

The whole constitution of man shows that he was destined for an active existence; and it is an invariable rule of nature that every mental and bodily faculty is liable to be increased in power, and preserved in soundness, by exercise, while inaction tends to weaken and disorder the same parts. He, therefore, who wishes that the powers of his body and mind should be improved, or even preserved in their existing state, will take care to keep them in moderate exertion; while he who is ignorant of or indifferent to the principles on which mental and bodily sanity depends, will act in the opposite manner, and encounter the hazards which attend this, as well as all other violations of the laws of nature.

The human body contains upwards of four hundred muscles, and it is a duty of every man to himself to keep these in moderate exercise. A muscle is a distinct piece of flesh, composed of innumerable small fibres or threads, each separated from, and at the same time loosely connected with, the others, by an almost invisible sheath of cellular membrane. The use of the muscles is to produce motion, and to enable us to operate upon the objects around us. We desire, say, to put one foot before the other, or to move away a particular substance: the mind, which in the first place has formed the design of doing so, sends its command to the proper muscles by means of a distinct set of nervous fibres, communicating between the brain and these muscles; another set of nervous fibres conveys back to the mind intelligence of the muscular power necessary for the operation. The necessary communication having been thus established, the operation is produced by an union of muscular power and mental energy or will, the latter being generally by far the more powerful of the two forces, though useless without the other. While a muscle is in operation, it is contracted; afterwards it relaxes into its usual state.

Exercise operates favourably upon the human frame by promoting the circulation of the blood, and increasing the power and healthiness of the muscles. In a series of exertions, the breathing becomes rapid, and the arterialisation takes place more quickly; the muscles, moreover, by jostling the neighbouring blood-vessels, which they do when in a state of exertion, stir and propel their contents. The effect upon the muscles takes place through increased vascularity and the accretion of new substance. The quantity and flow of blood through the part are increased by the exertion, a greater degree of animal heat is evolved in the part, and a secretion of coagulable lymph takes place, which, becoming organised, produces new fibre.

Exercise, however, produces little or no good, if it be not prompted by a liberal portion of nervous energy. A walk taken without a motive to animate the mind is of hardly any service: in that case, says Dr A. Combe, "the muscles are obliged to work without that full nervous impulse which nature has decreed to be essential to their healthy and energetic action." When we walk, however, with an object at the end of our journey, the nervous impulse is in full and harmonious operation with the muscles. Sports which we enjoy with one or more companions are generally the best, as the society tends to awaken the mind to nervous energy; and where a contention for victory, or for some stake sufficient to excite the mind, is superadded, the advantage must be still greater. It is also of great importance that we should have a curiosity after objects: thus, a taste for scenery, or for geological and botanical pursuits, may enliven a walk, and enable us to keep up a proportion between the muscular and the nervous energy. One rule, however, must be observed—that *the will and the muscle must be directed to the same end, and at the same time.* Dr Combe, from whose admirable treatise these observations are chiefly taken, does not deny that walking for health may be attended with the desired effect: for the object may there be sufficient to keep up the proper mental stimulus.

Exercise is usually considered as of two kinds—active and passive. The active consists in walking, running, leaping, riding, fencing, rowing, skating, swimming, dancing, and various exercises, such as the poles, ropes, &c., prescribed in gymnastic institutions. The passive consists in carriage-riding, sailing, frictions, swinging, &c. In walking, the weight of the body rests on one foot while the other is advanced; it is then thrown upon the advanced foot while the other is brought forward, and so on in succession. In this mode of progression, the pace may, at the pleasure of the individual, be increased or diminished. Those who are accustomed to sedentary habits should not on a sudden betake themselves to quick and violent walking; for thereby, in proportion as the breathing becomes hurried, the action of the heart is accelerated sometimes to a painful and injurious degree. "In my own person," says Dr Johnson, "I had some years ago a very severe and alarming instance of the bad effects of too great muscular action, occasioned by a habit of walking very fast. After a day and night of unusual fatigue and rapid pedestrian exertion, together with considerable mental anxiety, I was suddenly seized with an intermission of the pulse at irregular periods. During each intermission I felt the heart give a kind of struggle, as it were, and strike with great violence against the ribs, accompanied by a peculiar and most distressing sensation in the cardiac region which I cannot describe." These symptoms became aggravated, and lasted for eight weeks, "during which time," he continues, "I used horse-exercise, and kept, when at home, in a horizontal position. At length the heart gradually lost its morbid irritability; and at the end of fourteen or fifteen weeks I could walk as well as ever." The affect of this kind of exercise, viz. walking, on the body, is very well described by Dr A. Combe, who, speaking generally, says, "walking agrees well with every body; but as it exercises chiefly the lower limbs and the muscles of the loins, and affords little scope for the display of the arms and muscles of the chest, it is insufficient of itself to constitute adequate exercise: and hence the advantage of combining with it movements performed by the upper half of the body, as in rowing a boat, fencing, shuttlecock, and many other useful sports." The exertion of walking may be carried to a great perfection; thus, Captain Barclay walked on one occasion 180 miles without resting, and on another 1000 miles in 1000 successive hours: but such feats are always performed at the risk of health and life, and ought not to be encouraged. "In summer," says Dr Combe very truly, "walking excursions to the Highlands of Scotland are common among the youth of our cities; and when proportioned in extent to the constitution and previous habits of the individual, nothing can be more advantageous and delightful. But not a season passes in which health is not sacrificed and life lost by young men imprudently exceeding their natural powers, and undertaking journies for which they are totally unfitted. It is no unusual thing for youths, still weak from rapid growth, and perhaps accustomed to the desk, to set out in high spirits at the rate of twenty-five and thirty miles a-day, and to come out so much worn and debilitated that they never recover. Young soldiers, whose growth is scarcely finished, are well known to die in great numbers when exposed to long and heavy marches, particularly when food is at the same time scanty." Many such unhappy cases are on record; therefore, due attention should be paid to the constitutional strength and previous habits of the individual before heavy pedestrian excursions are undertaken.

Running is an exercise which is intermediate between walking and leaping; it consists, in fact, of a series of leaps performed in progression from one foot to another, and the degree of its rapidity bears a constant proportion to the length of the individual and successive leaps. During this exercise the individual is obliged to take long inspirations, and make slow expirations; the air-cells of the lungs are hereby distended, and the action of the heart being at the same time increased, and the circulation through the lungs much accelerated, a sense of oppression is felt on the chest, which is often exceedingly painful: then, when the violent action is discontinued, the heart palpitates with intermitting strokes in the endeavour to recover its natural equilibrium of motion. Although this and other gymnastic exercises, such as leaping, wrestling, throwing heavy weights, &c., may, when judiciously had recourse to, invigorate the body—a fact proved by the athletic exercises which were prescribed to the Greek and Roman youths—yet, in consequence of the evils and accidents which may be so occasioned, young persons ought not to be permitted to engage in such exercises, except under the care of some judicious professor of gymnastics.

Fencing is of all active exercises that which is the most preferable, inasmuch as it throws open the chest, and at the same time calls into action the muscles both of the upper and lower extremities. Add to this that it improves very much the carriage of the body; in consequence of which, its acquisition, independent of its occasional utility in countries where the sword is the principal weapon of assault and defence, is justly esteemed an accomplishment which is a necessary branch of polite education. The salutary effects of the other exercises which are taught in gymnastic institutions, such as exercise with the ropes, poles, pullies, &c. in increasing the strength of the body, will be seen by consulting Mr Roland's excellent Treatise on Gymnastics, where will be found a table showing the amount of the increasing growth and strength of the body in a given time, during the employment of these exercises.

Dancing is an exhilarating and healthful exercise, and seems to be almost the only active exercise which the despotic laws of fashion permit young ladies to enjoy. The only evils which are attendant on this species of exercise arise from the indiscretion of the parties themselves, who are apt to overheat themselves, and in this state expose themselves to a chilling blast of air; in gay assemblies, too, while the body is thus overheated, ices and iced liquids are not unfrequently taken, from which we have occasionally seen the most fatal effects ensue.

Riding, which we have classed among the active exercises, may, if taken gently and with moderation, be ranked among the passive exercises, and is extremely beneficial to many invalids. In many nervous affections, hypochondriasis, melancholy, nervous palpitations of the heart, and also in chronic affections of the lungs, it has been justly extolled. In nervous affections it operates beneficially by engaging the mind in the management of the animal, or the variety of surrounding scenery, at the same time that it calls into gentle action the muscles of the body. In affections of the lungs, the succussions of the body during horse-exercise have the effect of equalising the circulation, and dissipating the congestion, or undue accumulation of blood, which may occur in the membranes lining that organ. At the same time, the gentleness of the motion does not hurry the breathing, which in such cases is to be carefully guarded against.

The amount of exercise which should be taken must vary according to the habits, strength, and general health of the individual. It was an aphorism of Boerhaave, that every person should take at least two hours' exercise in the day, and this may be regarded as a good general rule. Again, the time of taking exercise has been a subject of some dispute. The truth is, that active exertion should not be taken when the stomach is full, as after a full meal, nor when the stomach is empty, as after a long abstinence. The medium should be observed; and for this purpose a walk or ride, some two or three hours after breakfast, will be found most agreeable and salutary.

CLOTHING.

Montaigne has, in one of his amusing essays, very gravely argued, that man was not destined to wear clothes; but the early history of all nations that ever attained to any thing like civilisation, and more especially the structure of the body itself, prove the contrary position. It is true that certain tribes of savages may have been found running naked in the forests; but it is certainly not thence to be inferred that nature intended all mankind should go about in the same exposed condition. On the contrary, the rudest people in the darkest ages had recourse to some species of clothing; they made themselves garments of the leaves of trees, or they covered their bodies with the skins of animals. The necessity, however, of adopting some form of dress will appear manifest, when we consider the construction of the body. It is well known that an equal distribution of blood through the system is essential to the enjoyment of health. The heart, therefore, has been provided as a fountain for the circulation of this vital fluid, which it propels through the internal organs, and over the whole surface of the body. It has been ascertained that the surface of the body extends to fourteen and a half or fifteen square feet, every part of which is crowded with blood-vessels, which appear to ramify in all directions. Hence it is manifest, that if, unprotected by clothing, this highly vascular surface be exposed to sudden transitions from heat to cold—such as must attend the ordinary vicissitudes of weather—the blood will be driven from the surface to the centre, and thereby occasion distressing and fatal maladies. The great object, then, of clothing, independent of its contributing to cleanliness and comfort, is to preserve the body at the same temperature, so that the circulation at the surface may not be interrupted; which physiological fact being recollected, we shall more clearly understand the principles by which we should be guided in the management of dress.

The first consideration obviously respects the quantity and quality of clothing that should be worn, which to a certain extent must be modified by the nature of the climate and the season of the year. Furs, woollens, flannels, &c., are necessary as we proceed northwards; linen and cotton as we advance into the warmer southern regions. It is necessary, however, to observe, that it is not so much the quantity as the quality of the clothing which contributes to our warmth; therefore a superabundance in the quantity of apparel worn is in no case necessary. The great rule which should be observed is, to preserve as uniform a system of dress as possible throughout the year, and thereby those sudden vicissitudes of temperature, the injurious effects of which we have already explained, will not be experienced. If it be necessary to observe this rule throughout the year, it is still more necessary that it should be observed during a single day; for among many persons a custom prevails of wearing a heavy dress in the morning and a light dress in the evening. Young ladies are very apt to clothe themselves in the morning with very warm habiliments; dressed in which, while the sun is above the horison attaining its meridian of heat, they go out into the open air, and enjoy a brisk walk; they then, when the heat of the day is about to decline, and the system is relaxed from exertion, put on a different character of habiliments altogether, and in the chill of the evening are found dressed in the lightest summer apparel. If the dictates of fashion be so imperious as to render a change of dress necessary for effect, care should be taken to compensate for the lightness of the upper evening dress by some additional under garments, otherwise the body will certainly be exposed to the chance of taking cold. For the same reason, as the seasons of the year succeed each other, the greatest caution should be observed in adopting a change of dress. We have known many persons suffer severely from inconsiderately and at once laying aside their winter and assuming their summer apparel; such changes so suddenly adopted in such a climate as this must always be attended with danger. In particular, delicate persons should be very cautious how they lay aside *any* article of apparel to which they have been accustomed.

As the clothing which is worn ought not to be excessive, neither ought it to be deficient, in quantity—an error which some parents commit, under the idea, that, in habituating their children to little clothing, they are inuring them to a strong and hardy constitution. This is an error; for, so far as clothing is concerned, it ought never to be so deficient as to expose any part of the body to an abiding sense of cold. There is no doubt that the effects of habit are considerable. The child of the cottager is seen running about in good health, exposing its little body half naked to the inclemencies of the weather; but it should be recollected, that, generally speaking, the constitution of every child corresponds in a certain degree with the constitution of its parents; so that, in respect to its clothing, food, &c., it will require in a great measure to be treated according to the habits which prevail in the sphere of life in which it is born. As the quantity of clothing ought not on any account to be inconsiderately changed, neither ought its quality; because, as we have already premised, the quality or kind of apparel worn has even a more important influence in maintaining the equal temperature of the body. Flannel, we all know, is warmer than linen; not because it imparts of itself any heat, but because it prevents the escape of the heat of the body. It is what is called a *bad conductor* of heat; for this reason, that it is of a loose texture, and the air between its interstices interrupts the heat being transmitted through it. Furs, woollen, &c., for the same reason, afford good winter clothing; and therefore we should be cautious how we lay aside apparel of this description for linen, which very readily permits the heat of the body to escape. Count Rumford, in one of his essays, states that he is convinced of the utility of flannel shirts in all seasons; that he has worn them in all climates, in the warmest apartments, and during the most fatiguing exercise, without the least difficulty; that he was relieved by the use of flannel from a pain in his breast, which he had been frequently subjected to, and never since knew an hour's illness; and that nothing exceeds the agreeable sensations of this dress, when we are once accustomed to it. "I have been informed," observes Dr Willich, "by the manufacturers in the different foundries in Birmingham, as well as at the ironworks of Colebrook Dale and Ketley, that in the most intense heat they wear no other than flannel shirts, without which it would be impossible to prevent continual colds, and the most fatal diseases." We would earnestly recommend all persons, particularly those who are liable to any affections of the chest, to wear flannel waistcoats or shirts next the skin, in this country, both during winter and summer. Its effect, as a preservative of health, cannot be too highly appreciated.

It is worthy of remark, that among all nations, however rude, a distinction is made between the male and the female form of dress, to individualise as much as possible the different character and habits of the two sexes. As civilisation has advanced, the desire of displaying the human form to the best advantage has suggested an infinite variety of fashions in clothing, many of which have been extremely absurd, and eminently calculated to injure health. The ideas of what constitute grace and beauty fluctuate every season, and are oftentimes ludicrously contradictory; indeed, the decrees of fashion respecting dress are so capricious as to set all reasoning at defiance; therefore, without attempting to argue with the fickle goddess herself, we shall merely caution her votaries against adopting such habits as may be prejudicial to their health. Whatever form of dress may be selected, no part of the body should be subjected to restraint or compression. If the neck be surrounded by a tight collar, handkerchief, or cravat, the veins which return the blood from the head will be compressed, and apoplexy may consequently be induced. No part of the dress, therefore, either of male or female, should very tightly surround the neck; a precaution which should be more especially attended to by those who appear predisposed to a determination of blood to the head. For this reason, when any person is observed to fall down as in a fit, the bystanders should immediately loosen the cravat or handkerchief, or the strings of the bonnet, or whatever else may act as a ligature on the windpipe and neighbouring vessels. The next principle to be observed is that of allowing the chest free motion. Every time we take an inspiration, the ribs are raised, and during every expiration they are depressed; no impediment, therefore, ought to prevent this important series of alternate actions. It was not long ago usual for ladies to wear stays as tightly laced as possible, and even now the anxiety to display a small waist tempts many a young woman to lace her stays to a degree equally unfavourable to health, and to the gracefulness of her own appearance. A more injurious custom than this cannot be adopted. It is evident that the compression of the stays round the chest will prevent the ribs being raised during inspiration, and thereby impede both the action of the lungs and heart. At the same time, being girded tightest round the centre of the waist, the stays approaching towards the hip, will have the effect of pressing the liver out of its natural position, and prevent that action of the digestive organs which is necessary for the disposal of food. Besides these effects, which give rise to many distressing and lingering diseases, the organs thus compressed will be forced to exercise a pressure on the larger blood-vessels contained within the chest and abdomen, whereby the circulation of the blood may become seriously impeded. We have often seen ladies faint from this cause; and not long ago a case was recorded in the London journals of a young woman who died suddenly after taking her dinner, and no other reason was assigned for her death, by the medical men who examined her body, than that of excessive tight lacing, the consequences of which were, that the stomach, when distended by food, could not turn upon its own axis; the surrounding vessels, by its muscular efforts, were forcibly compressed, and the action of the heart fatally interrupted. After a full meal, even men who wear their waistcoat or waistband of the trousers very tight, find a difficulty of breathing, owing to the circumstance of the distended stomach being forced by the unyielding girdle to press up against the diaphragm, or muscle which divides the contents of the chest from that of the abdomen. Another evil incident to the practice of wearing tight-laced stays is that of curvature of the spine, which is thus occasioned: By the compression of the stays, the motion of the intermediate parts of the spine is greatly circumscribed, and the action of the muscles attached to the trunk impeded; and the necessary circulation of the blood through their substance being interrupted, their power and size diminish, so that the vertebral column loses its natural support, and readily inclines to one side. It is perfectly evident that nature has so constructed the human body that it is able, if left to its own powers, to support itself; and accordingly, the finest women in the world, the Circassians, renowned in the annals of beauty, never wear any stays. When Lady Montague was travelling in the East, on the occasion of her undressing for the bath, the Turkish ladies who were present, on discovering she wore stays, could not restrain their curiosity and amazement. "What!" said one of them, "do all the women in your country *wall* themselves in after this fashion?" After all, it should be considered that the natural proportions of the human body can alone present us with a display of real symmetry; for a preternaturally small waist is as much out of nature, and as far from being really beautiful, as a compressed and crippled Chinese foot; the only difference, indeed, is in favour of the latter, for the ladies of China, in compressing their feet into as small a compass as possible, run no risk of injuring any of the vital organs. If, notwithstanding all the warnings and injunctions of medical men, this part of the dress be still held to be indispensable, it ought to be made of as soft and pliable materials as possible; the principle to be observed being that of allowing every muscle of the human body its full play, by which alone the muscular vigour of the system can be maintained.

Besides the evils which may arise from the effects of tight lacing, a considerable degree of mischief may be occasioned by the shoulder-straps of the stays being unequal in length, and pressing more on one shoulder than on the other. So, also, when the frocks of children are made too low, by slipping off the shoulders they induce a twitching, particularly of the right shoulder, to recover the falling strap, which calls into action the muscles of the right side of the body more frequently than those of the left, whereby a curvature of the spine to that side may be occasioned. Narrow sleeves in gowns and coats, tight bracelets, or wristbands in shirts, should be also avoided; for, by compressing the blood-vessels, such will occasion swelling of the veins at the back of the hand, rigidity, and weakness of the arms; and it is not improbable that to this cause may be attributed the thin and ill-formed arms that may so often be observed. To this evil women are more liable than men, because their arms are less muscular, and the veins therefore more readily compressed. Hence, the fashion of tying the sleeves of ladies' gowns close to the elbow, deserves censure; because the circulation and free motion of the arm are thereby apt to be obstructed. In like manner, tight and unyielding garters may be productive of much mischief; for, on the same principle, by interrupting the circulation of the blood, they will occasion enlarged or varicose veins, swelling or dropsy of the legs and thighs, and even aneurism. "Many years ago," observes Dr Willich, "when, in compliance with early habits and prejudices, I was accustomed to the use of garters, I could not walk or ride half a dozen miles without fatigue, which inconvenience I found immediately removed on abandoning these improper ligaments." It would be much better for the stockings to be tied by a tape to the waistband, than to be retained in their place by tight garters; but if this article of dress must still be retained, the most elastic, as those made of caoutchouc, or Indian rubber, should be used, which should be flat and broad, and tied above rather than below the knee, because there will be there less chance of compressing the blood-vessels, which lie more superficially below than above the joint. There is no part of the body the temperature of which should be more carefully preserved than that of the feet; wherefore, persons accustomed to worsted stockings should not inconsiderately exchange them for silk, which, on the occasion of evening parties, is often thoughtlessly done, and gives rise to all the evils incident to taking cold. Indeed, no article of dress should be either exchanged suddenly or laid aside for one of lighter texture; because any part of the body accustomed to a certain protection of clothing becomes chilled if it be taken away.

This is particularly illustrated by the cravat worn by men; for while delicate young women with impunity expose their necks without any covering to the open air, the strongest man, by laying aside his neckcloth and exposing his neck, will run the risk of catching a sore throat. It is related by Percy, that a regiment of infantry, travelling in very stormy and hot weather, were for their greater ease permitted by the colonel to take off their cravats; having done which, they entered a mountain-pass exposed to the north-east wind. The next day ninety men were obliged to be sent to the hospital, the greater part of whom were affected with violent inflammation of the throat; and during the following days as many as three hundred of their comrades became not less indisposed. So, also, those who are accustomed to wear a bonnet or hat in the open air, ought never to go out with the head uncovered; in very hot weather, by so doing, they will expose themselves to a *coup de soleil*, or sun-stroke; in damp or chilly weather, to severe cold. In this, also, may be recognised the effects of habit: thus, when the Asiatics expose themselves to the rays of the sun, they protect their head by wearing a turban; but the negroes in the West Indies, though exposed to the rays of a tropical sun, will on no account wear a hat or any other covering on the head.

Impressed with the conviction that where there is the slightest restraint there can be no ease nor freedom of motion, our ideas concerning grace and beauty become naturally associated with that form or style of dress which suggests the most perfect sense of ease and freedom. Hence, Hogarth has shown that beauty consists of lines flowing in easy curves; wherefore, those parts of dress composed of such curves are always the most agreeable. Hence, a sash descending from one shoulder to the opposite hip, or a Grecian veil thrown back, and winding carelessly down behind, suggesting the feeling of perfect freedom, are always beautiful. But whatever may be the rules suggested in respect to dress for the preservation of health, or whatever may be the arrangement of its style most consonant with the real principles of art, the imperious dominion Fashion will overrule; for it unfortunately happens in this country that every person, no matter whether it be becoming to them or not, indiscriminately adopts whatever style of dress may be introduced. "Not only," says Goldsmith, "ladies of every shape and complexion, but of every age too, are possessed of this unaccountable fashion of dressing in the same manner. They seem to have no other standard for grace but the run of the town; so that gardens, ballrooms, playhouses, &c., are filled with ladies in *uniform*; and their whole appearance shows as little variety or taste as if their clothes were bespoke by the colonel of a marching regiment, or fancied by the same artist who dresses the three battalions of the guards."

BATHING.

It is to be regretted that the practice of bathing, as a means of promoting cleanliness, and as a preservative of health, is not by us so highly appreciated as it was by the ancients, the remains of whose baths are to this day considered to rank among the most splendid ruins of antiquity. Already it has been observed, that the human body is constantly undergoing a certain decay and renovation; the old particles that have become useless are ejected out of the system, and new ones deposited in their stead. It is now, then, to be observed, that the vessels of the skin are constantly engaged in separating the effete watery particles of the blood, which are thrown off in the shape of insensible or sensible perspiration. The quantity of perspiration which the whole body yields daily, is estimated at from two to four pounds; the latter is the maximum, and the quantity generally perspired in tropical climates. Accordingly, it will appear evident that ablution is necessary, first, to wash away the perspirable matter, which will otherwise dry upon the skin; second, to stimulate the vessels of the skin to perform their healthy functions, otherwise they will become languid, and the fluid they should separate from the blood will be thrown back upon the system, and destroy that balance between secretion and excretion which is necessary for the renovation and health of the animal economy. Besides this, the perspiration thus secreted by the vessels of the skin is of the most eminent service in equalising the heat of the animal body; for by the superabundant heat to which it may be subjected being carried off by the process of perspiration, the temperature of the body in the hottest climates and in the warmest weather is maintained at its usual standard. If, then, the perspiration be checked, or the vessels of the skin cease to perform their functions, the system will become heated, and a feverish state be induced. It is further to be observed, that the skin, being continuous with the membrane lining the lungs and alimentary canal, so intimate a connection is established between it and these organs, that the functions of the one can seldom or never be disturbed without the functions of the other sympathising with the disturbance. If the body, when its surface is bedewed with perspiration, be exposed to a current of air, or the contact of water much below its temperature, the vessels near its surface will immediately contract, and the blood rush from them into the vessels of the internal organs; and hence arises inflammation of the lungs, bowels, &c. consequent upon what is commonly termed "catching cold."

These preliminary physiological considerations will enable us to understand the principles upon which the practice of bathing should be adopted, and the precautions which ought to be observed. All our sensations of cold and heat are, it is to be remembered, only relative; whatever is below the temperature of the body gives it the impression of cold—whatever is above its temperature gives it the impression of heat. Water at a temperature of 60 degrees excites neither a sensation of heat nor cold; at a temperature of from 32 to 65 degrees, it constitutes what is called a *cold* bath; from 65 to 85 degrees, a *tepid* bath; from 85 to 97, a *warm* bath; and from 97 as high as it can be borne above that degree, a *hot* bath; besides which forms of the bath there is also the vapour bath, in which the body is exposed to the steam of water. The best form of taking the cold bath, where it can be commanded, is that of sea-bathing; and the difference between this and fresh-water bathing consists in this, that sea-water holds in solution a greater quantity of saline matter, and has a more stimulating effect, therefore, on the vessels of the skin. For this reason, as the evaporation of the sea-water from the surface of the body which has been immersed in it is slower than that of fresh water under the same circumstances, persons are less likely to take cold from bathing in salt than from bathing in fresh water. The best season of the year for sea-bathing is after midsummer, because the earth, having during the summer months imbibed the heat of the solar rays, then imparts to the surrounding waters a genial warmth. The average temperature of the sea on the coasts of this country during the autumn months, has been stated by Dr J. Hunter to be about 63 degrees, although he has observed it occasionally to rise higher. Taking, therefore, the heat of the body at 90 degrees, it would appear that in sea-bathing at this season it plunges itself into a medium possessing a temperature of rather less than 30 degrees below its own heat. The effect of this sudden transition is to constrict the vessels of the skin, whereby the blood is driven into the larger and deeper blood-vessels, the elasticity of whose coats enables them to accommodate themselves to this change in the balance of circulation. Soon after this, however, *reaction* succeeds; that is, the heart and arteries overcome the additional burthen imposed on them, and propel the blood again into the superficial or capillary blood-vessels, and this rush of blood to the surface gives rise to that genial glow which is experienced after bathing. When the body first plunges into the sea, the difference of temperature excites a sudden impression on the nervous system, and the pressure of the surrounding fluid on the abdomen and chest excites a certain degree of breathlessness, which sensations combined constitute what is called a *shock*. The state of the body at the time of bathing is a matter of considerable importance. The general rule is, not to go into the water when the body is overheated, nor yet when it is reduced below its natural temperature. Many persons, after taking a brisk walk down to the sea-side, lounge about until they feel cool, when they imagine that they may bathe with impunity. This is an error. In such a state the vital energies are enfeebled and depressed, and after the cold immersion the system has not sufficient strength left to establish the reaction above explained. After such imprudence, the individual on leaving the water feels himself chilled. In fact, the blood does not return with its wonted stimulus to the surface of the body.

In consequence of the blood being driven, on immersion into cold water, from the surface to the internal organs, it is obvious, that, if an individual immerse himself in water up to the neck, leaving the head alone unbathed, there will be danger of the blood being driven to the brain, in which case throbbing of the temples, dizziness, and symptoms of apoplexy, not unfrequently ensue. Dr Cullen, in his lectures, used to relate the case of a lady, who after bathing was always affected with violent headache, drowsiness, and other symptoms approaching to apoplexy, although in other respects the use of the cold bath was of material service to her general health. On inquiry, he found that she carefully abstained from wetting her head. Next time she tried the bath, the doctor advised her to submerge her head as well as the rest of her body, which directions were followed, and from that time she continued to bathe not only with impunity, but with advantage. The use of the bathing-cap, commonly used by ladies to protect their hair from the effects of the sea-water, is for the same reason objectionable. Many persons accustomed thus to cover the head during bathing, are liable afterwards to severe headaches. These are occasioned by the determination of blood to the head, and will in general be completely averted by allowing the cold water to come in immediate contact with the head. In the reasons now assigned, the sooner any person in bathing plunges the head into the water, the better; although, perhaps, the custom of plunging in head foremost is objectionable, because it may determine a sudden rush of blood to the brain. It is also to be observed, that it is better to remain during a short time immersed in the water, than to take repeated plunges; in illustration of which fact, Dr Currie relates an interesting narrative of the effects of a shipwreck on some mariners who were cast away on a sand-bank that lies at the mouth of the river Mersey. They remained twenty-three hours clinging to the wreck, in the month of December. The part of the wreck to which they adhered lying in a sloping direction, those of the crew who were placed on the higher part of it were generally out of the sea, but frequently overwhelmed by the surge, and exposed to a piercing wind, while the others were almost constantly immersed in the water. In the former situation were placed the two masters, stout men in the prime of life, and accustomed to hardships. They both died during the night, while the remainder of the crew, among whom was a negro, were all preserved except one, and ultimately recovered. It is not necessary to remain longer in the water than two or three minutes, and during this time the body should be kept in constant motion. For the delicate, bathing-dresses are certainly useful. They protect the body to a certain extent from the danger of taking cold, but should be made of so open a texture as to admit the water in every direction. Immediately after bathing, the moisture should be wiped off the body; but rubbing the surface of the body perfectly dry is less necessary than resuming the clothes usually worn as speedily as possible. The sooner in particular that the chest is covered, the better. After bathing, it is desirable to take a moderate degree of exercise; but care should be taken not to prolong the walk or ride so as to produce fatigue or lassitude. If a sense of coldness or shivering occur, a slight stimulant should be taken—a little spirits or wine and water—with the view of establishing reaction. If this fail, the individual should be placed in a warm bed, and frictions, and bottles or bladders of hot water, applied to the surface of the body.

Cold-bathing is by no means a safe practice in all cases; indeed, no invalid should have recourse to it unless under professional advice. It has been shown that when the body is plunged into cold water, the blood leaves its surface, and rushes to the vessels of the internal organs. Accordingly, it is evident that if the lungs be delicate, or if any structural disease be lurking in that organ, it will not be able to sustain the accumulation of blood which may under such circumstances be driven to it. So, also, if the heart be diseased, it may be completely overcome by the shock of the blood thrown back upon it, and death immediately ensue. In like manner, persons who appear predisposed to apoplexy should be cautious how they indulge in cold-bathing. However, albeit that in such cases cold-bathing may be inadmissible, there is no doubt that, in early life in particular, it tends to invigorate very considerably the system. All young children in good health should be bathed every morning in cold water, and even those persons who are not very robust will derive considerable advantage from sponging themselves daily with cold vinegar and water, or with salt water.

For invalids, or persons of a weakly constitution, the tepid or the warm bath will be found by far the safest and most salutary form of bathing; and the period of immersion should vary, according to circumstances, from fifteen minutes to half an hour, during which time the water should never be allowed to become in the slightest degree chilled. The effect of immersion in cold water is, as we have explained, to produce a reaction in the circulation, by which the extreme vessels at the surface of the body having become constricted and partially emptied, are again dilated and filled by the return of the blood from the heart and arteries. The effect of warm-bathing, however, assumes a different character; for, in this case, by the application of the external warmth, the extreme vessels are relaxed, and more readily admit the blood which the enfeebled action of the heart and arteries could scarcely propel into them. Thus, the whole cutaneous system becomes filled with blood, while the interior organs are relieved, and the heart finding less difficulty in emptying its contents, becomes, as it were, encouraged to assume a fuller and stronger series of contractions. Hence, in persons of a weakly habit of body, the effect of the tepid or warm bath is to strengthen instead of to weaken the constitution—a fact attested by many high medical authorities, and recently by Dr Andrew Combe, who states that, in his own instance in particular, he is conscious of having derived much advantage from its regular employment, especially in the colder months of the year, during which he uniformly found himself most effectually strengthened against the impression of cold by repeating it at shorter intervals than usual. When the body is in a state of exhaustion from excessive fatigue, there is nothing which (on the principle just explained, of its facilitating the circulation of the blood to the extremities) is so refreshing and invigorating as a warm bath; and hence Homer describes Ulysses, among others, as refreshing himself with a warm bath, on his return home after all his fatigues and dangers.

The hot bath and the vapour bath are used rather as restoratives than as preservatives of health. Their effect is to soften the textures, increase the sensibility of the nervous system, promote absorption, restore the tone of the mucous membranes, and in many chronic diseases, especially in rheumatism, gout, scrofula, and cutaneous eruptions, they are found to be extremely beneficial.

SLEEP.

When the noise, bustle, and wonted occupations of the day have terminated, the stimulus of light is withdrawn, and nature invites all animals to repose. To the weary it brings rest; to the distressed temporary relief, and is the "wide blessing" which ministers to the comfort of all mankind. After having been engaged in daily occupations for fourteen or sixteen hours, a general feeling of fatigue and weakness is induced; the motions of the body become difficult, the senses confused, the power of volition or *will* suspended, and the rest of the mental faculties becoming more and more confused, sink into a state of unconsciousness. The sense of sight first ceases to act by the closing of the eyelids; then the senses of taste and smell become dormant; and then those of hearing and touch. The muscles, also, dispose themselves with a certain reference to ease of position, those of the limbs having ceased to act before those that support the head, and those that support the head before those of the trunk. In proportion as these phenomena proceed, the respiration becomes slower and more deep, the circulation diminishes, the blood proceeds in great quantity towards the head, and all the functions of the internal organs become retarded. In this state, shut out, as it were, from the external world, the mind still retains its wonted activity, deprived, however, of the faculties of judgment and recollection; in consequence of which, it does not perceive the monstrous incongruities of the imagery which sweeps before it, and takes no cognisance whatever of the time which elapses; wherefore, a dream, the pageantry of which has lasted during the whole night, will often appear, on our being awakened, to have occurred within a few minutes; and a complete dream, embracing a variety of successive incidents, which appear to be spread over a vast extent of time, will often pass through the mind in a few seconds.

It may be laid down as an axiom, that, the more uninterrupted sleep is, the more refreshing and salutary will be its effects; for, during this period, the body undoubtedly acquires an accession of nervous energy, which restlessness, however induced, must disturb; and therefore the state of the body before going to sleep, the kind of bed, the manner of clothing, require especial attention. As the functions of the body are performed more slowly during our sleeping than our waking hours, it is evident that a full meal or supper, taken immediately before going to bed, will impose a load on the stomach which it will be unable to digest, and, from the very great sympathy existing between the stomach and brain, will occasion frightful dreams. When these occur in their most aggravated form, the sleeper lies upon his back, and the heart pressing down while pulsating on the lungs, gives rise to a sense of intolerable oppression on the chest, which seems to bear down upon the whole body, so that in this painful state not a muscle will obey the impulse of the will, and every effort to move appears to be altogether unavailing. This constitutes *incubus* or *nightmare*; and it may be observed, that, as acidity on the stomach or indigestion gives rise to such dreams, so all dreams of this disturbed character are indications of indigestion; for which reason the great physiologist Haller considered dreaming to be a symptom of disease. It is certain that the dreams of healthy persons are the lightest, and most evanescent.

The kind of bed on which we repose requires attention. Some are advocates for soft, others for hard beds; hence some accustom themselves to feather-beds, others to mattresses. The only difference between a soft and a hard bed is this—that the weight of the body in a soft bed presses on a larger surface than on a hard bed, and thereby a greater degree of comfort is enjoyed. Parents on this subject err in fancying that a hard bed contributes to harden the constitution of their children; for which reason they lay them down on mattresses, or beds with boarded bottoms. This is a popular prejudice. The beds for young children cannot be too soft, provided the child does not sink into the bed in such a manner as that the surrounding parts of the bed bend over and cover the body. The too great hardness of beds, says Dr Darwin, frequently proves injurious to the shape of infants, by occasioning them to rest on too few parts at a time; it also occasions their sleep to be uneasy and unrefreshing. The universal analogy derived from other animals evinces the truth of this doctrine, both in respect to the softness and due degree of warmth of their beds. Birds line the nests of their young with feathers; the eider duck and the rabbit pluck the down from their own breasts to increase the softness of the beds of their tender offspring, and brood over them with their wings, or clasp them to their bosoms for the sake of warmth. For this reason, it is better that weak children should sleep with a bedfellow than alone; for, in this case, if any part of the body becomes cold, the child instinctively places that part in contact with the warmer body of his companion. So, also, it is better for a new-born infant to sleep with its mother in winter, or with its nurse, than in a solitary crib by the bedside. When in bed, the head should be always higher than the feet, and those accustomed to palpitation of the heart should lie with their heads very high. The clothes, which should never consist of more than a chemise or shirt, should be made of cotton or linen, and in such a manner as not to impose the slightest restraint on any part of the body. Sleeping with flannel drawers on, a flannel waistcoat, or petticoat, or with woollen stockings on, is decidedly an uncleanly and unhealthy habit. It is also highly improper to sleep in a bed overloaded with clothes; the body is thereby heated, and feverishness and restlessness induced. Many persons find themselves uncomfortable and restless during the night from this cause; and after throwing off a blanket or two, according to the number used, feel relieved and disposed to sleep. Accordingly, persons who complain of sleeplessness should look to the quantity of their bed-clothing; for the unnecessary addition of a single blanket may be the sole cause of the annoyance. It is also imprudent to lie with the head entirely within the bed-clothes; for, in this case, the same air which has been already breathed, must be again and again inhaled. For the same reason, the curtains should not be drawn closely round the bed. Washing the face and hands, and brushing the teeth before going to bed, will be found to contribute materially to comfort. The window-shutters ought never to be entirely closed, nor yet quite open, but so put together as to permit the full light of day to make only a sort of *glooming* or dawny light, which will not irritate the sight. In summer the windows should be a little raised; and indeed every bedroom should be kept well ventilated. Whatever be the time chosen for sleep, it is evident that no person can with impunity convert day into night. Eight o'clock for children, and ten for adults, may be recommended as good hours for retiring to rest. It is well known that children require more sleep than adults, tall people than short; and more sleep is requisite in winter than in summer. The average duration of sleep which may be recommended for adults is *eight* hours; but much depends upon habit, and many persons require only six. It is scarcely necessary to observe, that, on rising in the morning, the strictest attention should be paid to washing the body. The bedroom windows should then be immediately thrown open; and the clothes of the bed turned down, in order that the exhalations of the body during sleep may be dissipated. Instead of this, if the bed be made immediately after we have risen, these exhalations are again folded up with the clothes—a practice which is not consonant either with cleanliness or health. The bed-clothes, therefore, should be turned down, and the windows allowed to remain open some time before the bed is made.

We have now explained the principal rules which should be attended to for the preservation of health, and shall conclude by observing, that every individual has his health and happiness more immediately under his own control than is generally supposed, and is in some measure responsible for it to himself, society, and his Creator.*

* In writing the present number of the Popular Information, the author, among other works referred to and quoted, has been indebted to several excellent works, the titles of which are subjoined, that they may be consulted by those who wish to pursue farther a subject of such vast importance and extent as that of the means of preserving health:—Willich's Lectures on Diet and Regimen—James Johnston's British Hygiene—Dr Paris on Diet—Londe Nouveaux Elemens d'Hygiene—Darwin on Female Education—Ward on Distortions of the Spine, Chest, &c.—Moffet on the preparation of Foods—Thackrah on Diet—Tissot on the Disorders of People of Fashion—Sir John Sinclair's Code of Health—Dr Andrew Combe's Principles of Physiology—Henderson on Wines—Walker's Manly Exercises.

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OPTICS.

THE term Optics is derived from a Greek word which signifies *seeing*, and applies to that branch of natural philosophy which treats of the phenomena of light and vision. As to the nature of that attenuated substance by whose instrumentality objects become visible, philosophers differ in opinion; there are two theories by which the phenomena of vision are accounted for. The first is, that light is a material substance, consisting of very minute particles, which are thrown off from luminous bodies in all directions and with immense velocity; the second, which is denominated the undulatory theory, is, that an exceedingly thin and elastic medium, called ether, fills all space and penetrates all material bodies. The particles of this ether are like air, of which we formerly treated, susceptible of being thrown into a state of vibration, so that waves are propagated in all directions; and when these undulations reach the retina of the eye, they excite the sensation of light. By this hypothesis, therefore, light is, like sound, rather a state of matter than matter itself. But independent of all speculations as to the abstract nature of light, it possesses certain general properties, which have been discovered by experiment and observation; and to these it is our purpose to devote this paper.

All visible bodies may be divided into two classes, self-luminous and non-luminous. Under the first head are comprised all those bodies which possess in themselves the property of exciting the sensation of light or vision, such as the heavenly luminaries, terrestrial flames of all kinds, phosphorescent bodies, and those substances which shine by being heated or by friction. Under the second class we recognise such bodies as have not the power of throwing off particles of light, or exciting undulations of themselves, but which possess the property of reflecting the light which is cast upon them by self-luminous bodies. A non-luminous body may receive light from another non-luminous body, and throw it upon a third so as to illuminate it; but, in every case, the light which renders objects visible must proceed from some self-luminous body. When a candle is placed in a darkened room, it renders objects visible by discharging particles of light upon them, which they throw back or reflect in directions which we shall afterwards describe.

Light proceeds from every visible point of an illuminated body, and in all directions in which the point is visible. A piece of paper held before a candle, or in the sun, will be found illuminated over the whole of its surface, no part being left destitute of light. This will be found to be the case in whatever position the paper is held, provided the rays of light are allowed to fall upon it.

All bodies throw off light of the same colour as themselves. Although the light of the sun is white, it is not simple, but compounded of seven different rays, as we shall see hereafter. This white substance falling upon objects of different colours, is decomposed by them—the green bodies reflect green light, the red ones red light, the yellow ones yellow light, and so on; thus giving rise to that beautiful variety of tints which the face of creation exhibits. In whatever situation we place ourselves, if the light thrown back by bodies is not obstructed, they are shown to be only of that colour which they reflect.

Light consists of separate parts or atoms, called *rays*, which are independent of each other. These are projected from the luminous body in straight lines, which is proved when the sun darts his beams through a cloud of smoke or dust. There the progress of light in straight lines may be distinctly seen. It is also proved by the fact that we cannot perceive objects through a bent tube; and it may be inferred from the form of the shadows of bodies. If light be admitted into a dark room by a small hole in the shutter, it illuminates a spot in the room exactly opposite the shutter. If a small portion of the admitted light be stopped, or if the whole of it except a very minute portion be arrested in its straightforward course, that which is allowed to pass is not in the slightest degree affected by its separation from the main column of light, proving that the rays are independent of each other. The smallest portion which we either stop or allow to pass is called a *ray of light*.

Light travels with extraordinary velocity. Astronomers have proved, by observing the eclipses of Jupiter's satellites when that planet is nearest and when it is farthest from the earth, that light moves from the sun to the earth in seven and a half minutes. It proceeds through a space equal to the circumference of our globe in the eighth part of a second—a flight which the swiftest winged bird could not perform in less than three weeks.

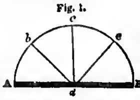
Of the light which falls upon a body, part is thrown back or reflected, and part is absorbed by the body or is transmitted through it. Those bodies, such as glass and water, which allow light to pass through them, are called transparent or pellucid bodies, and sometimes mediums. Bodies, such as a plate of silver, brass, &c., which throw back the light in great quantities, are called reflectors. Light is reflected according to certain fixed laws, the consideration of which forms a branch of the subject called *Catoptrics*. Light is also transmitted according to certain immutable laws, and this part of optics is denominated *Dioptrics*.

CATOPTRICS.

The term Catoptrics is derived from two Greek words, one of which signifies *from* or *against*, and the other to *see*, and denotes that branch of the science which treats of the reflection of light from plane or spherical surfaces, and the phenomena of the formation of images.

A *speculum* or *mirror* is any instrument of a regular form employed for the purpose of reflecting light, or forming images of objects. Mirrors usually consist of metal or glass, having a highly polished surface. Those which are constructed of glass are coated upon the back with quicksilver, for the purpose of reflecting more light; were this not the case, so little light would be thrown back, on account of glass transmitting it to a considerable extent, that a very indistinct image would be formed. The word speculum is generally confined to metallic mirrors, and they are either plane, concave, or convex. The plane ones are perfectly flat like a looking-glass; and a common watchglass conveys a very good idea of the other two species of mirrors. Coat the hollow surface with mercury, and place it before a candle, it forms a convex mirror; coat it upon the other side and employ it as before, it becomes a concave mirror. In the course of this paper, when mirrors are mentioned, those made of polished metal are meant.

Fig. 1.



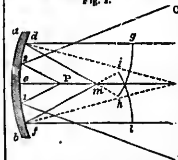
If a plane mirror A B be placed exactly in a horizontal position, and if a ray of light c darting downwards in an exactly perpendicular direction, and striking it at d, the ray will be thrown back in the exact path which it traversed in its descent, without any deviation. If, however, it descends in an oblique manner, as is shown at e, a point midway between the perpendicular c and the horizontal A B, it will not return, as in the former instance, to the place whence it came, but will be reflected from the mirror at an angle exactly equal to that at which it descended upon it. The ray $e\,d$ is called the *incident ray*, and the ray $d\,b$ is termed the reflected ray. The figure $e\,d\,c$ is called the *angle of incidence*, and $d\,b\,c$ the *angle of reflection*; and they are both, as we have observed, exactly equal to each other. This being the fact, we have afforded us a method of universal application, by which, when once the angle of incidence, or that at which the ray falls upon a body, is found, that of reflection is easily obtained. This holds true whatever shape the mirror may be of, plane, concave, or convex, and whatever number of rays may fall upon it.

Parallel rays, when reflected from plane surfaces, retain their parallelism after reflection. When *diverging* or *converging* rays fall upon a plane mirror, they retain their degree of divergency or convergency after they have been reflected. This fact is so obvious, that any farther illustration of it by diagrams is unnecessary.

REFLECTION OF RAYS FROM CONCAVE AND CONVEX MIRRORS.

When parallel rays fall upon a convex mirror, they will be made to converge or meet at a certain point called a focus. Thus, in the annexed figure, the parallel rays $g\,c\,l$ falling upon the concave mirror $a\,b$, are thrown back from its surface in angles of reflection equal to the angle of incidence, and meet at a common point m, which in the present instance is at exactly half the distance of the surface of the mirror from c, the centre of its concavity.

Fig. 2.



Thus, let c be the centre of concavity of the mirror $a\,b$, and let the parallel rays fall upon it at the points $d\,e\,f$. Draw the lines $c\,i\,d$, $c\,m\,e$, $c\,h\,f$, from the centre c to these points, these lines will be perpendicular to the face of the mirror, because they proceed like so many radii from its centre. Make the angle $c\,d\,h$ equal to the angle $d\,g\,c$, and draw the line $d\,m\,h$, which will be the direction of the ray g after it is reflected from the points of the mirror; so that the angle of incidence $g\,d\,i$ is equal to the angle of reflection $h\,d\,i$, the rays making equal angles with the perpendicular $c\,i\,d$ on its opposite sides. Draw also the perpendicular $c\,h\,f$ to the point f, where the ray $l\,f$ touches the mirror; and having made the angle $c\,f\,i$ equal to the angle $c\,f\,l$, draw the line $f\,m\,i$, which will be the course of the ray $f\,l$ after it is reflected by the mirror. The ray $c\,m\,e$ passes through the centre of concavity of the mirror, and falls upon it at e, the perpendicular to it, and is therefore reflected back from it in the same line $e\,m\,c$. All these reflected rays meet in the point m; and in that point the image of the body which emits the parallel rays $g\,c\,l$ will be formed, which point is distant from the mirror equal to half the radius $e\,m\,c$ of its concavity.

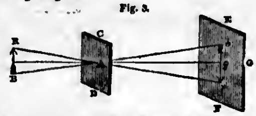
In all kinds of mirrors, of whatever substance they may be formed, the focal point is exactly equal to one-half of the radius of the mirror's concavity. The *focus* or *fire-place*, where the rays meet at a point, is so called on account of these collected rays possessing the power of burning any combustible body placed there. This property, however, of inflaming a body which the rays of light possess, is to be attributed to the presence of heat, which follows the same laws as light with regard to reflection. By means of reflecting mirrors, it is easy to produce an intense degree of heat. With respect to the reflection of diverging rays, or those rays which, proceeding from one point, such as c, and striking the concave mirror at $d\,e\,f$, &c. they will be reflected to a point nearer that of the mirror's concavity than they were concentrated to in the case of parallel rays. Thus, in the case of the reflection of diverging rays, the focal distance $c\,m$ of the mirror is greater than its distance from the parallel rays. On the other hand, converging rays falling on a concave surface, converge more, that is, they will meet at a point farther from the centre of the cavity of the mirror, than that to which the parallel rays $g\,c\,l$ were converged. Thus, let N and O be two converging rays which are severally projected upon a concave mirror at 1 and 2, their angles of incidence are evidently larger than those of the parallel rays; hence their angles of reflection will be greater. They therefore necessarily converge after their reflection, and meet at a point F, which is, as we have said, farther from the centre of concavity of the mirror than in any of the former instances.

If the reflecting mirror *a b* be reversed, and the convex side of it presented to the rays *g e l*, phenomena of a different kind will occur, but resulting from or depending upon the same laws. Instead of the rays being reflected inwards, and meeting at a focal point before the mirror, they will diverge as if they came from a point from behind the mirror, which is called their *virtual* focus, and which is similar to the distance *e m* in the former diagram. It is called a virtual focus, not because the rays meet there, but because the rays which pass from the surface of the mirror, if continued backwards, would all meet there, and seem to have diverged from that point. In reference to the reflection of diverging rays from convex mirrors, the virtual focal distance behind the reflecting surface will be less than for parallel rays, and with respect to converging rays it will be greater.

FORMATION OF IMAGES BY MIRRORS.

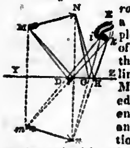
The image of an object is a likeness of it, formed generally by mirrors and lenses upon various grounds, and reflected accurately in shape and colour upon the eye which is fitted to perceive it. Images can also be formed upon a piece of paper, by placing a small hole between the object and the paper, and excluding all extraneous light. This will be best understood by the following diagram:—

Fig. 3.



Let C D be a window-shutter having a small aperture A, and E F a piece of paper placed in a dark chamber. Then, if an illuminated object, R G B, is placed on the outside of the shutter, we shall observe an inverted image of this object painted on the paper at *r g b*. In order to understand how this takes place, let us suppose the object R G B to have three distinct colours—*red* at R, *green* at G, and *blue* at B; then it is plain that the *red* light from R will pass in straight lines through the aperture A, and fall upon the paper E F at *r*. In like manner, the *green* from G, and the *blue* light from B, will severally fall upon the paper at *g* and *b*, and an inverted image *r g b* of the object R G B will be painted upon it. Every coloured point in the object R G B having a coloured point corresponding to it, and opposite to it on the paper E F, the image *b g r* will be an accurate picture of the object R G B, provided the aperture A is very small. If it be increased in size, indistinctness in the image will ensue; for, with a large aperture, two adjacent points of the object will throw their light on the same point of the paper, and thus create confusion in the picture. It is perfectly clear, that if the paper E F be moved to a farther distance from the hole A, the size of the image will be increased; and if it be brought nearer to it, it will be diminished. The law is, that when A *g* is equal to A G, the image will be equal to the object; when the distance between the two is less, the image will likewise be less; and when it is greater, it will be greater. As the aperture A is small, and admits only a small number of rays, and as to enlarge it would render the image indistinct, only a faint picture is formed. This is remedied, however, by means of mirrors and lenses.

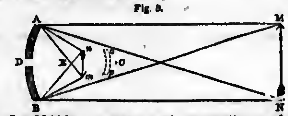
Fig. 4.



Images formed by Plane Mirrors.—Let Y Z be the surface of a plane mirror, M N any object placed in front of it, and E the eye of an observer placed at *i k*. Of the rays which shoot in a rectilinear direction from the points M N of the object, and are reflected from the mirror, those which enter the eye are few in number, and must be reflected from portions D F and G H of the mirror, so situated with reference to the eye and the object that the angles of incidence of the rays which fall on these portions must be equal to the angles of reflection of those which enter the eye between *i* and *k*. For instance, the ray M D is reflected in the direction D *i*, and the ray M F in the direction F *k*. In the same manner, the rays N G and N H will be reflected severally in the directions G *i* and H *k*. If the rays *i* D and *k* F be continued backwards, they will meet at a point M, whence they will appear to have come to the eye. For the same reason, the rays G *i* and H *k*, if continued in the same manner, will seem to meet at the point *n* as their focus, and *m n* will be the virtual image of the object M N. It is called virtual, because it is not formed by the actual union of rays in a focus, and cannot be received upon paper. The virtual image *m n* is supposed to be as far behind the mirror as the object M N is before it; consequently, if we join *m n*, it will be of the same dimensions as M N, and have the same position behind the mirror as the object has before it. If we join the points M *m* and N *n*, the lines M *m* and N *n* will be perpendicular to the mirror Y Z, and consequently parallel. In every position of the eye, the image is seen in the same spot and of the same size at equal distances from the eye. If the object M N is an individual surveying himself in the mirror, he will see his perfect image as if at *m n*; and thus we have an explanation of the principles and properties of the *looking-glass*.

Reflection of Images by Concave Mirrors.—If we bend the plane mirror Y Z in the last cut into a figure forming the segment of a circle, we will form a concave and a convex mirror.

Fig. 5.



Let M N be an object placed at some distance from a concave mirror A B, whose centre is C, and whose principal focus is E. The rays from M fall diverging upon the mirror, and are reflected to a focus at *m* (a little without the principal focus), where they form an image of the extremity M. In the same way, a representation of the extremity N will be painted at *n*, so that a complete but inverted image of N M will thus be formed; and it is evident that it will be very bright, though small, because a great number of rays are concentrated, and concur in forming each point of the image. The size of the image thus formed corresponds to the distance of the object from the mirror. If the latter be large, and the former very bright, a series of beautiful experiments may be made by varying the distance of the object, and observing the variations in the size and place of the image. As the object recedes from the mirror, the picture approaches E, and gradually decreases in size. It coincides with E when M and N are infinitely distant. If we consider *m n* as a small object, a magnified representation of it will be formed at M N, which, when viewed by a convex lens, such as will be afterwards described, constitutes a *reflecting microscope*. If we place a small concave mirror *o p* behind it, so as to enlarge the image, and reflect them through an opening D in the large mirror A B, then this second image may be magnified still more by means of a lens, in which case it constitutes a Gregorian reflecting telescope, so called from the inventor James Gregory. If instead of a concave we employ a convex mirror *o p*, and place it between E and *n m*, so as to reflect the rays which would otherwise have met at *n m*, then an enlarged image would in this case also be painted at D, where it can be magnified as in the former instance. This combination constitutes the Cassegrainian *reflecting telescope*, so called from its inventor M. Cassegrain.

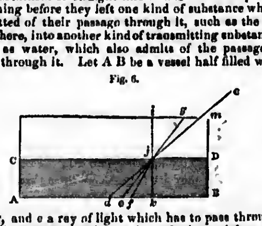
An image formed by a concave mirror is always highly magnified when the object is near the focus, but as it passes that point and approaches the mirror, the image gradually decreases in size, and becomes equal to the object when the latter touches the mirror. Indeed, when the image is placed between the principal focus and the mirror, the image is a virtual one formed behind the mirror. In convex mirrors, on the other hand, the image is always a virtual one formed behind the mirror. To perceive the truth of this, we have only to suppose the large mirror A B turned round, and *m n* placed at the back of it, or facing the concavity as at present, in which situation it will form the virtual image of the object M N at the virtual foci. In every position of the eye before the mirror, the image will be seen in the same spot *m n*, and it is always *erect*, and less than the object. The size of the image is to the size of the object as the distance of the image from the centre of the mirror is to the distance of the object. In approaching the mirror, the image and object approach to equality; and when they touch it, they are both of the same size.

DIOPTRICS.

Dioptrics is a term compounded of two Greek words, one of which signifies *through* and the other *to see*, and denotes that branch of optics which treats of the transmission of the rays of light through transparent bodies, the phenomena attendant thereupon, and the laws by which they are produced.

There is one general truth which the reader must bear in recollection: it is, that the rays of light, in passing from one medium into another, are bent from the rectilinear or straight-line course which they were pursuing before they left one kind of substance which admitted of their passage through it, such as the atmosphere, into another kind of transmitting substance, such as water, which also admits of the passage of light through it. Let A B be a vessel half filled with

Fig. 6.



water, and *c* a ray of light which has to pass through it. The direction of the ray is perfectly straight until it enters the water at *j*, when, instead of proceeding in a straight line to *d*, it is bent from its course and compelled to strike the bottom of the vessel at *e*. If oil instead of water had been used, the ray would have been still more bent, and have reached the bottom at *f*. A great variety of substances possess this power of bending the course of a ray of light, and it is called *refraction*, a term derived from a Latin word signifying *breaking back*, because, as in the above instance, the ray of light *c* is broken or refracted at *j*. The power by which bodies produce this effect is called their *refractive power*, and bodies that produce it in different degrees are said to possess different refractive powers.

Let the vessel A B be now emptied, and let a bright object, such as a sixpence, be cemented to the bottom of it at *d*. If the observer places himself a few feet from the vessel, he will find a position where he will see the sixpence through the hole. If water be now poured into the vessel up to C D, the observer will no longer see the sixpence; but if another sixpence be placed at *d*, and moved towards *e*, it will become visible when it reaches *e*. Now, as the ray from the sixpence at *e* reaches the eye, it must come out of the water at a point *j*, in the surface, found by drawing a straight line *j c* through the eye and the hole; and, consequently, *e j* must be the direction of the ray, which makes the sixpence visible, before its refraction at *j*. But if this ray move onward without being refracted at *j*, its path would have been *e g*; whereas, in consequence of the refraction, its path is *j c*. Hence it follows, that when a ray of light passing through any dense medium, such as water, &c., in a direction oblique or slanting to its surface, quits the medium at any point, and enters a rarer medium, such as air, it is refracted from the line perpendicular to the surface at the point where it quits it.

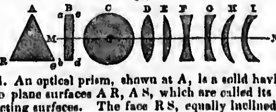
The degree of bending or refraction of light in traversing a transparent surface is ascertained by comparing the obliquity of its approach to the surface with the obliquity of its course after its departure. The angle which it forms with the perpendicular line *i k* determines the amount of refraction. The angle *i j c* is called *the angle of incidence*, and the angle *k j e*, which the ray *c* bent at *j* makes with the same perpendicular, is called the *angle of refraction*. When the ray comes out of the water, and is refracted in the manner described, these terms are just reversed. The line *i m* is called the sine of the angle of incidence, and the other line *e k* is called the sine of the angle of refraction. In every case these sines have a constant ratio to each other, and the number which expresses this ratio is called the *index of refraction*. The line *i m* which measures the obliquity before refraction, is invariably longer than *e k*, measuring it after refraction, by nearly one-third of the latter; and the refractive power of water is therefore signified by the index $1\frac{1}{3}$ nearly, or 1.336. In the same manner the greater refractive power of common glass has the index $1\frac{1}{2}$, that of the diamond the index $2\frac{1}{2}$, and so on. As we have observed, whatever relation holds between the obliquity of a ray and the refraction in any one case, the same holds for all cases. If, for instance, where the obliquity, as measured by its sine, is 40, and the refraction is 20, then, in the same substance, an obliquity of 10 will occasion a refraction of 5, and an obliquity of 4 will occasion a refraction of 2, and so on, the sines of incidence and refraction having always a fixed and invariable relation to each other. There is one fact to be observed, that a ray descending perpendicularly into any medium, or quitting it perpendicularly, suffers no refraction; it is only when it descends or rises in an oblique direction that this takes place.

With regard to the refractive power of transparent substances or media, the general rule, with certain limitations, is, that it is in proportion to the densities of the bodies. It increases, for instance, from the most perfect vacuum which can be formed, through air, fresh water, salt water, glass, and so on. But those substances which contain the most inflammable matter, have the greatest refractive power. It was from the great refractive powers of the diamond and water, that Newton, with admirable sagacity, predicted that they contained inflammable principles. This fact future discoveries in chemistry verified. Tables of the refractive powers of substances most interesting in optics will be found in Brewster's Optics. From these it would appear that substances which contain fluoric acid (See CHEMISTRY) have the least refractive power, as inflammable ones have the greatest. With regard to the cause of refraction, no good explanation has been given, but it may facilitate our conception of the phenomena, to consider it as depending upon the attractive power which the medium or body possesses over the light which passes through it.

REFRACTION OF LIGHT BY PRISMS AND LENSES.

The following figure represents the shape of the various optical instruments, where the effect is produced by refraction. They are most commonly made of glass. Sir David Brewster thus describes them:—

Fig. 7.



1. An optical prism, shown at A, is a solid having two plane surfaces A R, A S, which are called its refracting surfaces. The face R S, equally inclined to A R and A S, is called the base of the prism.

2. A plane glass, shown at B, is a plate of glass with two plane surfaces, *a b*, *c d*, parallel to each other.

3. A spherical lens, shown at C, is a sphere, all the points in its surface being equally distant from the centre O.

4. A double convex lens, shewn at D, is a solid formed by two convex spherical surfaces, having their centres on opposite sides of the lens. When the radii of its two surfaces are equal, it is said to be equally convex; and when the radii are unequal, it is said to be an unequally convex lens.

5. A plano-convex lens, shown at E, is a lens having one of its surfaces convex and the other plane.

6. A double concave lens, shown at F, is a solid bounded by two concave spherical surfaces, and may be equally or unequally concave.

7. A plano-concave lens, represented at G, is a lens, one of whose surfaces is concave and the other plane.

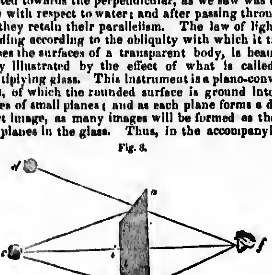
8. A meniscus, shown at H, is a lens, one of whose surfaces is convex and the other concave, and in which the surfaces meet if continued. As the convexity exceeds the concavity, it may be regarded as a convex lens. (It is called a meniscus, because it resembles the crescent moon.)

9. A concavo-convex lens, shown at I, is a lens, one of whose surfaces is concave and the other convex, and in which the two surfaces will not meet, though continued. As the concavity exceeds the convexity, it may be regarded as a concave lens.

In all these lenses, a line M N passing through the centres of their curved surfaces is called the axis. The figures represent only the sections of the lenses, as if they were cut by a plane passing through their axis; but the reader will understand that the convex surface of a lens is like the outside of a watchglass, and the concave surface like the inside.

As the peculiar manner in which these variously shaped crystals refract the rays of light must necessarily be represented when we show the manner in which, by virtue of their property, they form images of sizes different from the real object, only the general principle may be noticed. When a ray of light strikes the prism A R S on the surface A S, and perpendicular to it, it does not pass through the glass in a direct line, but is bent from its course in the same manner as was the case in the passage of light through water. The property of lenses having a convex surface, such as E, is to collect the rays of light into a focus—those having a concave surface, to disperse the rays. For instance, a parallel ray of light entering the double concave lens F is attracted in going through it upwards towards the thick end of the glass; and when it passes into the atmosphere, it is still more bent to the perpendicular, and is thus more widely dispersed. When parallel rays fall upon a double convex lens, such as D, the rays are refracted towards the axis, and meet at a focal point, which in a lens of this form is situated nearly at the centre of the sphere, of which the surface of the glass constitutes a portion. It is therefore at the distance of the radius of the sphere. In every case the focal distance depends not only upon the refractive power of the substance of which the lens is made, but upon the shape of the instrument. Parallel rays falling upon a plane glass, such as B, lying horizontally, are refracted towards the perpendicular, as we saw was the case with respect to water; and after passing through it, they retain their parallelism. The law of light's bending according to the obliquity with which it traverses the surfaces of a transparent body, is beautifully illustrated by the effect of what is called a multiplying glass. This instrument is a plano-convex lens, of which the rounded surface is ground into a series of small planes; and as each plane forms a distinct image, as many images will be formed as there are planes in the glass. Thus, in the accompanying

Fig. 8.

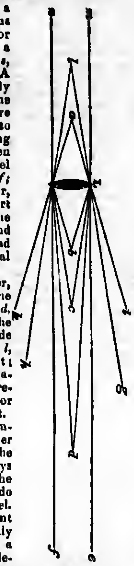


figure, $a\,b$ represents the plane side of the glass, and $i\,c$ a ray of light passing to the eye at f, upon which a distinct image is formed. The rays d and e striking upon oblique surfaces of the glass will be so bent as to reach the eye as if they had come in the direction $d\,f$ and $e\,f$, and in these directions two other distinct images will be seen. The refraction which light suffers in passing through a prism will be described when we come to notice the decomposition of light.

FORMATION OF IMAGES BY LENSES.

The principle upon which images are formed by light passing through small apertures, and by reflection from mirrors, we have already explained. Images are formed by lenses in the same manner as they are formed by mirrors. The image formed by a convex lens is inverted in position relatively to the object, as was the case in fig. 5. Its magnitude, in like manner, is to that of the object as its distance from the lens is to the distance of the object from the lens. By this means images of any size can be formed; small ones by removing the object from the lens, and large ones by bringing the object near the lens. These effects can also be varied by employing lenses of different focal lengths or distances.

In order to explain the power of lenses in magnifying objects, and bringing them near us, let us suppose an object placed at one hundred feet distance from the eye of a spectator. Let us place a convex glass of twenty-five feet focal distance half way between the object and the eye; then, as has been previously observed, an inverted image of the object, and of the same size, will be formed fifty feet behind the lens. If this picture is looked at six or eight inches behind it, it will be very distinctly seen, and nearly as well as if the object itself had been brought to within six or eight inches of the eye of the spectator. What is meant by the terms focal distance and conjugate foci, will be best understood by a diagram and explanation, fig. 9, which we quote from Dr Arnott:—



Rays falling from a on a comparatively flat or weak lens at L, might meet only at d, or even farther off; while, with a stronger or more convex lens, they might meet at c or at b. A lens weaker still might only destroy the divergence of the rays, without being able to give them any convergence, or to bend them enough to bring them to a point at all, and then they would proceed all parallel to each other, as seen at e and f; and if the lens were yet weaker, it might only destroy a part of the divergence, causing the rays from a to go to g and h, and after passing through, instead of to, i and k, in their original direction.

In an analogous manner, light coming to the lens in the contrary direction from b c d, &c., might, according to the strength of the lens, be all made to come to a focus at a or at l, or in some more distant point; or the rays might become parallel, as m and n, and therefore never come to a focus, or they might remain divergent.

It may be observed in the annexed figure, that the farther an object is from the lens, the less divergent are the rays darting from it towards the lens, or the more nearly do they approach to being parallel. If the distance of the radiant point be very great, they really are so nearly parallel that a very nice test is required to detect the non-accordance. Rays, for instance, coming to the earth from the sun, do not diverge the millionth of an inch in a thousand miles. Hence, when we wish to make experiments with parallel rays, we take those of the sun.

Any two points so situated on the opposite sides of a lens, as that when either becomes the radiant point of light, the other is the focus of such light, are called *conjugate foci*. An object and its image formed by a lens, must always be in *conjugate foci*; and when the one is nearer the lens, the other will be in a certain proportion more distant.

What is called the principal focus of a lens, and by the distance of which from the glass we compare or classify lenses among themselves, is the point at which the sun's rays are made to meet; and thus, by holding the glass in the sun, and noting at what distance behind it the little luminous spot or image of the sun is formed, we can at once ascertain the focus of a glass, as at a for the rays e and f.

It is remarkable that the bending power of the common glass should be such that the focus of a double lens of glass is just where the centre of the sphere would be, of which the surface of the lens is a portion. This gives us another fact with which to associate the recollection that the focus is near, as the convexity of the lens is greater; that is to say, as the surface is a portion of a smaller sphere. And such being the law, it may be proved, by calculation as well as by fact, that if a candle be held from a lens at twice the principal focal distance—suppose at c for a lens with the focus at a—the image of the candle will be formed at l, just as far on the other side. Thus, then, by trying with a lens until the image of a candle is formed at the same distance from it as the object is, we have a second mode of ascertaining the focal distance of a lens. Other kinds of glass, and other substances, refract with different powers; but the facts now stated should be retained in the memory as standards of comparison.

To revert to the case of the object placed at 100 feet distance, if, instead of a lens of 25 feet focal length, a lens of a shorter focus is made use of, and situated with respect to the eye and the object that its conjugate foci are at the distance of 20 and 80 feet from the lens—that is, the object is 20 feet before the lens, and its image 80 feet behind it—then the size of the image will be four times that of the object. If the eye, therefore, looks at this magnified image 6 inches behind it, it will be seen with great distinctness. In this case the image is magnified 4 times directly by the lens, and 200 times by being brought 200 times nearer the eye; so that its apparent magnitude is 800 times larger than before. At distances less than the preceding, the rule for finding the magnifying power of a lens, when the eye views the image which it forms at six inches distance, is, according to Sir David Brewster, as follows:—"From the distance beween the image and object in feet subtract the focal distance of the lens in feet, and divide the remainder by the same focal distance. By this quotient divide twice the distance of the object in feet, and the new quotient will be the magnifying power, or the number of times that the apparent magnitude of the object is increased. When the focal length of the lens is quite inconsiderable, compared with the distance of the object as it is in most cases, the rule becomes this:—Divide the focal length of the lens by the distance at which the eye looks at the image; or, as the eye will generally look at it at the distance of six inches, in order to see it most distinctly, divide the focal length by six inches, or, what is the same thing, double the focal length in feet, and the result will be the magnifying power."

TELESCOPE, MICROSCOPE, &c.

The word telescope is a compound Greek term, signifying *to see far*, and upon the above principle, the instrument in its simpler form is constructed. It consists of a lens whose focal length exceeds six inches, placed at one end of a tube which must always be six inches longer than the focal length of the lens. This is termed the object-glass; and here the light reflected by the objects in front is collected and formed into images near the other end of the tube, where they are inspected by another lens called the eye-glass. This lens is fixed in a smaller tube which slides backwards and forwards so as to admit of the focal distance being adjusted to different eyes, &c. In telescopes with only two lenses, such as those used for astronomical purposes, the image is inverted—a circumstance of no importance in viewing the heavenly bodies. To produce an upright image, another lens is introduced, so as to invert it a second time. There are various kinds of telescopes named after the makers, or the purposes to which they are applied; but as they are all constructed upon the above principles, it is unnecessary to describe them individually.

Microscope is a term compounded of two Greek words, signifying *to see what is small*, and denotes that instrument employed to examine minute objects. Those microscopes of greatest power, and termed compound, approach to the telescope in their form. The difference lies in this, that whilst in the telescope the object-glass forms the image of a distant object just as much smaller than itself as the distance of the image from the glass is less, in the microscope, conversely, a small object placed near the focus of the object-glass produces a more distant image, as much larger than itself as the image is more distant. In both cases an appropriate eye-glass is employed. The object-glass of a microscope is in general very small, that of a telescope large. An object-glass of a microscope having one-eighth of an inch of focal distance, and so placed as that the image of the object is formed at six inches, the image will be of a diameter forty-eight times as great as the object; and when viewed through an eye-glass of half an inch focus, it will appear magnified twelve times more, or will appear 30,000 times larger than the object. A single or one-lens microscope magnifies chiefly by allowing the eye to see the object nearer than it could do without the glass.

A *Camera Obscura* or *Dark Chamber* is formed by placing a convex lens, such as that represented in fig. 9, in an aperture made in the window-shutter of a darkened room. A glass of proper size and focal distance is chosen, and a screen or the wall of the chamber is properly prepared to receive the light, and by this means there is painted on it an accurate picture of all the objects seen from the window, every thing bearing an exact resemblance to the reality. Nothing can surpass the beautiful effects produced by this delightful instrument.

The *Camera Lucida* is an instrument now frequently used in drawing landscapes, delineating objects of natural history, and copying and reducing drawings. The best form of the instrument consists of a piece of thick parallel glass, at one end of which there is a metallic mirror having a highly polished face. The rays from the object are made first to pass through the glass, when they are reflected back upon one of its sides by the mirror, and from the glass they are again reflected to the eye.

The Magic Lantern.—When a small object is placed close to a lens, and the image reflected upon the wall of a dark chamber, at say one hundred times farther from the lens than the object is, there will be a greatly magnified representation of the object. It will only be seen, however, under ordinary illumination; and it is therefore necessary to have a very strong light, concentrated by a suitable mirror or glass, and directed upon the object. When artificial light is employed, as of a lamp, the instrument then becomes a magic lantern. It consists of an argand burner placed in a dark lantern, on one side of which is a concave mirror, the vertex being opposite to the centre of the flame, which is placed in its focus. In the opposite side of the lantern is fixed a tube containing a hemispherical illuminating lens, and also another convex lens at the external orifice of the tube. Between these two lenses there is a slit in the tube, through which sliders are introduced containing pictures, each painted and highly coloured with transparent varnishes. The light of the lamp, increased by the reflection of the mirror falling upon the hemispherical lens placed at the inner orifice of the tube, is by this lens concentrated upon the picture in the slider; and this picture being in one of the conjugate foci of the lens at the outer orifice of the tube, an enlarged image of it is painted on a white cloth or other screen made to receive it. The phantasmagoria is just a magic lantern in which the images are received on a transparent screen fixed in view of the spectator. The magic lantern mounted upon wheels is made to approach or recede from the screen at pleasure; and the consequence is, that the images upon the screen can be made to expand to a gigantic size, or contract into an invisible object, or a luminous point.

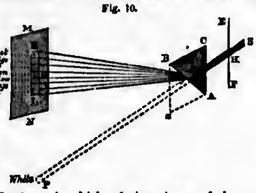
With regard to the aberration of lenses and mirrors, we can only refer the reader to larger works upon optics, such as that of Sir David Brewster in Lardner's Cyclopædia.

PHYSICAL OPTICS

Light is not a simple but a compound substance, and the phenomena exhibited by its decomposition and recomposition, as well as its other physical properties, are treated of under this head.

The white light of the sun, and that of any other luminous body, consists of seven different kinds of light, viz. red, orange, yellow, green, blue, indigo, and violet. There are two processes by which this compound substance may be decomposed, namely, by absorption and by refraction; the last method was that employed by Newton, who discovered the composition of white light in the following manner:—In the window-shutter E F of a darkened room, make a small

Fig. 10.



hole H, through which admit a beam of the sun's light S H, which, when nothing is interposed, will proceed in a straight line to P, and form a luminous white spot. If we now interpose a prism B A C, whose refracting angle is B A C, so that the beam of light may fall on its surface C A, and emerge at the same angle from its second surface B A in the direction g G, and if we receive the refracted beam on the opposite wall, or on a white screen M N, "we should expect," says Sir David Brewster, "from the principles already laid down, that the white beam which previously fell upon P would suffer only a change in its direction, and fall somewhere upon M N, forming there a round white spot exactly similar to that at P. But this is not the case. Instead of a white spot, there will be formed upon the screen M N an oblong image K L of the sun, containing seven colours, viz., red, orange, yellow, green, blue, indigo, and violet, the whole beam of light diverging from its emergence out of the prism at g, and being bounded by the lines g K g L. This lengthened image of the sun is called the solar spectrum, or the prismatic spectrum. If the aperture H is small, and the distance g G considerable, the colours of the spectrum will be very bright. The lowest portion of it at L is a brilliant red. This red shades off by imperceptible gradations into orange, the orange into yellow, the yellow into green, the green into blue, the blue into a pure indigo, and the indigo into a violet. No lines are seen across the spectrum thus produced; and it is extremely difficult for the sharpest eye to point out the boundary of the different colours. Sir Isaac Newton, however, by many trials, found the lengths of the colours to be as follow, in the kind of glass of which his prism was made. We have added the results obtained by Fraunhofer with flint glass:—

	Newton.	Fraunhofer.
Red . . .	45	56
Orange . . .	27	27
Yellow . . .	40	27
Green . . .	60	46
Blue . . .	60	48
Indigo . . .	48	47
Violet . . .	80	109
Total length	360	360

These colours are not equally brilliant. At the lower end L of the spectrum, the red is comparatively faint, but grows brighter as it approaches the orange. The light increases gradually to the middle of the yellow, where it is brightest; and from this it gradually declines to the upper or violet end K of the spectrum, where it is extremely faint.

From the phenomena which we have now described, Sir Isaac Newton concluded that the beam of white light S is compounded of light of seven different colours, and that for each of these different kinds of light, the glass of which his prism was made had different indices of refraction; the index of refraction for the red light being the least, and that of the violet the greatest.

If the prism be made of crown glass, for example, the indices of refraction for the different coloured rays will be as follow:—

	Index of Refraction.		Index of Refraction.
Red	1.5258	Blue	1.5360
Orange	1.5268	Indigo	1.5417
Yellow	1.5296	Violet	1.5466
Green	1.5330		

If we now draw the prism B A C on a great scale, and determine the progress of the refracted rays, supposed to be incident upon the same point of the first surface C A, by using for each ray the index of refraction in the preceding table, we shall find them to diverge as in the preceding figure, and to form the different colours in the order of those in the spectrum."

By means of a second prism placed behind a hole in the screen M N opposite the centre of each coloured space, Sir Isaac Newton refracted the light a second time. In this case it was not drawn out into an oblong image as before, and was not refracted into any other colour than that which formerly belonged to each particular ray. Hence this great philosopher concluded that the light of each particular colour possessed the same index of refraction; and he termed such light homogeneous or simple, white light being regarded as heterogeneous or compound. This doctrine is called the different refrangibility of the rays of light. The different colours as they exist in the spectrum are called primary colours, any combinations or mixtures of them being considered as secondary.

By various experiments, Sir Isaac proved that all the colours, when again combined, formed or recomposed white light. Indeed, the doctrine may be illustrated by mixing together in proper proportions seven colours as like those of the spectrum as can possibly be got. By their union, a greyish white is formed, for powders of the exact tint as those of the spectrum cannot be obtained. It may also be proved in this manner:—Let a circle of paper be divided into sections of the same size, and coloured like the spaces in the spectrum, and placed upon a humming top, which is made to revolve rapidly; the effect of all the colours when combined is to produce a greyish white. But the clearest proof is afforded by the following experiment:—Let a second prism B A a, represented by the dotted lines in fig. 10, be placed upon the first prism, in the manner shown in the cut, then the refraction suffered by the light in passing through A B C will be counteracted by the second prism B A a, and a single beam of white light g P will be formed, and fall in a bright spot at P.

The decomposition of light by absorption has been particularly investigated by the acute genius of Sir D. Brewster. It is a fact well known, that if a beam of white light be transmitted through a coloured prism, the latter absorbs a portion of the former. By looking at the spectrum K L, fig. 10, through the prism B A C, a prism of blue glass being interposed between the eye and the spectrum, Sir David found that the blue glass had absorbed the red light, which, when mixed with the yellow light, constituted orange; and had absorbed also the blue light, which, when mixed with the yellow, constituted the part of the green space next to the yellow. Thus, by absorption, green light was decomposed into yellow and blue, and orange light into yellow and red. Sir David Brewster analysed the spectrum with great care, and the conclusions which he arrived at were, that the solar spectrum consists of three spectra of equal lengths, viz. a red spectrum, a yellow spectrum, and a blue spectrum. The primary red spectrum has its maximum of intensity about the middle of the red space in the solar spectrum, the primary yellow spectrum has its maximum in the middle of the yellow space, and the primary blue spectrum has its maximum between the blue and the indigo space. The two minima of each of the three primary spectra coincide at the two extremities of the solar spectrum. Thus, then, it is concluded, that certain proportions of red, yellow, and blue, form white, and that these exist at every point of the solar spectrum, constituting its three primary colours.

DISPERSION OF LIGHT.

In fig. 10 we have considered the prismatic spectrum K L as produced by a prism of glass having a given refracting angle B C A. The green space G in the middle is called the mean ray of the spectrum; the index of refraction which belongs to it is called the mean refractive power of the prism; and the angle which the green ray forms with the line S P, the mean refraction of the prism. If the angle of the prism B A C be increased, the refraction will also be increased. The mean ray g G will be refracted to a greater distance from P; and the extreme rays will likewise be refracted to a greater distance in the same proportion, the length K L bearing always the same proportion to G P, whatever be the angle of the prism. It is a fact which was singularly overlooked by the great Newton, that prisms made of different substances produced spectra whose lengths are different when the mean refraction is the same. Flint glass, for instance, produces a spectrum which extends beyond K and L, and longer than that produced by the prism B C A, which is supposed to be of crown glass. Hence flint glass is said to have a greater dispersive power than crown glass.

In order to render this property of transparent bodies as intelligible as possible, let us suppose that in the crown glass prism B A C, the index of refraction for the extreme violet ray g K is 1·5466, and that for the extreme red ray g L 1·5258; then the difference of these two indices, or ·0208, would be a measure of the dispersive power of crown glass, if it and all other bodies had the same mean refraction; but as this is far from being the case, the dispersive power must be measured by the relation between ·0208 and the mean refraction, or 1·5330, or to the excess of this above unity, viz. ·5330, to which the mean refraction is always proportional. For the purpose of making this clearer, let it be required to compare the dispersive powers of diamond and crown glass. The index of refraction of diamond for the extreme violet ray is 2·467, and for the extreme red, 2·411, and the difference of these is 0·056, nearly nine times greater than 0·208, the same difference for crown glass; but then the difference between the sines of incidence and refraction, or the excess of the index of refraction above unity, or 1·439, is also about three times greater than the same difference in crown glass, viz. 0·533; and, consequently, the dispersive power of diamond is very little greater than that of crown glass. The two dispersive powers are as follow:—

$$\text{Crown glass} \quad . \quad . \quad . \quad . \quad \frac{\cdot 0208}{\cdot 5330} = 0\cdot0390$$

$$\text{Diamond} \quad . \quad . \quad . \quad . \quad . \quad \frac{\cdot 056}{1\cdot 439} = 0\cdot0388$$

When spectra of different lengths are examined by two bodies having very different dispersive powers, such as oil of cassia and sulphuric acid, there is a remarkable difference between them. It is found that in the former the red, orange, and yellow spaces, are less than in the latter; whilst the blue, indigo, and violet spaces, are greater; the least refrangible rays being as it were contracted in the former and expanded in the latter, whilst the most refrangible rays are expanded in the one and contracted in the other.

ACHROMATIC TELESCOPES.

By the application of the principles above explained, the refracting telescope has been greatly improved. It is evident, by an examination of fig. 10, that refraction cannot be effected without colour being produced—no two lenses of the same glass can be found to form an image perfectly free from colour. But by the different dispersive powers of different bodies, such as crown and flint glass, lenses formed of two such substances can be so adjusted as to produce an achromatic telescope, or one without colour. Let a convex lens, such as D, fig. 7, be formed of crown glass, and a concave one, such as F, be formed of flint glass, and both fitting neatly into each other, the ray falling upon the convex lens would have been refracted in the same manner as in the prism A B C, fig. 10, and separated into various colours. But as they have to pass through the concave lens, they are by it refracted to a certain focal point, where they again blend and form a white light. It is found, however, that the images of all luminous objects, when seen through such a lens, are bordered on one side with a purple fringe, and on the other with a green fringe. The difficulty, however, was surmounted by Dr Blair, who discovered, that, if muriate of antimony were enclosed between two convex lenses of crown glass, light would be refracted in parallel rays to a single focus, without any trace of secondary colour being observable. Other substances have also been employed, and telescopes are now formed so as completely to answer all philosophical purposes.

PHYSICAL PROPERTIES OF THE SPECTRUM.

Heating Power.—It was discovered by Sir William Herschel that the heating power of the spectrum gradually increased from the violet to the red extremity, and even beyond it. Hence he concluded that there are invisible rays in the light of the sun which had the power of producing heat, and which had a less degree of refrangibility than red light. Sir Henry Englefield confirmed his results, and obtained the following measures:—

	Temperature.		Temperature.
Blue .	56°	Red .	72°
Green .	58	Beyond red	79
Yellow .	62		

The place of maximum heat has recently been found to vary with the substance of which the prism is formed. Thus, in water, alcohol, and oil of turpentine, it is in the yellow; in crown glass, in the middle of the red; and in flint glass, beyond the red. In other substances it is intermediate between these two points.

Illuminating Power.—M. Fraunhofer, a celebrated philosopher of Munich, discovered, by means of a photometer, or measurer of the intensity of light, that the most luminous rays of the spectrum are not situated in the middle, but nearer the red than the violet end, in the proportion of 1 to 4 nearly, and that the mean ray is almost in the middle of the blue space. The same philosopher also discovered that the spectrum is covered with dark and coloured lines parallel to one another, and perpendicular to the length of the spectrum. They have always the same position in the coloured spaces in which they are found, their proportional distances varying with the nature of the prism by which they are produced. Their number, however, their order, and their intensity, remain invariable, provided light of the sun or moon be employed. One of the most important practical results of the discovery of these fixed lines, is, that they enable philosophers to take the most accurate measures of the refractive and dispersive powers of bodies; and by measuring the distances of the lines, their discoverer computed a table of the indices of refraction of different substances.

The spectrum exercises a chemical influence on certain bodies. The effect, for instance, produced on muriate of silver, varies with the nature of the coloured space where it is placed, and other substances are similarly affected. The solar rays possess also a magnetising power. If the violet rays be collected in the focus of a convex lens, and this focus carried from the middle of one-half of a small needle to the extremities of that half without touching the other, it will acquire perfect polarity. The indigo, blue, and green rays, produce this effect, but the others do not. Exposure to the sun's rays, under peculiar circumstances, can be also made to produce similar results on certain bodies.

INFLEXION OR DIFFRACTION OF LIGHT; COLOURS OF THIN AND THICK PLATES, FIBRES, GROOVED SURFACES, &c.

It is impossible within our circumscribed limits to enter into a full description of these various optical phenomena; and a few sentences explanatory of them in the simplest manner is all that we can venture upon.

If an aperture 1-40th of an inch diameter be made in the window-shutter of a dark room, or if a convex lens of a short focus be put in this hole, a beam of divergent light will be obtained. Bodies of any kind, if placed in this light, and their shadows accurately examined, will be found on each side of the shadow to have fringes of coloured light, the colours, reckoning from the shadow, being as follow:—First fringe, violet, indigo, pale blue, green, yellow, red; second fringe, blue, yellow, red; third fringe, pale blue, pale yellow, pale red. The shadow itself is divided by parallel fringes, which vary in number and breadth according to the distance from the body at which the shadow is examined. These phenomena depending upon light being in some way or other bent, this branch of optics is called the inflexion or diffraction of light.

When light is either reflected from transparent bodies, or transmitted through portions of them which possess parallel surfaces, it is always white. If, however, bodies of extreme thinness be employed, such as soap bubbles, beautiful colours are exhibited. This must have been observed by every one. In order to investigate a thin plate of air, Sir Isaac Newton took a double convex lens, to one of the sides of which he pressed the plane side of a plano-convex lens. When the rings are observed through the upper lens, so as to see those formed by the light reflected from the plate of air between the lenses, seven rings will be seen, or rather seven circular spectra or orders of colours. In the three first, the colours were very distinct; but towards the seventh they became gradually less and less, until they nearly disappeared altogether. Upon examining the light transmitted through the lenses, that is, by looking through the double convex lens, another system of circular coloured rings different from those seen by reflection were observed.

Sir Isaac first discovered and examined the colours produced by glass mirrors or thick transparent plates. Having admitted a sunbeam one-third of an inch in diameter through a hole in his window-shutter, he threw it in the direction of its axis on a glass mirror a quarter of an inch thick, concave in front, and convex and quicksilvered behind, the radius of the curvature of both its sides being equal to its distance behind the aperture. A sheet of paper having been placed on the window-shutter, with a hole in it to allow the ray to pass through, the hole was observed to be surrounded with several coloured rings. These rings had the same colours as those seen when light is transmitted through thin plates, as above noticed; and their diameters were reciprocally as the square roots of the thickness of the mirror. Sir David Brewster has investigated this subject with his usual skill and success. For an account of his discoveries we must refer the reader to his work on Optics, and his numerous papers in the Edinburgh Journal of Science.

If we look at the light of the sun or a candle through a plate of glass upon which we have breathed, or which is covered with very fine dust, it will be observed to be surrounded with a corona or ring of colours, resembling a halo. Minute fibres, such as those of silk or wool, produce the same effect, the rings in the first instance increasing with the size of the particles, and in the second with the diameter of the fibres which produce them. By employing the seed of the lycopodium, or by placing a drop of blood diluted with water between two pieces of glass, the coloured rings will be finely seen. Round the luminous body there is perceived a light area, terminating in a reddish dark margin; this is succeeded by a ring of bluish green, and then by a red ring, these two last colours succeeding each other several times, when the particles are of a uniform diameter. If surfaces of glass or metal be polished, and then crossed by small parallel grooves very near each other, an interesting class of colours will be exhibited. Mother-of-pearl, it is well known, possesses this singular property, and to the same cause, viz. the presence of minute grooves in its surface, it must be attributed. Sir David Brewster succeeded in transferring this quality of mother-of-pearl to other substances, by simply pressing its surface to theirs, whilst they were softened enough to receive an impression. By examining these surfaces with a microscope, Sir David discovered, in almost every specimen, "a grooved structure, like the delicate texture of the skin at the top of an infant's finger, or like the section of the annual growths of wood, as seen upon a dressed plank of fir. These may sometimes be seen by the naked eye, but they are often so minute that three thousand of them are contained in an inch."

The principle of thus producing colour by grooved surfaces, and of the communicability of these colours by pressure to various substances, has been happily applied to the arts by John Barton, Esq. With the point of a diamond, extremely minute grooves are cut in steel with the most perfect parallelism, and nothing can surpass the brilliant display of colours which are thus produced. Mr Barton conceived the idea of forming buttons for gentlemen's dress, and articles of female ornament covered with grooves, beautifully arranged in patterns, and shining in the light of candles or lamps with all the brilliant tints of the prism. To these the appropriate name of *Iris* ornaments was given. A variety of substances can be made to exhibit the same appearances.

To account for these phenomena, Newton supposed that the particles of light possessed the property at different points of their path, of fits or dispositions to be reflected from or transmitted by transparent bodies. How these fits are to be accounted for, Sir Isaac did not explain; and his theory has been to a great extent superseded by a new one, called the doctrine of interference, which may be thus explained:—Suppose two pencils of light radiate from two points very close to each other, and that they fall upon the same spot of a piece of paper held parallel to the line joining the points, so that the spot is directly opposite the point which bisects the distance between the two radiant points. In this case they may be said to interfere with one another, because they would cross each other at that spot if the paper were removed, and would diverge from one another. The spot will therefore be illuminated with the sum of their lights; and in this case the lengths of the paths of the two pencils of light are exactly the same. Now, it has been found that when there is a certain minute difference between the lengths of the paths of the two pencils of light, the spot upon the paper where the two lights interfere is still a bright spot. If we call this difference in the length of their path d, bright spots will be formed by the interference of the two pencils when the difference in the lengths of the paths is d, $2d$, $3d$, $4d$, &c. But it is a remarkable fact, and one which has been clearly demonstrated, that if the two pencils interfere at intermediate points, or when the difference in the lengths of the paths of the two pencils is $\frac{1}{2}d$, $1\frac{1}{2}d$, $2\frac{1}{2}d$, $3\frac{1}{2}d$, &c., instead of increasing each other's intensity of illuminating power, they actually neutralise it, and a dark spot is produced. This curious property is analogous to that of the beating of musical sounds, which depending upon vibrations of the air, it is conjectured that the phenomena above explained may go to support the undulatory theory which has made so great a progress in modern times. But as nothing clearly demonstrative of it has been yet advanced, it is not here that speculations as to its probability can be indulged in.

DOUBLE REFRACTION OF LIGHT.

In the foregoing part of this paper we have considered a single ray of light reflected or transmitted through the substance of a transparent body, as leaving it in the same way in which it came into contact with it, namely, in a single pencil or ray. But there are a great many bodies which have the power of breaking the pencil of light incident upon their surfaces into two separate parts or pencils more or less inclined to one another, according to the nature and state of the body, and according to the direction of the incident pencil. This is called double refraction, and the bodies which produce it are called doubly refracting bodies or crystals. They are very numerous, and include all salts and crystallised minerals not having the primitive forms of the cube, the regular octohedron, and the rhomboidal dodecahedron. The following is principally an abridgement of an article upon this subject in the British Cyclopædia:—

Of all known bodies, the Iceland spar, or rhomboidal carbonate of lime, shows the fact with the greatest certainty; and as it is a mineral easily procured, it has been generally used in experiments upon this subject. Its crystals are of a rhomboidal form, having six acute solid angles, and two obtuse. These last, x and x, fig.

Fig. 11.

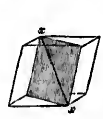
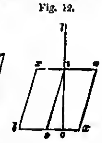
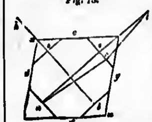


Fig. 12.



11, are formed by the junction of three equal plane angles, and equally inclined to each other. The line $x\,x$ joining these two angles, is therefore similarly situated with respect to the three planes forming each angle, and is called the axis of the crystal. A plane, perpendicular to the natural surface of the crystal, and coinciding with this line, is called its principal section, which term is also applied to any plane parallel to it. Let a small hole be pierced through any opaque plate, be applied to the lower surface of the crystal, and directed to a sheet of white paper. Let $x\,a$, $x\,b$, fig. 12, be the principal section of the crystal, and i a pencil falling on its surface. In this case it will be found that two images are formed. One part of the light will proceed in the ordinary direction (let us suppose perpendicularly), and is therefore called the ordinary ray, while the other portion of the light deviates considerably from this direction, and is called the extraordinary ray: $i\,o$ will represent the ordinary, and $i\,e$ the extraordinary ray.

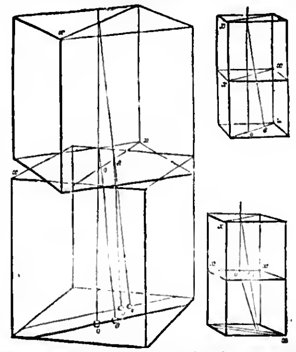
Fig. 13.



Let the crystal be cut by two planes $c\,g$ and $d\,f$ in the accompanying diagram, parallel to the axis, and two other planes, $e\,d$ and $f\,g$, perpendicular to the axis, to allow an object to be seen through it in the direction $c\,d$ or $o\,g$; it will be found that the two images will be farther separated, viewed in the direction $c\,d$, which is perpendicular to the axis, while in the direction of the axis there will be only one image. The inference from these experiments is, that there exists some peculiar force acting on the light passing through the crystal, producing a separation of the rays, and that this force emanates from the axis itself. As this produces a deviation of the second image towards or from the axis of the crystal, it is considered positive or negative, or, by Biot, attractive or repulsive.

The two rays into which a pencil of light is divided in passing through a crystal of Iceland spar, are always of the same intensity, and always in the plane of the principal section. But the two emerging rays are not merely diminished in intensity by the division of the light between them, but have undergone a most important modification; for if the rays be made to pass through another crystal, placed similarly to the first, there will be no subdivision of the light; the two images will be merely separated to a greater distance from the increased thickness through which the light passes. If now the two crystals are so placed that the principal sections are at right angles to each other, there will still be only two images; but the ray ordinarily refracted in the first will become extraordinary in the second, and the extraordinary ordinary. At all intermediate positions of the two crystals, however, there will be a subdivision of each ray, consequently four images: these four images will be of equal intensity when the principal sections of the two crystals are at an angle of 45° to each other; at all other angles one or other of the images diminish in intensity as the principal sections approach to a perpendicular or parallelism; not by the coalescence of the two images, but by the gradual diminution of the intensity of one and the augmentation of that of the other. In the subjoined diagrams, we have supposed the rhomboids reduced to the form of cubes in all three; the axis is denoted by $x\,x$, and the direction of the rays by the lines passing through the figure, and the letters e and o the extraordinary and ordinary rays. It is thus

Fig. 14.



seen that each emerging ray is only subject to a further division in particular positions of the second crystal, whereas natural light is always divided into two portions of equal intensity. Each ray has suffered a physical change; it is not acted on by the force of the second crystal, as natural light would be, but requires that the force be applied in a particular direction relatively to the modification it has received from the first crystal. The effect here produced has been termed

THE POLARISATION OF LIGHT.

Polarisation is also produced when light is reflected from the surfaces of bodies. Malus, a celebrated French philosopher, made the curious discovery, that a beam of light reflected from glass at an angle of 56°, or from water at an angle of 52° 45', possessed the very same properties as one of the rays formed by a rhomb of calcareous spar through which he had been looking at the light of the setting sun, as reflected from the windows of the Luxembourg palace in Paris. By a series of experiments, the important fact was established, that light reflected from all other transparent or opaque bodies, excepting metals, became polarised, the plane of polarisation being coincident with, or parallel to, the plane of reflection. This is more or less completely the case according to the angle formed with the surface. This angle varies for different substances; and Sir David Brewster discovered a law connecting the angle with the index of refraction of the given body, viz. "that the tangent of the angle of polarisation, measured from the perpendicular, is equal to the index of refraction," when complete polarisation, or the greatest the body is capable of, is produced.

To make the nature of polarisation as plain as possible, and to show the difference between common and polarised light, let us suppose a ray of light falls upon an unsilvered mirror plate, making an angle with it of 35° 25', then the ray will be reflected in a right line, so that the angle of reflection will be equal to the angle of incidence, according to the law laid down at the commencement of this paper. If we now receive this reflected ray on another similar plane of glass, it will in general suffer a second general reflection. But this reflection will entirely vanish, or, instead of being reflected, will be transmitted through the mirror, if the plane of incidence on the second mirror is perpendicular to the plane of incidence on the first mirror—that is, if it form an angle of 35° 25' with the ray reflected from the first plane of glass. Now, common or natural light—that is, light which had not been interfered with or experimented upon at all—would have been equally reflected in every position. It is to be observed, that a total transmission or obscuration will not take place if the angle of reflection of either mirror be greater or less than the angle of polarisation. It has been ascertained that the direction of polarity in the reflected light is to the plane of reflection similar to the polarity of the ordinary ray in Iceland spar to its principal section, or an identity of the modification produced in the reflected ray, and the modification produced by the action of the crystal on the ray ordinarily reflected; for if the ray reflected from water or glass at the polarising angle be received on a crystal of Iceland spar, the principal section of which coincides with the plane of reflection, the ray entering the crystal will proceed through it in the same direction that the ordinary ray emerging from another crystal would have proceeded. But if the principal section of the crystal be placed perpendicular to the plane of reflection, the ray will be reflected extraordinarily; but in both positions there will be no bifurcation of the ray. If the principal section of the crystal be any otherwise situated as to the plane of reflection, there will be two rays, but of equal intensity, when the angle contained between these two planes is 45°. If, again, the ordinary ray emerging from a crystal be made to fall at the proper angle on the surface of water, or any other reflecting surface capable of polarising light completely, it will be reflected when the principal section and plane of reflection coincide, but entirely transmitted when the planes are perpendicular to each other. But if the extraordinary ray fall on the surface, the reflection will take place when the planes are at right angles, and a total transmission will result when the planes coincide.

We are therefore justified in assuming that the physical change the light has suffered is the same in the two cases; that whether an ordinary ray be examined by subsequent reflection, or the reflected ray by a doubly refracting crystal, the inference is, that the polarity of each is in the same direction: the one in the plane of the principal section, and the other in the plane of reflection.

Light is not only reflected from the first surface of transparent bodies, but another portion is reflected

Fig. 15.

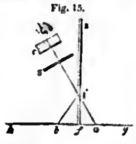
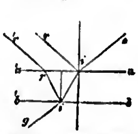


Fig. 16



from the second surface. We will suppose these two surfaces parallel, and it will not be difficult to see that if the light be completely polarised by reflection from the first surface *a'*, fig. 16, the portion reflected from the second surface *b'* will also be completely polarised, and in the same plane.

Let *e i* be the incident ray, and *i r* the reflected polar ray, *i i* the refracted ray, partially reflected and refracted to *r'* and *i g*, the remaining refracted light will be perpendicular to *i r'*, the reflected ray, a condition producing complete polarisation.

From various experiments it has been proved that the quantity of light reflected even from the two surfaces of a transparent body is small in proportion to the incident light, and it is now convenient to inquire into the condition of the refracted portion under circumstances in which polarisation of the reflected light is produced. If the ray *i g* be examined by a rhomboid, it will be found divided into two rays, but not of equal intensity; for the ordinary or extraordinary ray will be found the most intense, as the section of the crystal is parallel or perpendicular to the plane of refraction. This condition of light is called partial polarisation, and is the same as the state of reflected light when the incidence is not such as to produce complete polarisation.

M. Arago gives the following experiments: let us suppose a plate of glass, *e f*, fig. 15, in the diagram, placed perpendicularly on a sheet of fine white paper *h g*, the eye will see at the same time the reflected ray and the refracted ray; interpose an opaque plate perforated with a small hole *s*; let the eye be furnished with a doubly refracting crystal *e*. If by a black screen, placed between *b* and *i*, we stop the ray *b i*, which would have been transmitted by the glass plate, the hole in the plate *s* is illumined by the reflected light alone; and if the principal section of the crystal coincide with the plane of reflection, we see two images of the pole, of which the ordinary is the most brilliant. If the screen be now so placed as to intercept the reflected ray, there will be still two images, but now the extraordinary ray will be the most brilliant.

Now, if the screen be entirely removed, allowing both reflected and refracted light to reach the crystal, the intensity of the two images is found by actual experiment to be exactly equal. It is hence to be inferred that the plane which contains the poles of light polarised by transmission is perpendicular to the plane which contains poles of light polarised by reflection, and that the quantity of polarised light contained in the ray transmitted by a transparent plate is exactly equal to the quantity of polarised light contained in the ray reflected from its surface, whatever the angle of incidence may be. M. Arago observes, that a body which, at its angle of complete polarisation, would reflect half the incident light from its surface, would also completely polarise the transmitted ray, and that when there is no transmission of light, there is no polarisation; and which seems proved experimentally, as no trace of partial polarisation is discoverable in the light reflected from the interior of a glass prism, when the reflection is total.

As transparent substances reflect but a small portion of the incident rays, the quantity of polarised light in the transmitted ray is small in proportion to the light which has not undergone that modification. Sir D. Brewster considers the transmitted ray as consisting of one portion completely polarised in a plane at right angles to the plane of incidence, and another portion of light "which has suffered a physical change more or less approaching to complete polarisation." Light, having passed through a pile of plates, is at last polarised in a plane perpendicular to the plane of polarisation of the reflected light. This effect requires the agency of twenty-four plates at an incidence of 61°; "consequently," says this learned philosopher, "twelve plates will not polarise the whole pencil at that angle. Let us now suppose that the quantity not polarised amounts to twenty out of 100; then if these twenty were absolutely unpolarised, and in the same state as direct light, they would require to pass through twenty-four plates in order to be completely polarised. But experiments prove that they require to pass through only twelve other plates to be completely polarised; it therefore follows that the twenty rays have been half polarised by the first twelve plates, and the polarisation completed by the other twelve."

This reasoning appears good; but as Malus, Biot, and Arago, have adopted a somewhat different theory in their illustration of the subject, and as their view of the question admits of a ready explanation, we shall adopt it.

Let *a b c d* be supposed to represent the successive plates through which the incident ray 1000 is to pass, and at a given angle fifty out of the 100 be completely polarised by reflection, and a similar quantity of rays by refraction; the light emerging from the first lamina will consist of 900 in the state of direct light, and fifty of light polarised in a plane perpendicular to the plane of incidence. We have already seen that light polarised in one plane will not be reflected in a plane perpendicular to its plane of polarisation, and consequently the portion fifty of transmitted light will escape reflection from the lamina *b*, and therefore the light reflected from *b*, which we have supposed one-twentieth of the incident light, must be taken from the 900 of direct light. In this manner we may suppose the quantity of direct light constantly diminished, and the polarised light increased, by each succeeding transmission. According to this view, *complete* polarisation could never be produced, but the quantity of direct light, after a few transmissions, would be absolutely imperceptible.

It cannot be necessary to explain the result of submitting the ray emerging from a succession of plates to another pile of plates, to a doubly-refractive crystal, or to a reflection from a polarising surface. It is in all respects similar in its polarisation relatively to the plane of incidence on the first surface, to the extraordinary ray transmitted by a crystal relatively to its principal section. We will, however, mention one consequence of the foregoing laws; that polarised light falling on the first surface of a pile of plates will be *partially* reflected when the plane of incidence coincides with the plane of polarisation; and, a further portion being also reflected at each successive plate, an eye placed at the back of the plates will receive no sensible quantity of light. If, on the contrary, the plane of polarisation be perpendicular to the plane of incidence, the whole light will be transmitted. It therefore follows that an apparatus may be constructed of the most transparent plates of glass, in two piles or bundles, forming a system perfectly transparent in one position of the piles, yet perfectly opaque in another. This effect is to be produced only by a great number of plates of glass, if the incidence be near the perpendicular, yet some substances possess this property of polarising transmitted light, whatever the incidence. A thin plate of tourmaline, cut parallel to the axis of the crystal, completely polarises the light at any incidence in a plane perpendicular to the axis, and a second plate will transmit or stop all the rays, as the axis of the two plates are parallel or perpendicular to each other.

Sir D. Brewster found that a plate of agate, having surfaces perpendicular to its lamina, about one-fifteenth of an inch in thickness, completely polarised the transmitted light.

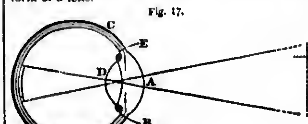
Among the most interesting phenomena connected with this branch of optics, are the colours produced by the action of crystallised bodies on polarised light. When thin plates of glass, selenite, mica, agate, quartz, crystal, tourmaline, and other substances, are exposed to a beam of polarised light, colours the most brilliant that can be conceived are exhibited. An attentive examination of them has led to a theory both of polarisation and double refraction, indeed one explanatory of optical phenomena in general. The experiments of Dr Young, by which two lights were made to produce darkness, and the law of interference, have been already mentioned. This was an important fact, and all that seemed awanting was a hypothesis of some mode in which light might be conceived to be propagated through an elastic medium, supposed to convey it in such a way as not to be contradictory to any of the facts, nor to the general laws of dynamics. Dr Young also supplied this. He conceived the idea, that the mode of propagation of a luminous impulse through the ether to be different from that of a sonorous one through the air. In the latter, the particles of the air advance and recede; in the former, those of the ether must be supposed to tremble laterally.

Fresnel, a French philosopher, made this the groundwork of his reasoning, and erected upon it a theory of polarisation and double refraction, "so happy in its adaptation to facts," says Sir John Herschel, "and in the coincidence with experience of results deduced from it by the most intricate analysis, that it is difficult to conceive it unfounded." It is impossible in this place to enter into details respecting the beautiful but artificial superstructure which the French philosopher has reared. His speculations are in support of the undulatory or Huygenian theory of light, one which certainly can be made to explain the phenomena to which the hypothesis of Newton cannot apply.

ON THE EYE AND VISION.

In applying optics to the explanation of natural phenomena, the structure of the eye, and the manner in which it performs vision, require particular notice. This masterpiece of divine mechanism is of a spherical form, with a slight projection in front. The eyeball consists of membranous coats, which have received the names of the sclerotic coat, the choroid coat, the cornea, and the retina; and these coats enclose three humours—the aqueous humour, the vitreous humour, and the crystalline humour; the last of which has the form of a lens.

Fig. 17.



The above figure represents an eye, supposed to be cut through the middle, from above downwards. C is the outer or sclerotic coat, known popularly, where most exposed in front, as the white of the eye. It is a strong and tough membrane, and to it are attached all the muscles which give motion to the eye. A is the clear and transparent coat called the cornea, joined to the edge of the round opening of the sclerotic: it is more bulging than the sclerotic, to which it is firmly united, and acts as a powerful lens for refracting the pencils of entering light. At B, and similarly all round the edge of the cornea, is attached the window-curtain or iris, shown here edgeways, immersed in the aqueous humour, and hanging inwards from above and below towards its central opening or pupil, through which the rays of light are passing to the lens. The iris has in its structure two sets of fibres, the circular and the radiating, which cross and act in opposition to each other. When the circular fibres contract, the pupil is lessened; when the radiating ones contract, it is enlarged; and the changes happen according to the intensity of light and the state of sensibility of the retina. The two parts into which the iris divides the eye are called the anterior and posterior chambers, the former containing the aqueous, and the latter the crystalline and vitreous humours, the last of which fills a considerable portion of the eye-ball. Behind the pupil is the crystalline lens D, a more solid substance than either the aqueous or the vitreous humours. It is suspended in a transparent bag or capsule by the ciliary process E, which is attached to every part of the margin or circumference of the capsule. This lens, as will be observed, is more convex behind than before, and it increases in density from its circumference to its centre, possessing likewise the doubly refracting structure. The three lines forming here the boundary of the eye, stand for its three coats—the strong sclerotic, and the double lining of the choroid and retina. The choroid is a delicate membrane which lines the inner surface of the sclerotic, and is covered on its inner surface with a black pigment. Immediately within the pigment, and close to it, lies the retina, which is the innermost coat of all. It is a delicate reticulated membrane, formed by the expansion of the optic nerve.

It is a well-ascertained fact that images painted upon the retina of the eye are inverted the same as they are in a camera obscura. Why, this being the case, the object should be seen, not inverted, but erect, is a question too abstruse to be here investigated. Philosophers are also involved in much perplexity as to which portion of the eye the seat of vision belongs, and likewise how impressions made by the rays of light are communicated to the brain. What is called the law of visible direction, is supposed to explain the phenomenon of erect position, for an explanation of which see Brewster's Optics, p. 292.

That although an image of any object looked at is formed upon each retina, and yet we should be sensible of perceiving only one object, is thus explained: In both eyes there are corresponding points equidistant, and in similar directions from the centres of the retinæ, called the points of distinct vision. At these centres the imaginary lines, called the axes of the eyes, terminate. When the two eyes are directed to any object at a greater distance than four or six inches, their axes meet at it, and the centres of the two retinæ are opposite to it. All the other points of the eyes have perfect mutual correspondence as regards that object, giving the sensation of single vision. If, however, the axes of the eye do not meet at the same point, the object will be seen double. This inability of one eye to follow the motions of the other is often the cause of squinting; but for the most part the orbs of vision are so wonderfully associated, that from earliest infancy they constantly move in perfect harmony.

The other phenomena and peculiarities of vision belonging to individuals we must sum up in a few words. The passage of a ray of light through the pupil, and various other portions of the eye, until it reaches the retina, including its refraction, will be distinctly understood from the foregoing description, in connection with the optical laws, as explained in an early part of this paper. Short-sightedness and long-sightedness arise from a change in the state of the crystalline lens, by which its density and refractive power, as well as its form, are altered. When by this change the rays are refracted too much, and come to a focus before they reach the retina, and then diverge from this focus, they produce on the retina a very indistinct image. This is the defect of short-sighted people. Now, by the use of a concave lens or eye-glass, the object is brought nearer the eye; and as the nearer it is to the eye, the more divergent the rays fall upon the crystalline humour, they are consequently not so soon conveyed to the focus; the perfect images in the eye are formed farther from the lens, and thereby on the retina itself. It is by using such an instrument that short-sighted people remedy their defect of sight. Those who have an opposite defect of vision—that is, those in whom the rays are not refracted sufficiently, and reach the retina before they are conveyed to a focus—employ just a remedy of an opposite description. As the nearer an object is brought to a lens, the farther the image formed recedes from it, so long-sighted people remove the object to a distance, and thus bring its image to a proper focus upon the retina. As the effect of a concave lens is to increase the divergence of the rays, the effect of a convex lens is to increase their convergency, which is what long-sighted people require. The defect of the eye, therefore, is remedied by employing a glass of this description. It makes up for the flatness in the crystalline, and enables the eye to converge the pencils flowing from near objects to distant foci on the retina.

UNUSUAL REFRACTION.

The elevation of coasts, ships, and mountains, above their usual level, when seen in the distant horizon, has been long known, and described under the name of *looming*. The name *mirage* has been applied by the French to the same class of phenomena; and the appellation *fata morgana* has been given by the Italians to the singular appearances of the same kind, which have been repeatedly seen in the Straits of Messina. When the rising sun throws his rays at an angle of 45° on the sea of Reggio, and neither wind nor rain ruffle the smooth surface of the water in the bay, the spectator on an eminence in the city, who places his back to the sun and his face to the sea, observes, as it were upon its surface, numberless series of pilasters, arches, and castles distinctly delineated; regular columns, lofty towers, superb palaces, with balconies and windows; extended vallies of trees, delightful plains with herds and flocks; armies of men on foot and horseback, and many other strange figures, in their natural colours and proper actions, passing one another in rapid succession. When vapours and dense exhalations, rising to the height of about twenty feet, accompany the state of the atmosphere above described, then the same objects are seen depicted as it were in the vapour, and suspended in the air, though with less distinctness than before. If the air be slightly hazy, and at the same time dewy, and fitted to form the rainbow, the above-mentioned objects appear only at the surface of the sea, but they are all brilliantly fringed with the prismatic colours. This description of the fata morgana, given by Antonio Minasi so recently as 1793, is no doubt overcharged, but there can be no hesitation in believing that the objects and movements which existed on the opposite coast were occasionally displayed in all the grandeur of aërial representation.

The phenomena of the mirage are most frequently seen in the case of ships when they are just beginning to appear above the visible horizon. The following is one of the most interesting cases of this description. In a voyage performed by Captain Scoresby in 1822, he was able to recognise his father's ship, when below the horizon, from the inverted image of it which appeared in the air. "It was," says he, "so well defined, that I could distinguish by a telescope every sail, the general rig of the ship, and its particular character; insomuch that I confidently pronounced it to be my father's ship the Fame, which it afterwards proved to be; though, on comparing notes with my father, I found that our relative position at the time gave our distance from one another very nearly thirty miles, being about seventeen miles beyond the horizon, and some leagues beyond the limit of direct vision. I was so struck by the peculiarity of the circumstance, that I mentioned it to the officer of the watch, stating my full conviction that the Fame was then cruising in the neighbouring inlet."

One of the most curious phenomena of this kind was seen by Dr Vince, on the 6th of August 1806, at 7 P.M. To an observer at Ramsgate, the tops of the four turrets of Dover Castle are usually seen over a hill between Ramsgate and Dover. Dr Vince, however, when at Ramsgate, saw the whole of Dover Castle, as if it had been brought over and placed on the Ramsgate side of the hill. The image of the castle was so strong and well defined, that the hill itself did not appear through the image.

In the sandy plains of Egypt, the mirage is seen to great advantage. These plains are often interrupted by small eminences, upon which the inhabitants have built their villages in order to escape the inundations of the Nile. In the morning and evening, objects are seen in their natural form and position; but when the surface of the sandy ground is heated by the sun, the land seems terminated at a particular distance by a general inundation: the villages which are beyond it appear like so many islands in a great lake, and between each village an inverted image of it is seen.

That the phenomena of the mirage are produced by variations in the refractive power of the atmosphere, can be proved by experiment. If the variation of the refractive power of the air takes place in a horizontal line perpendicular to the line of vision—that is, from right to left—then we have the lateral mirage; that is, an image of a ship may be seen on the right or left hand of the real ship, or on both, if the variation of refractive power is the same on each side of the line of vision. If there should happen at the same time both a vertical and a lateral variation of refractive power in the air, and if the variation should be such as to expand or elongate the object in both directions, then the object would be magnified as if observed through a telescope, and might be seen and recognised at a distance at which it would not otherwise have been visible. If the refractive power, on the contrary, varied so as to contract the object in both directions, the image of it would be diminished as if seen through a concave lens.

In order to represent artificially the effects of the mirage, Dr Wollaston views an object through a stratum of spirit of wine lying above water, or a stratum of water lying above one of syrup. These substances, by their gradual incorporation, produce a refractive power diminishing from the spirit of wine to the water, or from the syrup to the water; so that, by looking through the mixed or intermediate stratum at a word or object held behind the bottle which contains the fluids, an inverted image will be seen. The same effect, Dr Wollaston has shown, may be produced by looking along the side of a red-hot poker at a word or object ten or twelve feet distant. At a distance less than three-eighths of an inch from the line of the poker, an inverted image was seen, and within and without that an erect image.

The method employed by Sir David Brewster to illustrate these phenomena consists in holding a heated iron above a mass of water bounded by parallel plates of glass; as the heat descends slowly through the fluid, we have a regular variation of density, which gradually diminishes from the bottom to the surface. If we now withdraw the heated iron, and put a cold body in its place, or even allow the air to act alone, the superficial stratum of water will give out its heat, so as to produce a decrease of density from the surface to a certain depth below it. Through the medium thus constituted, the phenomena of the mirage may be seen in the finest manner.

THE RAINBOW.

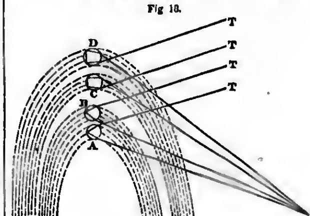
Every one knows that the rainbow is that brilliant and many-coloured arch which is occasionally seen spanning the sky opposite to the sun. In France and elsewhere, it is called the arc of the sky; and whilst to poets and other admirers of nature it is an object almost worshipped for its beauty, to the philosopher it is no less interesting and attractive. Rainbows are only visible when rain is falling between the spectator and that part of the sky which is opposite to the sun, which is in its centre, as if at the end of a straight line drawn from the sun through the eye of the spectator towards the opposite horizon; and being always under the horizon, the bow is less than a semicircle. It consists of two bows or arches, the one inner or primary, the other outer or secondary; and within the primary rainbow, and in contact with it, and without the secondary one, there have been seen supernumerary bows.

The primary or inner rainbow, which is commonly seen alone, is part of a circle whose radius is 41°. It consists of seven differently coloured bows, viz. violet, which is the innermost, indigo, blue, green, yellow, orange, and red, which is the outermost. These colours have the same proportional breadth as the spaces in the prismatic spectrum. This bow is therefore only an infinite number of prismatic spectra, arranged in the circumference of a circle; and it would be easy, by a circular arrangement of prisms, or by covering up all the central part of a large lens, to produce a small arch of exactly the same colours. All that we require, therefore, to form a rainbow, is a great number of transparent bodies capable of forming a great number of prismatic spectra from the light of the sun.

Sir David Brewster thus explains the cause of the arc of the sky:—As the rainbow is never seen, unless when rain is actually falling between the spectator and the sky opposite to the sun, we are led to believe that the transparent bodies required are drops of rain which we know to be small spheres. If we look into a globe of glass or water held above the head, and opposite to the sun, we shall actually see a prismatic spectrum reflected from the farther side of the globe. In this spectrum, the violet rays will be innermost, and the spectrum vertical. If we hold the globe horizontal, on a level with the eye, so as to see the sun's light reflected in a horizontal plane, we shall see a horizontal spectrum with the violet rays innermost. In like manner, if we hold a globe in a position intermediate between these two, so as to see the sun's light reflected in a plane inclined 45° to the horizon, we shall perceive a spectrum inclined 45° to the horizon, with the violet innermost. Now, since in a shower of rain there are drops in all positions relative to the eye, the eye will receive spectra inclined at all angles to the horizon, so that, when combined, they will form the large circular spectrum which constitute the rainbow.

To explain this more clearly, let A B, fig. 18, be drops of rain exposed to the sun's rays, incident upon

Fig 18.



them in the direction T A, T B, out of the whole beam of light which falls upon the drop; those rays which pass through or near the axis of the drop will be refracted to a focus behind it; but those which fall in the upper side of the drop will be refracted, the red rays least, and the violet most, and will fall upon the back of the drop with such sufficient obliquity, that many of them will be reflected, as shown in the figure. These rays will be again refracted, and will meet the eye at O, which will perceive a spectrum or prismatic image of the sun, with the red space uppermost, and the violet undermost. If the sun, the eye, and the drops A B, are all in the same vertical plane, the spectrum produced by A B will form the colours at the very summit of the bow, as in the figure. Let us now suppose a drop to be near the horizon, so that the eye, the drop, and the sun, are in a plane inclined to the horizon, a ray of the sun's light will be reflected in the same manner as at A B, with this difference only, that the plane of reflection will be inclined to the horizon, and will form part of the bow distant from the summit. Hence it is manifest that the drops of rain above the line joining the eye, and the upper part of the rainbow, and in the plane passing through the eye and the sun, will form the upper part of the bow; and the drops to the right and left hand of the observer, and without the line joining the eye and the lowest part of the bow, will form the lowest part of the bow on each hand. Not a single drop, therefore, between the eye and the space within the bow, is concerned in its production; so that, if a shower were to fall regularly from a cloud, the rainbow would appear before a single drop of rain had reached the ground.

If we compute the inclination of the red ray and the violet ray to the incident rays T A, T B, we shall find it to be 42° 2′ for the red, and 40° 17′ for the violet, so that the breadth of the rainbow will be the difference of those numbers, or 1° to 45′, or nearly three times and a half the sun's diameter. These results coincide so accurately with observation, as to leave no doubt that the primary rainbow is produced by two refractions and one intermediate reflection of the rays that fall on the upper sides of the drops of rain.

It is obvious that the red and violet rays will suffer a second reflection at the points where they are represented as quitting the drop, but these reflected rays will go up into the sky, and cannot possibly reach the eye at O. But though this is the case with rays that enter the upper side of the drop, as at A B, or the side farthest from the eye, yet those which enter it on the under side, or the side nearest the eye, may after two reflections reach the eye, as shown in the drops D C, where the rays T T enter the drops below. The red and violet rays will be refracted in different directions, and, after being twice reflected, will be finally refracted to the eye at O; the violet forming the upper part, and the red the under part of the spectrum. If we now compute the inclination of these rays to the incident rays T T, we shall find them to be 50° 58′ for the red ray, and 54° 10′ for the violet ray; the difference of which, or 3° 10′, will be the breadth of the bow, and the distance between the bows will be 8° 15′. Hence it is clear that a secondary bow will be formed without the primary bow, and with its colours reversed in consequence of their being produced by two reflections and two refractions. The breadth of the secondary bow is nearly twice as great as that of the primary one, and its colours must be much fainter, because it consists of light that has suffered two reflections in place of one.

Many peculiar kinds of rainbows have been observed, such as lunar ones, in which, however, the colours are faint and barely perceptible. Supernumerary rainbows are sometimes seen. "On the 5th of July 1828," says Sir D. Brewster, "I observed three supernumerary bows within the primary bow, each consisting of green and red arches, and in contact with the violet arch of the primary bow. On the outside of the outer or secondary bow I saw distinctly a red arch, and beyond it a very faint green one, constituting a supernumerary bow, analogous to those within the primary rainbow."

Red rainbows, distorted rainbows, and inverted rainbows on the grass, have been observed. The latter are formed by the drops of rain suspended on the spiders' webs in the fields. It is only necessary to mention that the iris, so frequently seen overarching the cataract, is produced by the refraction of light in passing through the misty vapour generated by the fall of the column of water.

OF HALOS, PARHELIA, &c.

The sun and moon frequently present very remarkable appearances according to the state of the atmosphere. When the latter is charged with dry exhalations the sun is occasionally as red as blood. When viewed through watery vapours, he is "shorn of his beams," but preserves a colourless disc. When light fleecy clouds pass over the sun and moon, they are often encircled with one, two, three, or even more coloured rings, like those of thin plates; and in cold weather, when particles of ice are floating in the higher regions, the two luminaries are frequently surrounded with the most complicated phenomena, consisting of concentric circles, circles passing through their discs, segments of circles, and mock suns, formed at the points where these circles intersect each other.

The term halo is indiscriminately applied to such appearances as are seen round either the sun or the moon. They are called parhelia (from two Greek words signifying "near the sun") when they are seen encompassing that luminary, and paraselenæ when seen round the moon. The large white halo, called in Scotland a *brough*, generally appears round the moon in cold weather, when the sky is of an uniform misty tint; and the prismatic halos, generally called coronæ, which are seen round the sun and moon, are commonly seen in fine weather; when white, thin, fleecy clouds float in the atmosphere. Owing to the dazzling effect of the sun's rays, the halos which surround his disk may be seen to most advantage when he is visible in a pool of water.

One of the most curious and best described combinations of halos and parhelia was observed by Hevelius at Dantzic, on Sunday the 20th February 1661, new style. We shall give an account of it as nearly as possible in the language of the observer:—

"A little before eleven o'clock, the sun being towards the south, and the sky very clear, there appeared seven suns together, in several circles, some white and some coloured, and these with very long tails waving and pointing from the true sun, together with certain white arches crossing one another. 1st, The true sun, being about 25° high, was surrounded almost entirely by a circle whose diameter was 45°, and which was coloured like the rainbow, with purple, red, and yellow, its under limb being scarcely 2½° above the horizon. 2d, On each side of the sun, towards the east and west, there appeared two mock suns, coloured, especially towards the sun, with very long and splendid tails of a whitish colour terminating in a point. 3d, A far greater circle, almost 95° in diameter, encompassed the sun and the other small circle, and extended itself down to the horizon. It was very strongly coloured in its upper part, but was somewhat duller and fainter on each side. 4th, At the tops of these two circles were two inverted arches whose common centre lay in the zenith, and these were very bright and beautifully coloured. The diameter of the lower arch was 96°, and that of the upper one was 45°. Thus the small circle had the largest arch inverted upon it. In the middle of the lower arch, where it coincided with the small circle, there appeared another mock sun, but its light and colours were dull and faintish. 5th, There appeared a circle much bigger than the former, of an uniform whitish colour, parallel to the horizon, at the distance of 25°, and 136° in diameter, which arose as it were from the collateral mock suns, and passed through three other perhelia of an uniform whitish colour like silver, one almost 96° from the true sun towards the east, another towards the west, and a third in the north, diametrically opposite to the true sun, all of the same colour and brightness. There passed also two other white arches of the greatest circle of the sphere, through the eastern and western mock suns, and also through the pole of the ecliptic. They went down to the horizon, crossing the great white circle obliquely, so as to make a white cross at each parhelion; so that seven suns appeared very plain at the same time: and if I could have seen the phenomenon sooner from an eminence, I do not question but I should have found two more, one directly below the sun, and another at the bottom of the small inverted arch, which would have made nine in all; for there remained in these places such marks as made the suspicion not improbable.

This most delightful and extraordinary sight lasted from 30 minutes past 10 to 51 minutes past 11, though it had not the same appearance all that while, but sometimes one and sometimes another. It appeared in the perfection of this description at about 11 o'clock, and then degenerated by degrees. The northern mock sun vanished first of all, together with a part of its circle; the other parhelia, with their arches, lasted till 10 minutes past 11; then the eastern mock sun, and after that the western, vanished with both the crosses. Soon after this, the collateral parhelia suffered several changes; sometimes one was brighter than the other, in light and colours, and sometimes fainter and darker; for at 18 minutes past 10, the eastern parhelion vanished, while the western parhelion remained very conspicuous; and at 24 minutes past 11, the eastern one was very bright again, and remained so, while the western one disappeared at 40 minutes past 11, although this western one had always the longer tail; for the tip of it was frequently extended for 30°, and sometimes 90°, but the tail of the eastern one was scarcely above 20°. At 30 minutes past 11 the great vertical circle which enclosed the small one next to the sun was destroyed, but the inverted arches, together with the collateral parhelia, continued to the last."

A halo of a different kind, and exhibiting all the prismatic colours, was discovered by Mr Huygens in 1652. "I observed," says he, "a circle about the sun as its centre; its diameter was about 46°, and its breadth the same as that of a common rainbow. It had also the same colours, though very weak, and scarcely discernible, but in a contrary order: the red being next the sun, and the blue being very dilute and whitish. All the space within the circle was possessed by a vapour duller than the rest of the air; of such a texture as to obscure the sky with a sort of continued cloud, but so thin that the colour of the blue sky appeared through it. The wind blew gently from the north."

Philosophers have agreed to ascribe those halos of 47° and 94°, such as so frequently occur in cold weather, and especially in northern regions, to the refraction of light produced by small particles of ice floating in the atmosphere. In freezing, water assumes a great variety of forms; and hence crystals of every conceivable shape are continually floating in the air, and giving rise to the numerous kinds of halos.

Halos may be artificially produced by crystallising various salts upon plates of glass. When the crystals are granular and properly formed, they will produce the finest effects. A few drops of a saturated solution of alum spread over a plate of glass so as to consolidate quickly, will cover it with an imperfect crust, consisting of flat octohedral crystals, scarcely visible to the eye. If an observer places the glass between him and the sun, or a candle, the clear surface being next the eye, he will perceive three fine halos at different distances encircling the source of light.

Among the luminous phenomena of the atmosphere, those of converging and diverging solar beams may be mentioned. The phenomenon of diverging beams is of frequent occurrence in summer, and when the sun is near the horizon. It is caused by a portion of the sun's rays passing through openings in the clouds whilst the adjacent portions are obstructed by the clouds. The phenomenon of converging rays is not of frequent occurrence, and is always seen opposite to the sun, and generally at the same time with the former phenomenon, as if another sun placed diametrically opposite to the real one were below the horizon, and threw off his divergent beams.

COLOURS OF BODIES.

It is to Sir Isaac Newton that we are indebted for the first scientific investigation of this interesting subject. Sir David Brewster considers Sir Isaac's theory of colours as applicable only to a small class of phenomena, while it leaves unexplained the colours of fluids and transparent solids, and all the beautiful hues of the vegetable kingdom. He observes, "In numerous experiments on the colours of leaves, and on the juices expressed from them, I have never been able to see the complementary colour which disappears, and I have almost invariably found that the transmitted and the reflected tint are the same. Whenever there was an appearance of two tints, I have found it to arise from their leaving two differently coloured juices existing in different sides of the leaf. The Newtonian theory is, we doubt not, applicable to the colour of the wings of insects, the feathers of birds, the scales of fishes, the oxidated films on metal and glass, and certain opalescences. The colours of vegetable life and those various kinds of solids, arise, we are persuaded, from a specific attraction which the particles of these bodies exercise over the differently coloured rays of light. It is by the light of the sun that the coloured juices of plants are elaborated, that the colours of bodies are changed, and that many chemical combinations and decompositions are effected. It is not easy to allow that such effects can be produced by the mere vibration of an ethereal medium; and we are forced, by this class of facts, to reason as if light was material. When a portion of light enters a body, and is never again seen, we are entitled to say that it is detained by some power exerted over the light by the particles of the body. That it is attracted by the particles, seems extremely probable; and that it enters into combination with them, and produces various chemical and physical effects, cannot well be doubted; and without knowing the manner in which this combination takes place, we may say that the light is absorbed, which is an accurate expression of the fact.

Now, in the case of water, glass, and other transparent bodies, the light which enters their substance has a certain small portion of its particles absorbed, and the greater part of it which escapes from absorption, and is transmitted, comes out colourless, because the particles have absorbed a proportional quantity of all the different rays which compose white light, or, what is the same thing, the body has absorbed white light.

In all coloured solids and fluids in which the transmitted light has a specific colour, the particles of the body have absorbed all the rays which constitute the complementary colour, detaining sometimes all the rays of a certain definite refrangibility, a portion of rays of other refrangibilities, and allowing other rays to escape entirely from absorption; all the rays thus stopped will form by their union a particular compound colour, which will be exactly complementary to the colour of the transmitted rays. In black bodies, such as coal, &c. all the rays which enter these substances are absorbed; and hence we see the reason why such bodies are more easily heated and inflamed by the action of the luminous rays. The influence exercised by heat and cooling upon the absorptive power of bodies, furnishes an additional support to the preceding views."

ABSORPTION OF LIGHT.

All bodies, even the most transparent in nature, absorb light, but philosophers have not as yet ascertained the power by which they do it. Some have thought that the particles of light are reflected in all directions by the particles of the absorbing body, or turned aside by the forces resident in the particles; while others are of opinion that they are detained by the body, and assimilated to its substance. The most absorptive body in nature is charcoal, then follow coal of all kinds, metals in general, and so on, air and gases being the lowest in the list. Some bodies, but very few in number, absorb all the rays of the spectrum in equal proportions; ink diluted is an example of this quality of bodies, and it was on this account applied by Sir William Herschel as a darkening substance for obtaining a white image of the sun.

There are many familiar instances of what are called accidental colours being seen. If a bright red wafer be placed upon a sheet of paper, and steadily looked at for some time, and the eye then withdrawn and fixed upon the white paper, a circular spot of bluish green light of the same size as the wafer will be seen. If the experiment be made with wafers of a different colour, other tints will be observable. The phenomenon is thus explained. When the eye has been for some time fixed upon one particular colour, the retina becomes as it were deadened to it, insensible to the particular rays which it reflects; and when it is turned upon the paper which throws off white light, it will see it of that colour which results from a mixture of all those colours but that to which it has become insensible.

Upon the subject of optical instruments it is impossible to present more details than those already given in a previous part of this paper. In Brewster's Optics, to which the reader is referred, they will be found fully treated of.

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NATURAL THEOLOGY.

"ENDEAVOUR," says Isaac Watts, "to derive some instruction or improvement of the mind from every thing which you see or hear, from every thing which occurs in human life, from every thing within you or without you. Fetch down some knowledge from the clouds, the stars, the sun, the moon, and the revolutions of all the planets. Dig and draw up some valuable meditations from the depths of the earth, and search them through the vast oceans of water. Extract some intellectual improvement from the minerals and metals; from the wonders of nature among the vegetables and herbs, trees and flowers. Learn some lessons from the birds, and the beasts, and the meanest insect. Read the wisdom of God, and His admirable contrivance, in them all: read His Almighty power, His rich and various goodness, in all the works of His hands." And assuredly it is a great part of wisdom to draw a lesson from every thing we see around us and above us, and appertaining to the universe to which we also belong. There is no lesson more important than the one conveyed with greater or less force by every department of nature; a lesson which must strongly inculcate the truth of the existence of an all-wise and infinitely good God, who was at first the author, and has ever since been the upholder, of all things. That this truth should ever have been doubted, might surprise us, even though we were extremely ignorant of the arguments by which it has been confirmed. And it is well worthy of remark, as showing the depth and solidity of the foundation on which rests the existence of a supreme, intelligent, and beneficent First Cause, that the farther we push our discoveries, the more clearly are the divine perfections exhibited. It is not merely true, that, on a superficial view, we perceive the necessity of believing that a limited and changing world, such as that on which we dwell, could neither exist without being produced, nor be the author of its own existence; and that there must, therefore, be, beyond the range of our senses, an independent and uncreated essence, without beginning, without bounds, incapable of change, intelligent, ever-active, all-pervading; but it is also certain, that those *primâ facie* views, as they may be called, are not only uncontradicted, but fully established by the most minute survey of the objects within the sphere of our vision; so that he who penetrates the deepest into the secrets of nature, only multiplies proofs of that most sublime and most animating truth, that "verily there is a God" who made and rules the universe. It is difficult to understand that strange moral obtuseness which has induced a certain class of writers to reject this; for grant but one assertion, which is—and it is not easily to be questioned—that wherever there exist indisputable traces of design, planned with wisdom, directed by goodness, and accomplished by power, there also must of necessity have been a wise, a good, and a powerful designer.

Let us suppose ourselves cast ashore upon some island previously unknown to us; we immediately proceed to examine the appearances which present themselves, in order to discover if any traces exist of human inhabitants. To ascertain that if such beings did there exist, it would not be necessary that they should actually be seen by us. In our wanderings we might come upon a hut bearing all the marks of occupation; we might see the roots of the trees which had been felled to form it, and other tokens of the recent presence of man upon the spot; and did we desire to discover something of their character and habits before we presented ourselves to their notice, it is most probable that sufficient data would be also afforded on which to found an opinion. Were the habitations we discovered merely wigwams, or such enclosures destitute of the conveniences of civilised life, or were the furniture, the weapons, or the instruments in and around them, such as barbarous nations generally use, we might reasonably argue that we had found the dwelling of an untamed savage. But if, instead of this, we find the surrounding land trenched, enclosed, and cultivated; should we find the common articles of European husbandry and the common utensils of an European household, we should naturally draw the inference that we had reached the abode of an emigrant, who had thus reared around him the attributes of civilised life. Much more, a few additional observations might reveal to us and enable us to form conjectures, bearing the aspect of probability, concerning the people among whom we had fallen. Now, it is in this way alone that we can argue respecting the Author of all things, and discover proofs and demonstrations of a first supreme cause. To prove that the formation of all things was the result of design, it is only necessary to show that they are in general, or in so far as we can discover, admirably suited to the uses and purposes to which they are to be applied—that their arrangement is perfectly harmonious, and that it is impossible that any chance could have thrown them together in a way so happy. To discover if this design can be evidenced or demonstrated, it is necessary to seek through the various works of creation with which we are surrounded; and the more minute we make our inspection, the more likely shall we be to perceive the deduction. If there be some departments to which our senses have a readier access than to others, and which we can therefore more readily examine, from these especially we ought to deduce our result. It may be that we shall find many things, which, from the deficiency of our observing faculties, we cannot understand, nor discover the uses nor consequent design which they display; but still, if, in the course of our inspection, particularly of bodies which we can observe minutely, we find every part admirably adapted for a specific purpose, and teeming with the most convincing evidences of design, then we may with safety and true philosophy infer that in those objects, which, from their nature and our imperfection, we cannot so completely investigate, a greater degree of light would tend to confirm the result to which our previous observations, among other things, had led us.

DESIGN IN THE PLANETARY SYSTEM.

We now proceed to contemplate the various kingdoms of nature, beginning with the most sublime of all, the Starry Heavens; in which, if we do not find the very best field for the discovery of design, we shall at least perceive the footsteps of a God, a beneficent First Cause, an originator and maker of all, alike infinite in skill to plan and in power to create.

To the uninstructed eye, the earth which we inhabit appears on a clear night to be surrounded by a numerous host of radiant points, which, rising in the east, move majestically through the sky until they reach the western horizon, when they set or disappear; and so completely does this idea commend itself to the mind of an observer, that it requires a considerable effort to conceive how it can be otherwise. But science has taught us that this is a mere illusion, and the discoveries of Copernicus and Sir Isaac Newton have established the truth suggested by Pythagoras upwards of 2000 years before the time of either of them, that the apparent motion of the heavens is the consequence of the real revolution of the earth every twenty-four hours upon its axis; that, with relation to the earth, the sun is stationary, while the earth every year completes a journey round him; that the planets are globes similar to our own, revolving at once upon their own axis, and round the sun; that the moon is a satellite or attendant upon the earth, accompanying it in its course, and at the same time describing every month a circular orbit round it; and that to several of the planets are attached similar moons or satellites, bearing to them a corresponding relation.

By turning to our article ASTRONOMY, in which the number of the planets, and their distances from the sun, with other particulars, are noted, it will be seen that the earth which we inhabit is but a very small point, even in the solar system (as the concourse of planets round the sun has been called), and that it forms but a part of one magnificent and resplendent whole. But to ascertain the marks of a designing mind in this mighty mass of brilliant wonders, let us turn our attention to some of those particulars regarding them with which we are acquainted; and it must be confessed, that, if we are to suppose them mere masses of matter unclothed with aught bearing analogy to our vegetable productions, and uninhabited by beings either sentient or rational, it will be difficult to see why any of the arrangements connected with these bodies, so far at least as they themselves are concerned, and apart from their attractive influence upon our own world, should be either beneficial or the contrary. It is solely on the *conjecture* that there are organised beings on their surface to be warmed, and nourished, and upheld, that we can argue regarding such arrangements; and making this conjecture, we shall find that there are some very remarkable apparent contrivances for ministering to their comfort and happiness. It has been supposed that a planet so far distant as Herschel, or even Jupiter or Saturn, must suffer from an extreme deficiency both of light and heat; and hence it has been argued that they are necessarily unfit for the sustenance either of animal or of vegetable life. But when we consider that even Herschel, the most distant from the sun, possesses 248 times the light afforded by our full moon, it will not be difficult to believe, that, with a somewhat more acute power of vision than we possess, the inhabitants of that planet, if formed like ourselves, may be quite able to engage in employments which require considerable minuteness of perception. Besides, to compensate for the deficiency of light derived directly from the sun to this planet in common with Jupiter and Saturn, there is afforded the subsidiary benefit of several moons or satellites to reflect light upon the surface when the sun has withdrawn his beams; neither is it probable that the inhabitants should miserably perish from cold; for, putting out of view the possibility that they may be formed with constitutions adapted to a more frigid climate than that of any portion of our world, we must remember that heat is not dependent altogether upon the body from which it originates, but is regulated in a very great measure by the nature of the body to which it is transmitted. Keeping this in view, the planet Mercury may be as cool, and Herschel as warm, as our own globe, although they be at such different distances from the great source of heat. This, however, can be the subject of conjecture alone; and it is only valuable, as showing that we have no reason to suspect the goodness of the Creator in having placed some of his worlds in situations which, at first sight, might be supposed necessarily incapable of affording even the most essential accommodations to organic existences.

Of all the planets, Saturn presents us with the most singular example of design in reference to this subject. When viewed through a telescope, this beautiful orb is seen to be surrounded by a double circle 30,000 miles distant from any part of its surface. This apparatus consists of two concentric rings, separated from each other by a space nearly 3000 miles in breadth, and moving round the planet at the extraordinary rate of a thousand miles a minute. Now, there is one use of this appendage, whatever may be its other purposes, which is very apparent: it must contribute much to enlighten and beautify the globe to which it is attached; and a very little reflection will show the effect it must have in this respect. What a magnificent brilliant spectacle must these rings present to the inhabitants of Saturn! During its more than fourteen years of summer, the night must be enlivened by the bright reflection of this brilliant arch extending its luminous curve from the eastern to the western horizon; while even during the day, the sun must be materially aided by it in shedding light upon the world to which it belongs. "There is no planet in the solar system," says a late writer, "whose firmament will present such a variety of splendid and magnificent objects as that of Saturn. The various aspects of his seven moons, one rising above the horizon while another is setting; a third approaching the meridian; one entering into an eclipse, and another emerging from it; one appearing as a crescent, and another with a gibbous phase; and sometimes the whole of them shining together in one bright assembly: the majestic motions of the rings, at one time illuminating the sky with their splendour, and eclipsing the stars; at another, casting a deep shade over certain portions of the planet, and unveiling to view the wonders of the starry firmament, are scenes worthy of the majesty of the Divine Being to unfold, and the rational creature to contemplate." Of the other planets it is unnecessary individually to speak; our knowledge of them is extremely limited, and we may simply remark, that, in most of them, the same causes exist which in our globe produce the various seasons. To the causes of the seasons, further than that they are the result of the influences of the celestial bodies, we will not here allude to. To the arrangement of these, and to the forethought and all-pervading knowledge and goodness of Him who designed them, are we, in a word, indebted for the opening beauties of spring—the full glow of summer, arrayed in flowers and clothed with verdure—the sober and sear leaves of autumn, with its aureate fields and happy harvests—and the cold but not desolate winter, which even in its frigidity serves a valuable purpose in the scheme of the natural world.

In these arrangements, we see proofs of the care, the power, and the beneficence of that great Being who was the cause of all things. To what else, indeed, shall we trace the primary fact, that, of all the heavenly bodies connected with our system, the sun alone, situated as he is in the centre, possesses undivided light, while the planets which surround him are all dark bodies receiving their light from him? There is no reason, in the nature of things, why a body placed in the centre of a system should give forth light and heat, while those revolving round it should be destitute of them. And yet we find it to be so: and we perceive the consequence of this arrangement to be not only most beneficial, but absolutely indispensable to the existence of the organic beings with which these orbs may be clothed or peopled.

But there is another view of the system of worlds to which our earth belongs, that strongly corroborates the existence of a creating and presiding Being. We mean the provision which is made for its perpetuity. Notwithstanding the existence of so many conflicting forces, any one of which, if the system were differently arranged to what we find it to be, might in the course of ages derange the relations which the different bodies composing it possess towards each other, and precipitate the whole into confusion, only equalled by that chaos from which, by might and power, it was called. It will hardly be necessary minutely to explain the causes by which the earth and the other planets are kept in a continual state of rotation round the sun; but as perspicuity is one of the chief objects at which we aim, a few words on this subject will not be out of place. Let it be understood, then, that in every body of matter there exists a certain tendency to rush towards every other body, and that the larger, and denser, and nearer, any two bodies are, the greater is that tendency, and it will easily be comprehended that the sun, the largest of all the bodies in our system, should attract every other orb with a degree of force regulated by the size, the density, and the distance of each; so that, had all these bodies at first been placed in a state of rest in the universe, they would immediately have begun to move towards the sun, and thus, in the course of time, would, one after the other, have reached and been amalgamated with him in the form of one vast and irregular mass. But at the creation, this result was prevented by communicating to the planets an impulse at right angles to the diameter of their orbits, which, combining with the force of attraction—that is, the power of the sun in drawing or attracting the planets towards himself—caused the planets to revolve round the sun. If each of the planets, however, were to revolve round the sun, with no other prevailing power to interfere with their motions except these two, viz. the attraction of the sun, and the original impulse at creation, they would of course continue as they are throughout all ages; but this is not the case. In the words of Mr Whewell, "each of them is acted on by all the rest. The earth is constantly drawn by Venus, by Mars, by Jupiter, bodies of various magnitudes perpetually changing their distances and positions with respect to the earth. The earth, in return, is perpetually drawing these bodies. What in the course of time will be the result? The cause acts perpetually, and it has the whole extent of time to work in. Is it not, then, easily conceivable, that, in the lapse of ages, the derangements of the planets may accumulate, their orbits may change their form, their mutual distances may be much increased or much diminished? Is it not possible that these changes may go on without limit, and end in the complete subversion and ruin of the system?" What might have been the case had the balance of powers, so to speak, in our system, been differently disposed, it is not easy to say; but that all which is here suggested as possible, would actually take place, were a capricious or ignorant hand to interfere in the distribution of these forces, may assuredly be affirmed. We should soon have "years of unequal length and seasons of capricious temperature; planets and moons of portentous size and aspect, glaring and disappearing at uncertain intervals; tides like deluges sweeping over whole continents; and, perhaps, the collision of two planets, and the consequent destruction of all organisation in them both." As the solar system exists, however, so nicely is it adjusted, that the deep inquiries of several of the philosophers of the last century, founded on the most complicated calculations, have shown that its arrangements are stable—that although there are and may be perturbations, there are invariably proportionate compensations; so that, whenever a maximum has been reached in the derangements of the system, it must necessarily begin to revert to its ancient order, and the restoration must in the end be as complete as was the derangement. It would require a hardihood greater than we can easily conceive to exist in the human mind, to view this subject, and to deny, after all, that a perfectly wise, beneficent, and powerful being, originally made and has since sustained and governed all things; for had the original impulse of which we have spoken been a little stronger or a little weaker—had the relative inclination of the orbits of the planets to one another been greater—had one or more of them moved in a direction opposite to the rest—had any one of these causes operated, the whole solar system must sooner or later have been precipitated into chaotic confusion. Will any man, then, deny the proof here afforded of design and skill?

We cannot leave the heavenly bodies without adverting to the fixed stars; and if little be known respecting the planets, still less has been ascertained regarding these more distant bodies. But it is by no means an unedifying employment to contemplate, through them, the immensity of creation, and, thus elevated, to draw the conclusion that the Being by whom they originated must indeed be infinitely glorious. Had there been no other design on His part than thus to strike the mind of man with a sense of His magnificence and grandeur, no surer method could have been adopted to impart the lesson. The mind is bewildered when it dwells upon the glories which astronomy developes; and it cannot find words lofty enough to express its sense of the intelligence it discovers, or the proofs of the power and wisdom and goodness it perceives.

RELATIONS BETWEEN MAN AND EXTERNAL NATURE.

Leaving the evidences of design that are to be deduced from the contemplation of the heavens, let us regard some of the relations that exist between man and external nature, and consider the wonderful adaptations to each other which they exhibit. There can be no blank in nature, and, consequently, no body is isolated; all more or less influence each other, and it is of some of these relative influences that we are about to speak. Man is attached by the laws of gravitation to the earth which he inhabits, and is surrounded by an atmospheric medium capable of exercising certain influences upon him; these influences are modified by the Almighty Power to be subservient to his wants, and *designed* to be adapted not only to his necessities, but to those of every living thing, whether plant or animal, that exists. The air which surrounds us exercises, in consequence of its extent, a pressure on the human body equal to about 33,600 pounds. But why do we not sink and miserably perish beneath this immense weight? It is by the reaction of the elastic fluids contained within our bodies that we are enabled to support so enormous a pressure. Here we find a mutual relation between us and the air, which cannot be interrupted without mutual injury. Suppose this weight to be withdrawn from our bodies, what would be the result? The expansibility of the fluids contained within us would have no restraint; they would dilate, burst through the solids which contain them, and destroy the individual. Place any animal beneath the receiver of an air-pump, and withdraw the air, the result is very apparent. One of the causes of the inconveniences that are experienced when on the summit of a very high mountain, is, that the air is less dense, and does not oppose so much pressure to the body; and this, too, occasions the violent bleedings from the ears, eyes, and mouth, that sometimes attack those so situated. The effect of a cupping-glass, when applied to the skin, has the same cause. We feel more or less the effects of any sudden change of atmospheric pressure, but still the density of the air is well adapted to the wants of man; had it been greater, our energies would have been oppressed as by an unnatural load; and if less, insufficiently sustained as by a defective support. The senses of hearing and smelling, too, which depend for their perfection on a medium density of the air, would have either been insupportably intense or defective. Again, the atmospheric pressure materially affects temperature. If a certain quantity of air contains a certain quantity of heat, it is clear that it must be equally diffused throughout it; and if the same air be contained in less bulk, or if the pressure be greater, the heat is increased in the same ratio. In the same manner, if the pressure be lessened, the air expands, and with it the heat is diffused over a greater surface. By compressing air, we can produce a sufficient concentration of heat to produce ignition. This influence of the air upon the body is as universal as the former, and the adaptation of the one to the other as constant. With the exception of some countries near the equator, and there only in the hot season and the middle of the day, the temperature of the atmosphere is always below that of man; and as heat always tends towards an equilibrium, it is obvious that a constant subtraction of heat from the body must be going on. Now, we are so organised as to allow of this universal subtraction; and, indeed, were it suddenly stopped, or even diminished, we should soon perish. Again, if the subtraction became increased, or went on more rapidly than the vital principle could replace it, our temperature would sink, our humours and fluids freeze, and in this case, too, we should soon perish. But there are intermediate points between these two extremes; and as we before said, our organisation is such that it adapts itself to the degree. All organic bodies are capable of resisting to an extraordinary extent, and of modifying the action of, heat and cold; indeed, this principle of self-preservation is in them so striking as to have been regarded from a very early period as the most essential attribute of life. The power possessed by the higher classes of animals, of preserving a more or less uniform degree of heat, is almost unlimited. In very cold climates, the thermometer not unfrequently sinks to 50° or 55° below the freezing point, while in very hot ones it is sometimes 120° or 125° above it, making a difference of 170° or 180°; still, however, the temperature of the body remains unchanged. What unanswerable evidence of design is this, and how limitless must be that Power who could create such wonderful adaptations!

If the atmospheric pressure produces in some measure the regulation of heat and cold, in no less degree does it affect moisture and its concomitants—clouds, mist, rain, snow, and hail; and thus we are dependant for many of our comforts and for most of our necessities upon the due adjustment of atmospheric influences. Winds, too, arise from any unwonted atmospheric pressure disturbing the equilibrium of the atmosphere, and are the efforts of nature to restore the balance. All the changes of weather, the most violent storms and tempests, own the same cause; and why the whole machinery—if we may use the term—is not utterly destroyed, its balance lost—why

> "Hot, cold, moist, and dry, four champions fierce
> Striving for mastery, bringing to battle
> Their embryon atoms,"

do not annihilate the world, and reduce it to its pristine chaos, is, that it is a God who rules, and who in his mercy has so adapted cause and effect, that they shall regulate each other, and blend together in harmonious concord.

Connected with this subject, as evidencing design, is the composition of the air, which is precisely that best adapted to support respiration. It consists, besides small proportions of aqueous vapour and carbon, of two fluids, or gases, called oxygen and nitrogen. In a separate state these gases are inimical to life. Lavoisier proved by experiment that pure air, or oxygen gas, if respired for a certain time, rarifies the blood too much, and increases the rapidity of the circulation, the effects of which are violent fever, inflammation of the lungs, and death. Nitrogen is equally destructive to life, as not yielding that principle on which the purification of the blood depends. It is their combination that renders them salutary to the constitution, neither consuming life by too much stimulus and excitement, nor deadening its energies by a languid circulation and depression of spirits. Why should the air have been composed exactly of twenty-one parts of oxygen and seventy-nine of nitrogen? Why were all other proportions excluded? It could not have been owing to a blind and fortuitous chance. The fact that we find two deadly ingredients so united as to become not only harmless, but salutary, must strike every mind with an unanswerable evidence of design. Atmospheric air is absolutely necessary both to animal and vegetable life, and both classes of beings are fully adapted for its reception. The boldest Epicurean could scarcely imagine that so necessary a substance has by mere chance surrounded this globe for the support of its inhabitants, upon whom, without it, God would have bestowed his power and wisdom and goodness in vain; nay, even had men, according to the doctrine of Epicurus, sprung up like mushrooms from the earth without an atmosphere, they could not have existed upon it. Has not, then, the hand of a wise Creator been here visibly employed, or why were we supplied with instruments that render the air available to us?—enabling us to resist its dreadful pressure, and to avail ourselves of its unutterable advantages. If we contemplate for a moment the evils which would have followed had not divine intelligence presided at the constitution of our globe, and placed an atmosphere around it, how fearful and dreary it would have been! The moon has no atmosphere, and hence its climate must be very extraordinary: either the fiercest sunshine must reign, or the keenest frosts endure. If our earth had been similarly situated, no organic being would have adorned its surface; neither plant nor animal could have existed; no reflection of light could have taken place; no dawn or twilight would have prepared us for morning or for night; a dome blacker than darkness would have surrounded the earth, and light only have become manifest when the eye received it directly from the sun. The blue sky which now surrounds us, and which is owing to the thin watery vapours floating in the atmosphere, and reflecting peculiar rays of light, the blue and the violet, would not have been there. And where can we find such evidences of design as the blue colour which the sky exhibits? Of all hues we could imagine, is there any to surpass that mild and soft ethereal tint, harmonising with all around us, and on which the eye, fatigued with more brilliant and dazzling objects, turns for relief and repose? The unbeliever may say that this colour was the result of chance; but suppose any other, a bright yellow, a dazzling white, a glaring red, a fearful colour, how uncomfortable and painful would it have been for the vision of man! Again, an atmosphere is necessary to hearing; it enlarges the field of vision, and contributes also to the means of smell: and not only do the beings on earth enjoy life through its means, but it contributes to the sustenance of the finny tribes, enabling them not only to exist, but to rest in the water, or ascend and descend in it in quest of food.

There are still other relations existing between men and external nature, to which we would shortly allude as illustrative of design; and they are such, that without them certain important functions could not be performed, and, consequently, man could not exist. These relations, which may be termed *organic*, are the more numerous and necessary to life, as the organisation of the individual is the more developed or complete; and while they may be all included in the two functions of nutrition and sensation, they are the more multiplied as the operations of the former are more complex, and the extension of the latter greater; and hence they are more numerous in man than in any other animal. As in the physical relations, to some of which we have already alluded, so in the organic we must assign the first rank to the atmosphere, so necessary to life and so admirably adapted to sustain it. It is the medium, also, through which we receive heat, light, and electricity, of which we appear to be as much in need as of that principle of air which purifies our blood, and fits it for the performance of its several operations. These matters are inherent in all living bodies; and if simple elementary bodies do exist, these are they. Many physiologists recognise the greatest analogy between the nervous fluid and electricity, and there is great reason for believing that it assists considerably in the maintenance of the vital phenomena. We know, however, that all these agents exercise a great influence upon life, from the demand that living bodies make upon them. Observe how plants languish and become weak when deprived of light, and how solicitously they move in the direction that will the most expose them to its invigorating influence. Nor is it less necessary to animal existence. Eggs cannot be hatched when deprived of it; and the transformations to which many insects are exposed, go on more slowly when in a darkened place. But let us suppose that this element was only given for the purpose of enlightening the earth, what a wonderful relation, then, does it bear to the eye which perceives it! No one who considers the eye attentively can resist the impression of the evidence of design and skill which its construction exhibits. At the same time, it must be obvious that this construction of the eye would not answer its purposes, unless the constitution of light corresponded to it. Light is an element of the most peculiar kind and properties, and such an element can hardly be conceived to have been placed in the universe without some regard to its operations and functions. As the eye is made for light, so light must have been made, at least among other ends, for the eye. What we have said of light is equally applicable to colour. It is obvious that the vital energy of plants is much diminished, even suspended, during winter, while with the return of summer they again shoot forth their leaves and flowers; the same alternation obtains also among hybernating animals. Heat is evidently the cause of these changes; so much so, indeed, that vegetables may be forced to invert the order of the seasons. The climates in fact demonstrate the influence of heat. How stunted is both animal and vegetable life in polar regions, and how exuberant do the same individuals become under warmer skies. Electricity undoubtedly exists in the atmosphere in all its states; but we know very imperfectly the laws of this agent, and are still more ignorant of its atmospheric operation. The present state of science, while it permits us to hazard an opinion, does not enable us to perceive those adaptations of its laws to its uses, which we can discover in those cases where the laws and the uses are both of them more apparent. "It is at any rate very probable," says Whewell, "that electricity has its important purposes in the economy of the atmosphere. And this being so, we may see a use in the thunderstorm and the stroke of the lightning. These violent events are, with regard to the electricity of the atmosphere, what winds are with regard to heat and moisture. They restore the equilibrium where it has been disturbed, and carry the fluid from places where it is superfluous, to others where it is deficient. We are so constituted, however, that these crises impress every one with a feeling of awe. The deep lowering of the gloom of the thundercloud, the overwhelming burst of the explosion, the flash from which the steadiest eye shrinks, and the irresistible arrow of the lightning which no earthly substance can withstand, speak of something fearful, even independently of the personal danger which they may whisper. They convey, far more than any other appearance does, the idea of a superior and mighty Power, manifesting displeasure and threatening punishment. Yet we find that this is not the language which they speak to the physical inquirer; he sees these formidable symptoms only as the means or the consequences of good. What office the thunderbolt and the whirlwind may have in the *moral* world, we cannot here discuss; but certainly *he* must speculate as far beyond the limits of philosophy as of piety, who pretends to have learnt that these work more of evil than of good. In the *natural* world, these apparently destructive agents are, like all other movements and appearances of the atmosphere, parts of a great scheme, of which every discoverable purpose is marked with beneficence as well as wisdom."

We think we have now sufficiently shown the wonderful adaptations and relations that exist between some of the phenomena of external nature and organised existences. It does not accord with our purpose to enter deeply or at greater length into the subject, but even the little we have said, must, we hope, carry with it the conviction, that verily it is a God who made and rules the universe.

DESIGN IN THE STRUCTURE OF THE EARTH.

In considering the structure and theory of the earth, we cannot but perceive many evidences in the adaptations these discover to the beings which inhabit it; and this alone will show that the whole must have been the result of a superior and intelligent Being, whose powers our senses are inadequate to conceive or to understand. Still it is not surprising that many should be led into the general opinion, that the study of the mineral kingdom is a dry and uninteresting one. The mere inspection of minerals, and the business of labelling and assorting them according to certain artificial systems, are no doubt very mechanical employments. But yet there is not a more philosophical study than that of geology, or one that is calculated to impress the mind more forcibly with the power, and majesty, and awful justice of a great and superintending Being. In studying geology, if we open our eyes to plain facts that are every day before us, and look through the unprejudiced medium of our senses, avoiding the doctrines of inveterate theorists, we cannot fail to perceive that the world must at first have been called into existence, and fashioned into land and water, mountain and valley, by the direct fiat of an omnipotent Creator; and that, from the very nature of things, and the physical laws of matter, it could not have been so arranged from any inherent influence of mere matter itself. We shall see that after this world had been formed, and existed for a considerable space—that after it had been clothed with luxuriant vegetation, and peopled with myriads of all classes of living beings, a great and sudden catastrophe must have taken place by which the face of the earth was completely overwhelmed, and every plant and animal swept off and scattered amid the general wreck, throughout every quarter of the deluged sphere. We shall find that after this a new order of things arose—that new soil and new vegetation began gradually to cover the devastated globe, and that animated beings again enlivened its dismal solitudes. We shall find, too, what is a very singular circumstance, that a great proportion of the plants and animals of the old and antediluvian world differ entirely from the vegetation and the animated beings at present existing on this globe. As far as the investigation of fossil remains has yet gone, and the number of species already amounts to some hundreds, the entire difference of many of these from any species now extant is quite apparent.

From a minute examination of our coal-fields, it is allowed that coal is an accumulation of vegetable matter, subjected to long chemical action under considerable pressure, and excluded from the influence of the atmosphere. In many coal strata, the remains of leaves, and stems, and large trunks of vegetables, are every day found, evidently component parts of this mass: and when a thin piece of pitch coal is pared off with a sharp knife, and examined with a microscope, the woody fibre and texture is distinctly visible. Now, all our coal-beds must be the accumulated remains of antediluvian vegetation, for they are uniformly found covered by an earthy stratum, that bears all the marks of having been accumulated and deposited by water. Thus we observe a beautiful provision of nature, which has stored up the luxuriant vegetation of tropical climates, and of long-forgotten ages, as it were in cellars, to cheer the gloom and enliven the long wintry periods of these our northern regions. It is also to these diluvian currents that we owe a great many of the stratified masses of our most useful and most easily wrought quarrying-stones for the purposes of architecture; as, for instance, most of our sandstones, and in all probability many of our newer limestones.

It is vain and absurd to endeavour to explain the first formation of the earth, upon the presumption that it was originally a fluid or a smooth sphere, or to attempt to describe the manner in which the various rocks and minerals assumed form and identity. With equal reason might we speculate upon the manner in which the first human body organized its bones, and muscles, and arteries, and skin. The true province of geology consists in marking the present state of the earth's surface, and in tracing, as far as facts justify our conclusions, the changes that have there occurred. A prevailing opinion of the present day seems to be, that the earth is infinitely older than history describes it, having remained for ages an uninhabited mass, previously to the existence of plants and animals; and that, instead of one great catastrophe or deluge, it has suffered various local and partial changes, whereby its surface has been greatly altered. Another opinion is, that a series of operations is continually going on, by which an incessant change is brought about in every portion of the globe, and that this may have commenced at the creation, an indefinite period in past time, and may go on perpetually without limits as to future time. In whatever manner the changes may have been effected upon the body of the earth, it is at least obvious that these changes have operated to the benefit of mankind. Ample deposits of coal and metals have thus been formed at commodious depths from the surface, which cannot be ascribed to mere chance, but must have taken place through the agency of laws framed by the Creator for a beneficent purpose.

DESIGN IN ANIMAL PHYSIOLOGY.

The earth, whose structure we have just briefly noticed, serves as the place of habitation for two kinds of existences—the animal and vegetable—in whose formation and functions we discover the beautiful dispensations of Providence, extending on every side over a vast range of beings, and demonstrating the unity of plan on which organised creation has been devised. And, first, the whole circle of our knowledge does not afford greater evidence of design than comparative anatomy; in it we find innumerable contrivances for the comfort and happiness of the different tribes of beings adapted to the peculiarities of their condition; in each animal we see the same organ repeated, but modified to render it more available to the habits of its possessor; and among all the wonders of creation, there are none which strike the inquiring mind more forcibly than this change or modification of formation for the obvious purpose of accommodation to circumstances. Were all animals formed alike, or did the differences which exist between them bear no relation to their habits or destinies, it would be less easy to refute the doctrine which assigns all things to material causes, and excludes the designing hand of an intelligent Creator. Although even then the argument would be totally untenable, still the demonstration which disproves it would have been less satisfactory and perfect, as the surprising skill and beneficent care by which the structure of every animal is adapted to its individual habits and necessities, could not have been so well displayed. A single tool in the hands of the carpenter is a proof of contrivance, but that proof is much multiplied and rendered more forcible when we find the same instrument modified into a thousand forms to suit the different operations of the workman. Few of the functions of animated beings better illustrate this than that of alimentation, which we shall now briefly trace, though the humble zoophytes and worms up to birds and mammiferous animals. This may add to the number of the instances of obvious design we may adduce; but this and thousands more would merely give us a faint idea of the stupendous extent of the wisdom and goodness of God which the animal creation displays. Nutrition is common to all animals without exception; and the numerous and varied modifications of the means employed to effect it, are obvious proofs of the design and intelligence of the Creator. There are some animals so nearly allied to plants as to be scarcely distinguishable from them; and in these, as in them, nutritive matter is in like manner introduced by mere imbibition. Fixed like plants to the spot where they grow, any other organs would have been superfluous; while to those which are not so attached, but seek their food and obtain it through their locomotive powers, organs for seizing and preparing it are necessary. In them, therefore, we find lips variously and curiously modified; glands about the mouth for furnishing fluids for lubricating dry alimentary matters; a tongue, or something analogous to it; teeth and jaws for breaking down hard substances, and rendering them fit for swallowing; with a passage called the œsophagus, or gullet, leading from the mouth to the stomach, in which the food is at last assimilated, and rendered fit for nourishing the animal. But it is not until we advance some way in the great chain of animal life that these parts become sufficiently obvious, or their offices clearly defined. In quite the lowest orders, the mouth and stomach are one continuous tube, or all stomach, as it may be called, and so simple in construction, that the animal may be turned inside out without detriment to it; that which was external being now internal, and performing, apparently with equal facility, all the offices of what was previously the stomach. As we advance, however, we find the nutritive organs ceasing to be a mere sucking apparatus, or a receptacle for imbibed fluids. In those whelks which are furnished with proboscides, we find its cavity occupied by the aperture of the œsophagus, a tongue, and teeth; while the snail possesses a perfectly formed mouth and lips. Among the worms, whose stomachs are generally membranous bags, we find examples of wonderful contrivance and design. Thus, the powerful stomach of one species contains three hard calcareous shells, by which the individual is enabled to bruise and masticate the shelled animals on which it feeds. The discoveries of Ehrenberg respecting the animalculæ inhabiting different vegetable infusions, have extended, in an extraordinary degree, our knowledge of the stupendous power of God; and the inimitable proofs of design displayed in beings to whom, in relative size, the mite is as an elephant, afford astonishing displays of a minute and most beneficent attention to the preservation of these curious creatures, in whose organisation and instincts new and admirable indications of creative wisdom are revealed. By the aid of the microscope, we are enabled to perceive the Creator of the universe minutely busy among the worlds of living creatures to which he has given birth on a blade of grass, or in a drop of water, and to discover fresh scenes of wonder, and interest, and evident design, among hosts of animated beings, infinite in number as in minuteness. These discoveries, of which an able analysis was lately given by Dr Gairdner in the Edinburgh New Philosophical Journal, have dissipated the obscurity in which the animalculæ were plunged, and displayed the wonders of their organisation. To render their digestive organs more conspicuous, he supplied them with coloured food, which communicated its tinge to the cavities through which it passed. The moment a minute particle of a highly attenuated solution of pure indigo was applied to the drop of water on the field of the microscope, in which were some of the infusory animalcules, the most beautiful phenomena presented themselves. Presently their bodies, which had been hitherto quite transparent, became dotted with a number of spots of a dark blue colour, evidently produced by particles of indigo accumulated in these situations. In some species, particularly those which had a contracted part, or neck, between the head and the body, these particles were to be traced in a continuous line in their progress from the mouth to these internal cavities. In this way, by the employment of colouring matters, Ehrenberg succeeded in ascertaining the existence of a system of digestive cavities in all the known species of this tribe of animals; one of the largest of which he found to possess a highly complicated structure with regard to many organs: with respect to the nutritive function, he found a head provided with a regular apparatus for mastication, consisting of jaws having from two to six teeth, which were seen actively opening and shutting when the animal was taking its food.

As we ascend higher in the scale of existence, we find the digestive apparatus ceasing to be simple cavities, or canals hollowed out of the substance of the body, and becoming distinct organs formed by membranes and coats proper to each; and among these, the first example occurs in the sea anemone, in which we find spaces intervening between the coats of the stomach and the skin of the animal: here, however, the stomach is still a blind pouch, one aperture serving alike for receiving and ejecting the alimentary matters. In the *echini* or sea-urchins these organs are still more perfect. Those of mastication are peculiarly developed; an œsophagus or gullet also presents itself, and a stomach continued into a regular intestine, which takes two turns in the body before it terminates.

DESIGN IN THE FORMATION OF INSECTS.

In the digestive organs of insects we meet with a multitude of new and peculiar formations, while most of the simple forms found in the lower animals are here repeated. The organs of mastication, deglutition, and suction, present such remarkable differences, that the arrangements of modern systems of entomology have been chiefly founded on them. In this order of animals, nutrition by vegetable substances is much more common than in those below it; indeed, as Blumenbach has observed, the business of nutrition in insects does not seem to have for its object the mere preservation of the individual, as in most red-blooded animals, but chiefly the consumption of organised matter, which will appear from considering the structure of their alimentary canal. In most of those which are subject to a metamorphosis, the stomach in the larva state is of a great size in comparison with the short intestinal canal; while those, on the contrary, which take little or no nourishment in their perfect state, have this organ remarkably diminished, and, as it were, contracted. How beautifully does the great size and straight course of the intestinal apparatus of the animal, when in its caterpillar state, coincide with its enormous voracity and quick digestion! It has been computed that caterpillars sometimes devour and digest no less than three times their own weight of aliment in four-and-twenty hours. On the other hand, during the subsequent metamorphosis which the animal undergoes, no food is taken; but nature, or rather the God of nature, has wonderfully, and with beneficent design, provided against any necessity for this, by causing insects to become very fat, as observed by Malpighi, on the approach of these changes; so that this fat, being absorbed into the blood while these are going on, serves all the purposes of a supply of alimentary matters from without. The insects now under consideration exhibit at different periods of their existence the greatest contrasts, not only in external form, but also in their habits, instincts, and modes of subsistence. The larva, as we have seen, is remarkable for its voracity, requiring large supplies of food, and consuming enormous quantities of vegetable matter; the perfect insect or butterfly, having attained its full dimensions, is sufficiently supported by small quantities of a more nutritious food, consisting either of animal juices or of the fluids prepared by flowers, which are generally of a saccharine quality, and contain nourishment in a highly concentrated form. It is evident that the same apparatus which is necessary for the digestion of the bulky food taken in during the former period, would not be suited for the assimilation of that which is received during the latter; and that, in order to accommodate it to this altered condition of its function, considerable changes must be made in its structure. Who can believe that these changes are made without wisdom, or persuade themselves that all this is to be brought about by causes divested of knowledge and understanding? Dr Roget, in his admirable Bridgewater Treatise, has beautifully illustrated the subject, by very clear and correct drawings by Mr Newport, of the three different states of the entire alimentary canal of the privet hawkmoth (*Sphinx ligustri*): first, when a caterpillar; then as a chrysalis; and, lastly, as the moth: and of these, taking our text from Roget, or rather from Herold, we shall endeavour to give some account. We have seen that in the caterpillar the stomach forms by far the most considerable portion of the alimentary canal, bearing some resemblance in its structure and capacity to the stomachs of certain worms. This is followed by a large but short and perfectly straight intestine. In the chrysalis, these organs have undergone considerable modifications; the whole canal, but more especially the stomach, being contracted both in length and width: the shortening of the intestine not being proportionate to that of the whole body, obliges it to be folded upon itself for a certain length. In the moth, the contraction of the stomach has proceeded much farther, and an additional cavity, which may be considered as a kind of craw, is developed; the small intestine takes a great many turns during its course, and a large pouch has been formed at the part where it joins the large intestine. "When we consider," say Kirby and Spence, speaking of the phenomena which we have detailed, "the adaptation of all these changes of form, the loss of old organs and the acquisition of new ones, to the functions and mode of life of the animal, we see evidently the all-powerful hand of that Almighty Being who erected the universe, upholding by his providence, and the law that he has given to every creature, the system that he at first brought into existence."

In insects, all parts concerned in digestion are in general smaller and less complicated in the carnivorous than in the herbivorous tribes, apparently from the matters on which the former subsist being already animalised, and requiring, therefore, less preparation before they are received into the blood; and it is no slight indication of design, to observe in them how admirably parts are adapted to the animal necessities. Thus, scorpions, spiders, millepedes, and others which live for the most part on hard animal substances, are furnished with jaws of a firm horny texture, in many cases very large, when compared with the size of the animal; dragon-flies and beetles, particularly the stag-beetle, are examples in which the jaws are very large and manifest, often possessing tooth-like edges; and these, too, feed on smaller insects than themselves. In another description, of which the bee, wasp, and ant, are examples, we find the animal deserting the coarser kinds of food, living chiefly on juices; and in them also we again find the same mode of taking in nourishment, as in the lowest stages of the animal kingdom, viz. by means of organs of suction, which here, however, are combined with organs for mastication. These organs of suction are still more developed in insects, such as gnats, house-flies, &c.; in them they consist of a tube, of which the sides are strong and fleshy, and moveable in every direction, like the trunk of an elephant, and having at its extremity a double fold, resembling lips which are well adapted for suction. The gnat, and other insects which pierce the skin of animals, have for this purpose instruments termed *lancets*, from their shape and office. In the gnat they are five or six in number, finer than a hair, exceedingly sharp, and generally barbed on one side; while in the house-fly they are flat, like the blade of a knife. In the butterflies, however, which are almost wholly independent of solid nutritive matter, these organs present themselves in the greatest perfection, and without any addition of teeth. The proboscis of this order of insects is a double tube, constructed by the two edges being rolled longitudinally till they meet in the middle of the lower surface, thus forming a tube on each side, but leaving also another tube, intermediate to the two lateral ones. This middle tube is formed by the junction of two grooves, which, by the aid of a curious apparatus of hooks, lock into each other, and can be either united into an air-tight canal, or be instantly separated at the pleasure of the animal.* It would be quite incompatible with the nature of this essay to enter at greater length into the evidences of design, deducible from the digestive apparatus of insects. "This immense class," says Cuvier, "in the structure of their alimentary canal, exhibit as many variations as those of all the vertebral animals together: there are not only the differences that strike us in going from family to family, and from species to species, but one and the same individual has often a canal quite different, according as we examine it in its larva or imago state;† and all these variations have relations very exact, often easily estimable, with the temporary or constant mode of life of the animals in which it is observable." That this statement is correct, we have seen; and no one can be blind enough to deny that it evinces an origin of things quite incompatible with mere brute and uncertain chance.

DESIGN IN THE FORMATION OF FISHES.

Still ascending in the scale of creation, we come to the contemplation of fishes. We ask, was it by mere chance that the respiratory apparatus of fishes was so formed that their blood receives its vivifying principle from the air which is held in solution by the water in which they move? And who cannot, in this one instance, but discern the hand of a ruling Providence, adapting the structure of animals to the habits which are to characterise them? Was it by chance that, in the plaice, the sole, the turbot, and other flat fishes, the eyes are placed both on one side of the body, an isolated instance of a want of uniformity in the two sides? No; the design is obvious: for as these animals are destined to continue always with one side in the mud at the bottom of the water, an eye on this side would have been superfluous and inconvenient to them. The same design and evident adaptation of structure to circumstances is apparent in the Surinam sprat. This singular animal generally swims so near the surface, that its eye is partly in and partly out of the water; and all its parts correspond with this strange peculiarity, the pupil being partially divided into an upper and a lower portion, and the lens consisting of two globes, an upper and a lower one attached together. It appears that the superior part of the eye is, like that of terrestrial animals, adapted to refract rays transmitted by air, and the inferior part, like that of aquatic animals, those transmitted by water, and that the refracting power of the several parts of the eye is accordingly much less above than below. With regard to the function of hearing, we find in fishes the Creator still proceeding on one vast plan or unity of design; with the exception of one species, all the parts of the ear are buried within the skull, and send no process to the surface; and this is precisely what we should have looked for in beings destined to hear through the medium of water, the vibrations of which, being so much more powerful than those of air, would render the complicated apparatus requisite in terrestrial animals, in them superfluous. In the class of fishes, we see the lowest condition of the alimentary canal as it is found in vertebral animals. Fishes, voracious to a proverb, subsist almost entirely on animal food. The ocean teems chiefly with animal life. It is a dense, and rich, and moving, and tempestuous element, where vegetation is comparatively small, contrasted with its developement in the light and unresisting element of the atmosphere. This rich and resisting element of water abounds in every latitude and in every drop, with all forms of animated beings. Thus, fishes have the means of easily satisfying their voracious appetites with a selection of all kinds of food. Their teeth, more instruments of prehension than mastication, are sharp, recurved, dense, and pointed cones, adapted to grasp and retain every living thing that moves in the waters, and placed in all parts of the mouth of these all-devouring animals; their œsophagus or gullet is very wide and short, and directly opening into their capacious stomach. Thus, the food of fishes not being masticated in the mouth, does not dwell there; and as they are surrounded with an abundance of moisture, they require no salivary glands for lubricating the food, and they have none. Like larvæ, their stomachs are very large; and like them, also, they are chiefly intent upon the gratification of their appetites. All other senses seem to be absorbed in this. Their brain is very small, and their senses correspondingly obtuse.* The intestine of fishes varies considerably in length, according to the kind of food; but, generally speaking, it is not longer than their bodies; whereas, in most reptiles—which compose the next class of animals in the ascending scale—it is considerably longer; a provision unnecessary in fishes, perhaps, from the matters on which they for the most part feed, being almost always of the same nature as their own bodies, and, therefore, requiring comparatively little preparation.

Relinquishing our plan of illustrating design by an account of the digestive apparatus, let us consider, in reptiles, the organs subservient to the function of respiration, which, though somewhat similar to birds and mammiferous animals, differ from it in some remarkable particulars. The former are indeed furnished, like the two latter, with a kind of lungs, but, unlike them, they are membranous and not fleshy; that is to say, the cells which they contain are so much larger as to give them a membranous and not a fleshy appearance; nay, in many reptiles the lungs consist of one membranous bag, very similar to the air-bladder of fishes. These lungs or bags are situated in the abdomen, and are loose and floating among the entrails; and they receive their supply of air, in general, not as in birds and mammiferous animals, in consequence of the formation of a vacuum around them, but by a process very similar to that of swallowing. Hence, reptiles, unlike the higher classes of animals, can still continue to breathe if their bodies are cut open, because they do not require a vacuum round the lungs. The air thus received is subservient to the purification of the blood in the usual manner; but it is not so immediately vitiated as air received into fleshy lungs, owing to the larger size of the cells, which do not immediately allow the whole of it to come into contact with their sides. This is one reason why reptiles can sustain an impediment to their respiration for a much longer time than birds and mammals; but another and a much better reason is to be found in the distribution of their blood-vessels, those going to the lungs not forming a necessary part of the general circulating system, but constituting, as it were, only an appendage to it, which may for a time cease to transmit blood without inconvenience. A fish was destined always to be in the water,

* Roget, vol. ii., p. 114.

† Imago or perfect state.

* Grant's Lectures.

and a bird or quadruped always in the air; and hence the structure of their respiratory, as well as circulating system, is such as to incapacitate them each for the other element.

DESIGN IN THE FORMATION OF BIRDS.

We come now to birds; and whether we consider their external form or anatomical structure, or in whatever light it is possible to view them, the same conclusion presents itself to the mind. Inexhaustible contrivance, vast and comprehensive intelligence, are every where conspicuous. Behold, in their pointed bill, and gradually enlarging head and neck, a means of penetrating the yielding air; then the prow-like breast, the flexible rudder tail, the equipoised wings, and feathers at once adapted for lightness, for strength, and for tenacity, and all bearing relations, not only to each other, but to the air in which the animal is to fly: the wise contrivance of these could not be the result of chance. The investing membranes of their lungs, prolonged from various parts of their surface in the form of tubes, and expanding into bags, enveloping almost all the entrails, so as to keep them constantly surrounded with air, and similar prolongations extending also into the cavity of their bones, serving to inflate these in the same manner—are not these peculiarities for the obvious purpose of giving lightness to the animal, and thus enabling it to support itself in the air?—and does not this palpable subserviency of one part of the structure of birds to the rest, irresistibly inculcate the truth that one master-hand has regulated the whole? Can this correspondence be the work of a blind chance?—or does it imply an unity of design, an extent of benevolence, and a vastness of power, indicative of a ruling Providence?—the great architect alike of the star of the firmament and of the mite which plays in the sunbeam—whose hand is traced equally in the immensities of magnitude and minuteness—the Almighty Father of the universe, and of every thing which astounds and delights us in its construction.

In the beaks or bills of birds, various as are their forms, we can trace an exact adaptation to the food of the species. In those that tear their prey, as the eagle and hawk—or bruise hard fruits, as the parrot—or penetrate the bark of trees, as the woodpecker—the bills are of extraordinary hardness, and, in form, intimately connected with the habits of the animal. In those to whom a sense of feeling in this part is necessary to enable them to find their food in mud or water, as the duck, it is very soft, generally flattened, and so constructed that fluids may filter through it, while the solid food is retained. A bill hooked at the end, with sharp edges, characterises birds of prey. Another species of strong sharp-edged bill, of an elongated shape, but without a hook, serves to cut and break, but not to tear; and this is the form of the bill in birds which live upon animals which make resistance in the water; some of these are straight, as in the heron—others curved, some downwards, some upwards. Some sharp-edged bills have their sides approximating, like the blade of a knife to its handle, and thus adapted to seize small substances; as the penguin. The small, conical, arched bill of poultry, serves only to take up grain. The bills of the smaller birds present all the varieties of the conical form, from the broad-based cone of the hawfinch to the thread-like cone of the humming-bird. Such of them as have strong short bills, live on grain; those with long thin ones, on insects. Where the bill is short, flat, opening very anteriorly, as in martens and swallows, the bird seizes flies and butterflies in the air; and if it be long and curved, possessing some strength, we find it grubs up worms for its food. The same evidence of design which we discover in the bills of birds adapting them to procure the kind of food on which the individual is to subsist, is apparent also in the conformation of their digestive organs. As the food of birds varies from the softest animal matter to the hardest grain, so we observe every gradation in the structure of their stomachs, from the membranous sac of the carnivorous tribes to the true muscular gizzard of granivorous birds varying according as the food consists of animal or vegetable materials, or presents more or less resistance from the cohesion of its texture.

In no branch of natural history do we find more remarkable evidences of design, than in the varieties of kinds of covering of animals adapted to their wants and situations on the globe. The covering of birds, in particular, "cannot (says Paley) escape the most vulgar observation. Its lightness, its smoothness, its warmth:—the disposition of the feathers all inclined backward, the down about their stem, the overlapping of their tips, their different configuration in different parts, not to mention the variety of their colours, constitute a vestment for the body, so beautiful, and so appropriate to the life which the animal is to lead, as that, I think, we should have had no conception of any thing equally perfect, if we had never seen it, or can now imagine any thing more so. Let us suppose (what is possible only in supposition) a person who had never seen a bird, to be presented with a plucked pheasant, and bid to set his wits to work how to contrive for it a covering which shall unite the qualities of warmth, levity, and least resistance to the air, and the highest degree of each; giving it also as much of beauty and ornament as he could afford. He is the person to behold the work of the Deity, in this part of his creation with the sentiments which are due to it.

The commendation which the general aspect of the feathered world seldom fails of exciting, will be increased by farther examination. It is one of those cases in which the philosopher has more to admire than the common observer. Every *feather* is a mechanical wonder. If we look at the quill, we find properties not easily brought together—strength and lightness. I know few things more remarkable than the strength and lightness of the very pen with which I am writing. If we cast our eye to the upper part of the stem, we see a material, made for the purpose, used in no other class of animals, and in no other part of birds; tough, light, pliant, elastic. The pith, also, which feeds the feathers, is, amongst animal substances, *sui generis*; neither bone, flesh, membrane, nor tendon.

But the artificial part of a feather is the beard, or, as it is sometimes I believe called, the vane. By the beards are meant, what are fastened on each side of the stem, and what constitute the breadth of the feather; what we usually strip off from one side or both, when we make a pen. The separate pieces or laminæ of which the beard is composed, are called threads, sometimes filaments, or rays. Now, the first thing which an attentive observer will remark is, how much stronger the beard of the feather shows itself to be, when pressed in a direction perpendicular to its plane, than when rubbed, either up or down, in the line of the stem; and he will soon discover the structure which occasions this difference, viz. that the laminæ whereof these beards are composed, are flat, and placed with their flat sides towards each other; by which means, whilst they *easily* bend for the approaching of each other, as any one may perceive by drawing his finger ever so lightly upwards, they are harder to bend out of their plane, which is the direction in which they have to encounter the impulse and pressure of the air, and in which their strength is wanted, and put to the trial.

This is one particularity in the structure of a feather: a second is still more extraordinary. Whoever examines a feather, cannot help taking notice that the threads or laminæ of which we have been speaking, in their natural state *unite*; that their union is something more than the mere apposition of loose surfaces; that they are not parted asunder without some degree of force; that nevertheless there is no glutinous cohesion between them; that, therefore, by some mechanical means or other, they catch or clasp among themselves, thereby giving to the beard or vane its closeness and compactness of texture. Nor is this all: when two laminæ which have been separated by accident or force are brought together again, they immediately *reclasp*: the connection, whatever it was, is perfectly recovered, and the beard of the feather becomes as smooth and firm as if nothing had happened to it. Draw your finger down the feather, which is against the grain, and you break, probably, the junction of some of the contiguous threads; draw your finger up the feather, and you restore all things to their former state. This is no common contrivance: and now for the mechanism by which it is effected. The threads or laminæ above mentioned are *interlaced* with one another, and the interlacing is performed by means of a vast number of fibres, or teeth, which the laminæ shoot forth on *each side*, and which hook and grapple together. A friend of mine counted fifty of these fibres in one twentieth of an inch. These fibres are crooked, but curved after a different manner; for those which proceed from the thread on the side towards the extremity of the feather, are longer, more flexible, and bent downwards; whereas those which proceed from the side towards the beginning, or quill end of the feather, are shorter, firmer, and turn upwards. The process, then, which takes place, is as follows:—When two laminæ are pressed together, so that these long fibres are forced far enough over the short ones, *their* crooked parts fall into the cavity made by the crooked parts of the others, just as the latch that is fastened to a door enters into the cavity of the catch fixed to the door-post, and there hooking itself, *fastens* the door; for it is properly in this manner that one thread of a feather is fastened to the other.

This admirable structure of the feather, which it is easy to see with the microscope, succeeds perfectly for the use to which nature has designed it; which use was, not only that the laminæ might be united, but that, when one thread or lamina has been separated from another by some external violence, it might be reclasped with sufficient facility and expedition.

In the *ostrich*, this apparatus of crotchets and fibres, of hooks and teeth, is wanting; and we see the consequence of the want. The filaments hang loose and separate from one another, forming only a kind of down; which constitution of the feathers, however it may fit them for the flowing honours of a lady's head-dress, may be reckoned an imperfection in the bird, inasmuch as wings, composed of these feathers, although they may greatly assist it in running, do not serve for flight.

But under the present division of our subject, our business with feathers is, as they are the *covering* of the bird. And herein a singular circumstance occurs. In the small order of birds which winter with us, from a snipe downwards, let the external colour of the feathers be what it will, their Creator has universally given them a bed of *black* down next their bodies. Black, we know, is the warmest colour: and the purpose here is, to *keep* in the heat arising from the heart and circulation of the blood. It is farther likewise remarkable, that this is not found in larger birds; for which there is also a reason:—Small birds are much more exposed to the cold than large ones; forasmuch as they present, in proportion to their bulk, a much larger surface to the air. If a turkey were divided into a number of wrens (supposing the shape of the turkey and the wren to be similar), the surface of all the wrens would exceed the surface of the turkey, in the proportion of the length and breadth (or of any homologous line) of a turkey to that of a wren; which would be, perhaps, a proportion of ten to one. It was necessary, therefore, that small birds should be more warmly clad than large ones; and this seems to be the expedient by which that exigency is provided for.

The *oil* with which birds prune their feathers, and the organ which supplies it, is a specific provision for the winged creation. On each side of the rump of birds is observed a small nipple, yielding upon pressure a butter-like substance, which the bird extracts by pinching the pap with its bill. With this oil or ointment thus procured, the bird dresses its coat, and repeats the action as often as its own sensations teach it that it is in any part wanted, or as the excretion may be sufficient for the expence. The gland, the pap, the nature and quality of the excreted substance, the manner of obtaining it from its lodgment in the body, the application of it when obtained, form, collectively, an evidence of intention which it is not easy to withstand. Nothing similar to it is found in unfeathered animals. What blind *conatus* of nature should produce it in birds? should not produce it in beasts?"

As we have entered so fully into this subject when treating of other classes of beings, we shall not here revert to it, or bring forward illustrations of the truth of our proposition; the facts already detailed seem sufficient to display the wisdom which the great Creator has evinced in this department of the animal world. Nothing can be more worthy of remark than the exhaustless contrivances by which every difficulty is obviated, and nature moulded to the will of its Almighty Author. How many obstacles were to be overcome before a heavy body like that of an eagle or the mighty condor could be rendered buoyant in the air, and made to track its adventurous course so high above the earth as to be almost lost to human gaze! How many conditions were necessary to give safety and enjoyment to the smallest of the winged tribes, even after the first obstacles were overcome! Yet how wonderfully simple and efficacious the means by which the whole has been accomplished! That man is indeed to be pitied who can turn even a transient glance on such a subject, without being lost in astonishment and admiration.

THE STRUCTURE OF MAN AND OTHER ANIMALS.

We now arrive at the consideration of the mammalia, or those animals which suckle their young; and at the head of this great class we find man proudly pre-eminent. We have already seen, that, as the materials on which the function of digestion is to be performed are numerous and diversified, so a difference exists in the parts which are subservient to it. Without altering the general plan of the function, or the essential parts of the organs concerned in it, nature makes such additional provisions, in the instincts by which the reception of food is guided, and in the organs by which it is assimilated, as are suited to the circumstances in which the animal is placed, to the food on which it is to subsist, and to the ulterior purposes which it is to serve in the world. Such evidences of design are very remarkable in the mammalia; and in few organs are they more powerfully instanced than in the teeth, between which, in form, structure, and position, and the kind of food on which each animal of this class is intended to subsist, the most intimate connections present themselves. These relations—which indeed may be also traced in the shape of the jaw, in the mode of its articulation with the head, in the proportional size and distribution of the muscles which move the jaw, in the form of the head itself, in the length of the neck and its position on the trunk, and, in fact, in the whole conformation of the skeleton—have been noticed from very early ages, and frequently described.

The purposes answered by the teeth are principally those of seizing and detaining whatever is introduced into the mouth, of cutting it asunder and dividing it into smaller pieces, of loosening its fibrous structure, and of breaking down and grinding its harder portions. Four principal forms have been given to teeth, which accordingly may be distinguished into the conical, the sharp-edged, the flat, and the tubercolated teeth; though we occasionally find a few intermediate modifications of these forms. It is easy to infer the particular functions of each class of teeth, from the obvious mechanical actions to which, by their form, they are especially adapted. The conical teeth, which are generally also sharp-pointed, are principally employed in seizing, piercing, and holding objects; such are the offices they perform in the crocodile and similar reptiles, where all the teeth are of this structure: and such also are their uses in most of the cetacea or whale tribe, where similar forms and arrangements of teeth prevail. The animals subsist on fish, and their teeth are therefore constructed very much on the model of those of fish; while those cetacea, on the other hand, which are herbivorous, as the manatus and dugong, have teeth very differently formed.

The sharp-edged teeth perform the office of cutting and dividing the yielding textures presented to them: they act individually as wedges or chisels; but when co-operating with similar teeth in the opposite jaw, they have the power of cutting like shears or scissors. The flat teeth, of which the surfaces are generally rough, are used, in conjunction with those meeting them in the opposite jaw, for grinding down the food by a lateral motion, in a manner analogous to the operation of millstones in a mill. The tuberculated teeth, of which the surfaces present a number of rounded eminences, corresponding to depressions in the teeth opposed to them in the other jaw, act more by their direct pressure in breaking down hard substances, and pounding them, as they would be in a mortar.

The apparatus for giving motion to the jaws is likewise varied according to the particular movements required to act upon the food in the different tribes. The articulation of the lower jaw to the skull is somewhat similar to a hinge; but considerable latitude is given to its motions by the interposition of a moveable cartilage between the two surfaces of articulation, a contrivance admirably answering the intended purpose. Hence, in addition to the principal movements of opening and shutting, which are made in a vertical direction, the lower jaw has also some degree of mobility in a horizontal or lateral direction, and is likewise capable of being moved backwards or forwards to a certain extent. In the conformation of the teeth and jaws, a remarkable contrast is presented between carnivorous and herbivorous animals. In the former, of which the tiger may be taken as an example, the whole apparatus for mastication is calculated for the destruction of life, and for tearing and dividing the fleshy fibres. The teeth are armed with pointed eminences, which correspond in the opposite jaws so as exactly to lock into one another, like wheelwork, when the mouth is closed, and the muscles which close it are of enormous size and strength. In the herbivorous animals, on the contrary, as in the antelope, the greatest force is bestowed, not so much on the motions of opening and shutting, as on those which are necessary for grinding, and which act in a lateral direction. The surfaces of the teeth are flattened and of great extent; and they are at the same time kept rough, like those of millstones, their office being in fact very similar to that performed by these implements of grinding. The *Rodentia*, or gnawing quadrupeds, are formed for subsisting on dry and tough materials, such as the bark and roots, and even the woody fibres of trees, and the harder animal textures; and their teeth are expressly adapted for gnawing, nibbling, and wearing away, by continued attrition, the harder texture of organised bodies. They are all furnished with two front teeth, generally very long, and having the exact shape of a chisel; while the molar or back teeth have surfaces irregularly marked with raised zig-zag lines, rendering them very perfect instruments of trituration. The beaver and rat are examples among omnivorous rodentia, and the hare and rabbit among those that are principally herbivorous.

The *Quadrumana*, or monkey tribes, approach nearer to the human structure in the conformation of their teeth, which are adapted to a mixed kind of food; while the other orders of mammalia exhibit gradations in the structure of their teeth corresponding to the varieties in the nature of their food. Thus, the teeth and jaws of the hyæna are formed more especially for breaking bones, while those of the sea-otter have rounded eminences, which peculiarly fit them for breaking shells.

"On comparing the structure of the digestive organs of man," continues Dr Roget,* "with those of other animals belonging to the class mammalia, we find them holding a place in the series intermediate between those of the purely carnivorous and exclusively herbivorous tribes, and in some measure uniting the characters of both. The powers of the human stomach do not indeed extend to the digestion of either the tough woody fibres of vegetables on the one hand, or the compact texture of bones on the other; but still they are competent to extract nourishment from a wider range of alimentary substances than the digestive organs of almost any other animal. This adaptation to a greater variety of food may also be inferred from the form and disposition of the teeth, which combine those of different kinds more completely than in most mammalia. In addition to these peculiarities, we may also here observe, that the sense of taste in the human species appears to be affected by a greater variety of objects than in the other races of animals. All these are concurring indications that nature, in thus rendering man omnivorous, intended to qualify him for maintaining life wherever he could procure the materials of subsistence, whatever might be their nature, whether animal or vegetable, or a mixture of both, and in whatever soil or climate they may be produced; and for endowing him with the power of spreading his race, and extending his dominion over every accessible region of the globe. Thus, then, from the consideration of the peculiar structure of the organs of his frame, may be derived proofs of their being constructed with reference to faculties of a higher and more extensive range than those of any, even the most favoured, species of the brute creation."

There is one circumstance connected with the function of digestion, as displayed in certain of the mammalia, to which, as evidencing great and wonderful design and accommodation in structure to circumstance, we would particularly allude; it is the facility and power of the camel of abstaining long from drinking—a power which he is often necessitated to bring into effect during the long period of nine, ten, or even twelve days. In Arabia, the camel is the chief beast of burden; and travelling through a country such as it, it is only at long intervals that water can be obtained; a country, as described by Buffon, without verdure, without water, possessing a burning sun, an air always parched, sandy plains, mountains still more scorched, which the eye runs over without perceiving a single animated being; a dead earth perpetually tossed with the winds, and presenting nothing but bones, scattered flints, rocks perpendicular or overturned; a desert totally void, where the traveller never breathes under a shade, where nothing accompanies him, nothing recals the idea of animated nature; absolute solitude, more dreadful than that of the deepest forests, more solitary and naked, more lost in an unlimited void; he every where beholds space surrounding him as a tomb. The light of day, more dismal than the darkness of night, serves only to give him a clearer view of his own wretchedness and impotence, and to conceal from him the barriers of the void, by extending around him that immense abyss which separates him from the habitable parts of the earth; an abyss which in vain he should attempt to traverse, for hunger, thirst, and scorching heat, haunt every moment that remains to him between despair and death. Frightful as is this picture, the desire of lucre, or the gratification of a curiosity, and a love of enterprise no less insatiable, often tempt men to traverse the sandy deserts of Arabia. For their own necessities they may provide, but no human means could afford the possibility of conveying water sufficient to satisfy the longings of the beasts of burden which accompany these expeditions. It is by the singular structure of the camel's stomach that it is enabled to pass several days without drinking, and to take at a time a prodigious quantity of water, which remains in reservoirs pure and limpid, because these wells are so contrived that neither the fluids of the body nor of digestion can mix with it. What design is here!—and how redolent of wisdom, and how full of mercy! But let us endeavour to explain the nature of this structure which so evidently adapts the camel to be the inhabitant of the sterile and arid regions of the east:—Ruminating quadrupeds, or those which chew the cud, have two, three, or four stomachs, distinguished—when there are four—by the names of paunch, bonnet, many-plies, and caille. When the food is swallowed for the first time, it passes directly from the gullet into the paunch, where it undergoes some necessary changes, and it is then transmitted to the bonnet, to be mixed with the fluids of the cavity. This process is going on during the time the animal is grazing, when, from the incessant occupation of nipping off the grass, for which its teeth are so admirably suited, it has not leisure to chew it sufficiently. When afterwards reposing itself, however, the half chewed aliment is brought again, in successive little balls, from the bonnet into the mouth, where it is subjected to a perfect mastication; and when again swallowed, it passes directly to the many-plies, thence, after some time, to the caille, and ultimately to the intestines. In the camel, however, the paunch has two deep cellular appendages; and the bonnet, or second stomach, has its internal membrane hollowed into numerous deep cells, serving as reservoirs of water, to be used only as occasion requires; while the third stomach is alone appropriated to the immediate necessities of the body. Between the end of the gullet, then, and the orifice of this third stomach, extends, through the two first, a long muscle capable of drawing up the third stomach, so as to receive alimentary matters directly from the gullet, when the immediate wants of the animal are to be supplied; but when the fluid taken is meant to be used only in its long journeys through the deserts, this muscle is relaxed, and it is thus received into the two first stomachs, and transmitted onwards by these only at the necessary intervals. The Arabs who traverse these extensive plains, accompanied by these useful animals, are, it is said, sometimes obliged, when faint and in danger of perishing from thirst, to kill one of their camels, for the sake of the water contained in these reservoirs, which is always found pure and wholesome. It is stated by those who have travelled in Egypt, that camels, when accustomed to go journeys during which they are for a long time deprived of water, acquire the power of dilating the cells, so as to make them contain a more than ordinary quantity, as a supply for their journey.

COMPENSATION OF PARTS IN ANIMATED NATURE.

The evidences of design in creation are beautifully developed in what is called the compensatory structure of animals. By this is signified the supplying the defects of one organ by the structure of another part or organ. Paley has summed up a few striking instances of this nature. "The short unbending neck of the elephant (says he) is compensated by the length and flexibility of his *proboscis*. He could not have reached the ground without it; or, if it be supposed that he might have fed upon the fruit, leaves, or branches of trees, how was he to drink? Should it be asked, Why is the elephant's neck so short? it may be answered, that the weight of a head so heavy could not have been supported at the end of a longer lever. To a form, therefore, in some respects necessary, but in some respects also inadequate to the occasions of the animal, a supplement is added, which exactly makes up the deficiency under which he laboured.

If it be suggested that this proboscis may have been produced, in a long course of generations, by the constant endeavour of the elephant to thrust out his nose (which is the general hypothesis by which it has lately been attempted to account for the forms of animated nature), I would ask, How was the animal to subsist in the meantime, during the process, *until* this prolongation of snout were completed? What was to become of the individual whilst the species was perfecting?

Our business at present is simply to point out the relation which this organ bears to the peculiar figure of the animal to which it belongs. And herein all things correspond. The necessity of the elephant's proboscis arises from the shortness of his neck; the shortness of the neck is rendered necessary by the weight of the head. Were we to enter into an examination of the structure and anatomy of the proboscis itself, we should see in it one of the most curious of all examples of animal mechanism. The disposition of the ringlets and fibres, for the purpose, first, of forming a long cartilaginous pipe; secondly, of contracting and lengthening that pipe; thirdly, of turning it in every direction at the will of the animal; with the superaddition, at the end, of a fleshy production of about the length and thickness of a finger, and performing the office of a finger, so as to pick up a straw from the ground—these properties of the same organ taken together, exhibit a specimen not only of design (which is attested by the advantage), but of consummate art, and, as I may say, of elaborate preparation, in accomplishing that design.

The hook in the wing of a *bat* is strictly a mechanical, and also a *compensating*, contrivance. At the angle of its wing there is a bent claw, exactly in the form of a hook, by which the bat attaches itself to the sides of rocks, caves, and buildings, laying hold of crevices, joinings, chinks, and roughnesses. It hooks itself by this claw; remains suspended by this hold; takes its flight from this position: which operations compensate for the decrepitude of its legs and feet. Without her hook, the bat would be the most helpless of all animals. She can neither run upon her feet, nor raise herself from the ground. These inabilities are made up to her by the contrivance in her wing; and in placing a claw on that part, the Creator has deviated from the analogy observed in winged animals. A singular defect required a singular substitute.

The *crane* kind are to live and seek their food amongst the waters, yet, having no web-feet, are incapable of swimming. To make up for this deficiency, they are furnished with long legs for wading, or long bills for groping; or usually with both. This is *compensation*. But I think the true reflection upon the present instance is, how every part of nature is tenanted by appropriate inhabitants. Not only is the surface of deep waters peopled by numerous tribes of birds that swim, but marshes and shallow pools are furnished with hardly less numerous tribes of birds that wade.

The common *parrot* has, in the structure of its beak, both an inconveniency and a *compensation* for it. When I speak of an inconveniency, I have a view to a dilemma which frequently occurs in the works of nature, viz., that the peculiarity of structure by which an organ is made to answer one purpose, necessarily unfits it for some other purpose. This is the case before us. The upper bill of the parrot is so much hooked, and so much overlaps the lower, that if, as in other birds, the lower chap alone had motion, the bird could scarcely gape wide enough to receive its food; yet this hook and overlapping of the bill could not be spared, for it forms the very instrument by which the bird climbs; to say nothing of the use which it makes of it in breaking nuts and the hard substances upon which it feeds. How, therefore, has nature provided for the opening of this occluded mouth? By making the upper chap moveable, as well as the lower. In most birds the upper chap is connected, and makes but one piece, with the skull; but in the parrot, the upper chap is joined to the bone of the head by a strong membrane placed on each side of it, which lifts and depresses it at pleasure.

The *spider's web* is a *compensating* contrivance. The spider lives upon flies, without wings to pursue them; a case, one would have thought, of great difficulty, yet provided for, and provided for by a resource which no stratagem, no effort of the animal, could have produced, had not both its external and internal structure been specifically adapted to the operation.

In many species of insects the eye is fixed, and, consequently, without the power of turning the pupil to the object. This great defect is, however, perfectly *compensated*, and by a mechanism which we should not suspect. The eye is a multiplying glass, with a lens looking in every direction, and catching every object; by which means, although the orb of the eye be stationary, the field of vision is as ample as that of other animals, and is commanded on every side. When this lattice-work was first observed, the multiplicity and minuteness of the surfaces must have added to the surprise of the discovery. Adams tells us that fourteen hundred of these reticulations have been counted in the two eyes of a drone-bee.

* Bridgewater Treatise.

In other cases the *compensation* is effected by the number and position of the eyes themselves. The spider has eight eyes, mounted upon different parts of the head; two in front, two in the top of the head, two on each side. These eyes are without motion, but, by their situation, suited to comprehend every view which the wants or safety of the animal render it necessary for it to take.

The Memoirs for the Natural History of Animals, published by the French Academy in the year 1667, furnish us with some curious particulars in the eye of a chameleon. Instead of two eyelids, it is covered by an eyelid with a hole in it. This singular structure appears to be *compensatory*, and to answer to some other singularities in the shape of the animal. The neck of the chameleon is inflexible. To make up for this, the eye is so prominent, as that more than half of the ball stands out of the head; by means of which extraordinary projection, the pupil of the eye can be carried by the muscles in every direction, and is capable of being pointed towards every object. But then, so unusual an exposure of the globe of the eye requires, for its lubricity and defence, a more than ordinary protection of eyelid, as well as a more than ordinary supply of moisture; yet the motion of an eyelid, formed according to the common construction, would be impeded, as it should seem, by the convexity of the organ. The aperture in the lid meets this difficulty. It enables the animal to keep the principal part of the surface of the eye under cover, and to preserve it in a due state of humidity without shutting out the light; or without performing every moment a nictitation, which, it is probable, would be more laborious to this animal than to others.

But the works of the Deity are known by expedients. Where we should look for absolute destitution, where we can reckon up nothing but wants, some contrivance always comes in to supply the privation. A *snail*, without wings, feet, or thread, climbs up the stalks of plants, by the sole aid of a viscid humour discharged from her skin. She adheres to the stems, leaves, and fruits of plants, by means of a sticking-plaster. A *mussel*, which might seem, by its helplessness, to lie at the mercy of every wave that went over it, has the singular power of spinning strong tendinous threads, by which she moors her shell to rocks and timbers. A *cockle*, on the contrary, by means of its stiff tongue, works for itself a shelter in the sand. The provisions of nature extend to cases the most desperate. A *lobster* has in its constitution a difficulty so great, that one could hardly conjecture beforehand how nature would dispose of it. In most animals, the skin grows with their growth. If, instead of a soft skin, there be a shell, still it admits of a gradual enlargement. If the shell, as in the tortoise, consists of several pieces, the accession of substance is made at the sutures. Bivalve shells grow bigger by receiving an accretion at their edge; it is the same with spiral shells at their mouth. The simplicity of their form admits of this. But the lobster's shell being applied to the limbs of the body, as well as to the body itself, allows not of either of the modes of growth which are observed to take place in other shells. Its hardness resists expansion, and its complexity renders it incapable of increasing its size by addition of substance to its edge. How, then, was the growth of the lobster to be provided for? Was room to be made for it in the old shell, or was it to be successively fitted with new ones? If a change of shell became necessary, how was the lobster to extricate himself from his present confinement? how was he to uncase his buckler, or draw his legs out of his boots? The process which fishermen have observed to take place, is as follows:—At certain seasons, the shell of the lobster grows soft; the animal swells its body; the seams open, and the claws burst at the joints. When the shell has thus become loose upon the body, the animal makes a second effort, and by a tremulous spasmodic motion, casts it off. In this state, the liberated but defenceless fish retires into holes in the rock. The released body now suddenly pushes its growth. In about eight-and-forty hours, a fresh concretion of humour upon the surface, *i. e.* a new shell, is formed, ad[illegible]ed in every part to the increased dimensions of the animal. This wonderful mutation is repeated every year."

In the changing of the colour of the chameleon, we see one of the beautiful compensatory provisions of nature. This little animal, which is common in the East Indies and some other Asiatic countries, lives upon flies, beetles, or other insects, which it catches by climbing up shrubs or trees, and darting out its tongue; but its pace is slow, and as insects have good eyes to perceive the approach of an enemy, they would be sure to make their escape in the present case, unless the chameleon approached them in disguise. This, therefore, it invariably does. As it passes among green leaves, it is of a green colour; and when it glides by any of a red or yellow tinge, so does it change its hue to red or yellow. So closely does it assume not only the shades and colours, but even the shapes of the leaves around, that a spectator might look at the tree for some minutes before discovering it. How wisely, therefore, has the Creator endowed this poor reptile with the wonderful gift of altering the colour of its skin! for if it were not possessed of such a property, it would inevitably die of hunger.

BEAUTY.

The wisdom of the great original Contriver is eminently manifested in that property of inanimate and animate objects which we call beauty. Here there is an evident fitness betwixt the taste and habits of animals, human beings included, and what can be seen by the eye. We feel pleasure in contemplating the works of nature most obvious to our senses; and we cannot but remark, that that which is loathsome is not ordinarily presented to the eye. The splendid colouring of the vegetable kingdom, the smooth or spotted skins of the brute creation, and the lovely plumage of the feathered tribe, all give us delight in the contemplation. Consider, also, how beautiful is the outward appearance of the human form. Reflect on what the parts and materials are of which the fairest body is composed, and no farther observation will be necessary to show how well these things are wrapped up, so as to form a mass which will be capable of symmetry in its proportion, and of beauty in its aspect; how the bones are covered—the bowels concealed—the roughness of the muscle smoothed and softened; how over the whole is drawn an integument, the skin, which converts the disgusting materials of a dissecting-room into an object of attraction to the sight, or one upon which it rests at least with ease and satisfaction.

The more minutely that we inspect the works of nature, the greater cause have we to wonder at the extraordinary perfection and beauty every where prevalent. The microscope developes splendours in the creation of insects which we can hardly comprehend. The back of a diamond-beetle exhibits an assemblage of brilliant colours and glittering gems more splendid than any artificial arrangement of the most precious stones. The colours of the feathers of birds in tropical climates, and the skins of the fishes of Ceylon, are incomparable for their beauty. And why is all this the case? Because it yields a pleasure to the sight, both of men and other living creatures; for the Creator has not denied the feeling of delight to the meanest reptile which crawls. All is beautiful, it would appear, in the estimation of one or other of living creatures. The most insignificant little flower, now blooming far from the haunts of men, in some remote wilderness, does not, as has been said, waste its sweetness on the desert air. It furnishes an object of pleasing gratification to some description of sentient creatures, perhaps so small as to be imperceptible to our naked eye.

Placing agreeableness of aspect entirely out of the question, there is another purpose answered by the skin, and that is concealment. Were it possible to view through this integument the mechanism of our bodies, the sight would frighten as much as it would disgust us. Durst we make a single movement or stir a step from the place we were in, if we saw our blood circulating, the tendons pulling, the lungs blowing, the humours filtrating, and all the incomprehensible assemblage of fibres, tubes, pumps, valves, currents, pivots which sustain an existence at once so frail, and so presumptuous?

In clothing the human frame with a covering of skin, the Creator has not omitted to vary its character according to local necessities. The skin is most beautiful on the face, because the face is most exposed to observation; it is softest where least liable to injury, and hardest or firmest in texture where it is most subject to be pressed upon. There is not less sign of contrivance in the manner in which it ceases at the extremities of the toes and fingers. A man has only to look at his hand, to observe with what nicety and precision that covering, which extends over every other part, is here superseded by a different substance, and a different texture. Why do we find the skin cease at our fingers' ends, or on the back part of the fingers, and not the fore part? Because something hard or horny was required on these parts, by which we could hold fast or lift nimbly objects which we wished to grasp or seize upon. Nails therefore supersede the skin on such places. The same forethought is visible in the covering of our heads. What could have been a more beautiful or appropriate substance wherewith to cover the head and preserve the hard bony skull from injury, than the hair, a substance at once light, warm, and graceful.

DESIGN IN VEGETABLE PHYSIOLOGY.

In accordance with our intentions of glancing through most of the natural sciences, and bringing home to the main object of our labours treasures illustrative of design from them all, let us now turn our attention to those afforded by the vegetable kingdom of nature. And first, of the mutual relations that exist between animals and vegetables; in considering which, we shall find that these two great organised kingdoms of the creation are made to co-operate in the execution of the same design; each ministering to the other, and preserving that due balance in the constitution of the atmosphere, which adapts it to the welfare and activity of every order of beings, and which would soon be destroyed were the operations of any one of them to be suspended. "It is impossible to contemplate so special an adjustment of opposite effects, without admiring this beautiful dispensation of Providence, extending over so vast a scale of being, and demonstrating the unity of plan on which the whole system of organised creation has been devised." We said in a former part of this essay, that two principles of atmospheric air were oxygen and carbon; that the former was as essential to animal life as the latter was obnoxious to it; but that, on the other hand, carbon was indispensable to the continuance of vegetable organisations. We will now endeavour to explain this by a short account of the phenomena of respiration as displayed in the two kingdoms. Among animals, the function of respiration is that by which the blood, received into its vessels from the alimentary canal, is, during its subsequent circulation, kept in a state of requisite purity. This is in all cases effected by bringing it, at intervals, into contiguity, either with atmospheric air alone, or with water containing this air diffused through it; when such is the mutual action of the blood and the air upon each other, that the former is purified, and passes in general from a dingy purple to a bright scarlet colour, while the latter is in the same degree rendered impure, and after a time becomes inadequate to support either respiration or combustion. Now, whether the aërating organs be lungs or gills, it appears to be the object of nature, in their construction, to expose a large surface to the contact of air. This object is accomplished by their division into numerous cells or leaf-like processes, or by their extension on the walls of cavities, or the surface of pectinated ridges. The blood brought to these organs is there distributed by their terminating branches. Although still retained in vessels, it can nevertheless be easily acted upon by the air on the exterior. Priestley found the colour of blood changed by the air when enclosed in a moistened bladder, and the same effect was observed by Hunter when it was covered with goldbeaters' skin. It is scarcely possible to determine by direct observation what is the exact nature of the changes that the blood undergoes in its passage through the lungs; the most obvious is its change of colour; and the chemical differences between the dark purple blood in the veins before it has reached the lungs, and the bright vermilion colour it exhibits in the arteries after it has circulated through the lungs, and been exposed to the influence of the air, may be collected from the changes made in the air itself. Atmospheric air is known to consist of certain principles in definite proportions; when it has acted upon the blood, and is returned from the lungs, it is found that a certain proportion of oxygen which it contained has disappeared, and that the place of this oxygen is almost wholly supplied by an addition of carbonic acid gas and watery vapour. For our knowledge of the fact of the disappearance of oxygen, we are indebted to Dr Priestley, the great founder of pneumatic chemistry. It had indeed been long before suspected by Mayow, that some portion of the air inspired is absorbed by the blood; but the merit of the discovery that it is the oxygenous part of the air that is thus consumed, is unquestionably due to Dr Priestley. The exact quantity of oxygen which is lost in natural respiration, varies in different animals, and even in different conditions of the same animal. Birds, for instance, consume larger quantities of oxygen by their respiration, and hence require, for the maintenance of life, a purer air than other vertebrated animals. Vauquelin, however, found that many species of insects and worms possess the power of abstracting oxygen from the atmosphere in a much greater degree than the larger animals; thus, snails are capable of living for a long time in the vitiated air in which a bird had perished. Some insects which conceal themselves in holes, or burrow under ground, have been known to deprive the air of every appreciable portion of its oxygen. It is observed by Spallanzani, that those animals whose modes of life oblige them to remain for a great length of time in these confined situations, possess this power in a greater degree than others which enjoy more liberty of moving in the open air; so admirably have the faculties of animals been, in every instance, accommodated to their respective wants.

Now, bearing in mind that the air coming in contact with the blood of animals parts with its oxygen, and receives in its place carbonic acid gas, let us consider the function of respiration, or more properly aëration, as it occurs in vegetables. It was necessary that some means should be appointed by which this great quantity of carbon given out into the air by animals, and so injurious to animal life, should be removed from it. We have said that this principle was necessary to vegetable life; and here we find the means, not only by which in a very considerable degree it is procured, but also by which it is removed from the atmosphere. The leaves of plants are analogous to the lungs of animals, and it is in them principally that the decomposition of the carbonic acid absorbed from the air is effected. When exposed to the action of the sun, they decompose that gas, retain its carbon, and disengage its oxygen. Solar light is an essential agent in effecting this chemical change; for it is never found to take place at night, nor while the plant is kept in the dark. That the carbon resulting from this decomposition of carbonic acid is retained by the plant, has been most satisfactorily proved by the experiments of Saussure, who found that this process is attended with a sensible increase in the quantity of carbon which the plant had previously contained. "Thus, the great object to be answered by this vegetable aëration," says Dr Roget, speaking at considerable length of this undeniable evidence of design to which we have thus shortly alluded, "is exactly the converse of that which we see effected by the respiration of animals; in the former, it is adding carbon to the vegetable organisation; in the latter, it is that of discharging the superfluous quantity of carbon from the animal system. On the whole, therefore, the atmosphere is continually receiving from the vegetable kingdom a large accession of oxygen, and is at the same time freed from an equal portion of carbonic acid gas, both of which effects tend to its purification, and to its remaining adapted to the respiration of animals."

We have not much space to devote to the contemplation of vegetables, but we are unwilling to leave the subject without alluding to some other evidences of design which we find displayed in them. Among these, nothing more beautifully demonstrates that nature, or rather the Almighty Creator of nature, proceeds on a uniformity of plan and design, than the fact that plants as well as animals are possessed of the means of reproducing and continuing their species. The pistil which occupies the centre of the flower is destined to produce the seeds, while the stamens of the plant contain the dust necessary for fertilising them, and without which the seeds would not produce young plants. Nature has guarded with nice care this precious dust, so as on its preservation depends the continuance of the species. The apparatus by which in many flowers it is defended from injury, is very curious; nor are the means that are provided by which it comes in contact with the stigma of the pistil less demonstrative of a great, a wise, and a beneficent Providence. In some plants where the organs are in the same flower, the stamens are placed above the stigma, upon which the dust, or pollen, falls by its own gravity; in others, we find the contrary is the case, the pistil being the longest; but here the flower is generally drooping. To assist the emission of the pollen, and its contact with the stigma, in many plants the stamens possess a very apparent moving power. When ripe, the ten stamens of the rue are seen alternately to bend down upon the stigma, deposit their portion of pollen, and return to their former position. The stalks or filaments of the pellitory of the wall are possessed of a remarkable elasticity, and thus forcibly scatter the pollen. This is very apparent if touched by the point of a needle; immediately it acts with a jerk, which dashes the pollen with some force on the stigma. The same arrangement is met with in the barberry bush, in which the six stamens remain sheltered under the concave tips of the flower-leaves or petals, till some extraneous body, as an insect in search of honey, touches the filament, which instantly contracts, and also dashes the pollen against the stigma. But all plants have not their stamens and pistils sheltered under the same veil; in many they are in different flowers, and in others even placed on different plants. Here, again, we have to admire the wise measures nature has taken for the accomplishment of her designs. In many the scattering of the pollen is effected by the winds; to favour the access of which, we find in some, as the hazel, the leaves are not evolved until after the seed has been perfected; or, if the plants be evergreens, the leaves are needle-shaped, so as to present very little obstacle to the passage of the pollen, which is secreted in much larger quantity than usual. Various species of insects, and especially the bees, are selected by nature for this purpose. In the pink we observe numerous small insects creeping to and fro, and thus depositing the pollen on the stigma. In flowers where the stamens and pistils are on different plants, often at a considerable distance from each other, bees, and other flying insects, are peculiarly accessory to the great end of nature. These insects, it is true, do not visit the flower for the purpose of scattering the pollen; they only seek for the sweet juice which exudes from its nectary. Their hairy body, which nature did not bestow without design, is seen covered with pollen, often in such quantities as to impede the progress of the animal; this, whenever they visit another flower, is rubbed against the stigma; and it is a fact, no less wonderful than calculated to fill us with admiration at the wise provision of nature, that many insects are peculiar to one flower, and that others, as the bee, will only visit one species in each journey from its hive.

The various methods which nature employs to disperse the different varieties of seeds over the earth, are truly wonderful. Many plants, when the seed is fully ripe, discharge it from its covering, with a jerk or elastic spring. The common oat is thrown out in this way; and the loud crackling of the pods of the broom in a dry sunshiny day, or, as Drummond has it, "bursting seed-balls crackling in the sun," is caused by their bursting and scattering about the contained seeds, and must have been frequently noticed. "Who has not listened," again asks Sir James Edward Smith, "in a calm and sunny day, to the crackling of the furze bushes, caused by the explosion of their elastic little pods; or watched the down of innumerable seeds floating on a summer breeze, till they are overtaken by a shower, which, moistening their wings, stops their farther flight, and at the same time accomplishes its final purpose, by immediately promoting the germination of each seed in the moist earth! How little are children aware, when they blow away the seeds of the dandelion, or stick burs in sport upon each other's clothes, that they are fulfilling one of the great ends of nature!" These downy appendages to which Sir J. E. Smith alludes, buoy up the lighter seeds, as the thistles, and carry them floating through the air to great distances; then there are the currents of rivers which bear the seeds from one part of the country to another; and even seas and oceans, whose tides and currents float along the germs of vegetation to the various regions of the globe. Birds, too, by feeding on particular seeds, carry them to great distances, where, being often voided entire, they vegetate. There is evident design in this. It could not have been by mere chance, that in flowers which stand erect, the pistil is shorter than the stamens, permitting the pollen as it falls to descend upon the stigma; and when the flower is drooping, that the contrary arrangement is effected. And surely no one will be so blind or hardy enough to assert that the mechanical means, to which we have alluded, for the dispersion of seeds, with all the beauty and aptitude of its arrangement, was not the result of divine wisdom—a wisdom which will be still more apparent when we extend our views from the power which called into being such various and beauteous existences, and gave the means of distributing them over the globe, and consider the laws that govern that distribution which we so much admire.

It is not here out of place to remark, that there is scarcely a vegetable production on which some species of animal does not subsist; and, generally speaking, wherever that peculiar production is to be found, there also is the animal to which it furnishes wholesome food. With some striking examples of this kind, the most uneducated man is acquainted; he knows that the partridge is on the plain, the woodcock in the forests, the grouse on the moors, and the ptarmigan on the loftiest peaks of the mountains. He knows, too, that other species migrate from country to country, seeking their food in distant regions, over trackless oceans, when it fails in their native haunts; and among the animal kingdom so universal is this, as to form an example of the wonderful adaptations which exist between it and the vegetable world. Vegetables, like animals, are adapted to varieties of climate and temperature; and when we consider their distribution over the globe, we shall find that those which are most essential to the maintenance of man, bear a variety of climate better than most others. This is the case with greens, carrots, potatoes, and many kinds of grain. Warm climates are much more favourable to vegetation than cold. In Spitsbergen, the whole number of plants with conspicuous flowers, natives of the country, is found by botanists scarcely to exceed thirty species; while in the warmer regions of the West Indies, in Madagascar and the coast of Coromandel, Willdenow enumerates from four to five thousand different species of indigenous plants. Now, observe how admirably this distribution of plants corresponds with the wants and necessities of man. The inhabitants of warm climates generally prefer a vegetable diet; and there we find that kind of food most abundant.

It is impossible for a reflecting individual to walk beside a field of growing barley, without being impressed with the conviction, that, in the economy of this description of grain, the design of a Creator has been wonderfully manifested. An ear of barley differs from one of wheat or oats. Each of the grains is furnished with a long slender bristle or beard, which is prickly to the touch, and seems to serve as a protection to the ear. These bristles form a roof, if we may so call it, to carry off the rain from the ear, and yet, by their elegant disposition, do not prevent the heat of the sun and the light from influencing the grain. And why should such be the case with barley, when the ears of wheat, oats, &c., do not possess any such protective process? Because barley is a grain easily injured by wet, which, if not carried off, would cause the ear to sprout even while on the stalk, and, consequently, be entirely useless to man.

In speaking of the economy of vegetable life, it should not pass unnoticed that there is a remarkable instance of creative wisdom in the means which have been arranged for the growth of plants from putrescent matter. All kinds of vegetable and animal substances, when deprived of life, as well as excrementitious matter, have a tendency to decomposition—that is, to resolve themselves into those elementary gases of which they have been chiefly composed. This process of dissolution, as every one knows, produces a most disagreeable odour, which is often inimical to animal life. But this is not an evil; it displays a bountiful provision in nature; for it tells us in a way not to be misunderstood, that the substance undergoing, or about to undergo, the putrifactive process, should be buried underground; and so being there deposited, it immediately proceeds to supply its no longer useful gases to the infant plants and crops of grain which flourish on the surface. Thus do we see another striking evidence of the harmonious design which every where prevails between the animal and vegetable creation.

Considering the alimentary regimen of the different nations of the earth, it will be clearly seen that a vegetable diet is preferred by the inhabitants of warm countries: to them sobriety is an easy virtue and a happy consequence of the climate. Northern regions, on the contrary, are voracious from instinct and necessity. They swallow enormous quantities of food, and prefer those substances which in digestion produce the most heat. Obliged to struggle incessantly against the action of cold, their life is but a continual act of resistance to external influences. Let us not reproach them with voracity, and their avidity for ardent spirits and fermented liquors. Those nations which inhabit the confines of the habitable world, in which man is scarcely able to withstand the severity of the climate, the inhabitants of Kamtschatka, the Samoiedes, &c. live on fish, that, in the heaps in which they are piled up, have already undergone a certain degree of putrifactive fermentation. In them there is a necessity for this inward excitement, which in our climate would be inevitably attended with disease, and probably death. The abuse of spirituous liquors is fatal to the European transported to the burning climate of the West Indies. The Russian drinks spirituous liquors with a sort of impunity, and lives on to an advanced age, amidst excesses under which an inhabitant of the south of Europe would sink.

The influence of climate not only affects alike the regimen of man in health, but of man in sickness; and it has been justly observed of medicine, that it ought to vary according to the places in which it is practised. A few substances, for the most part obtained from the vegetable kingdom, sufficed to Hippocrates in the treatment of diseases; and physicians who practise in a climate such as Greece, may imitate the simplicity of the father of medicine. Opium, bark, wine, spirits, aromatics, and the most powerful cordials, are, on the other hand, the medicines suited to the inhabitants of the north; and thus we are enabled to use freely those medicines which elsewhere would be attended with the utmost danger.

We are now prepared to understand the beautiful and wonderful harmony that exists between the distribution of man and plants over the globe; and no one, we think, can deny their meed of praise and admiration for the care and beneficence this universal adaptation thus exhibits.

The frigid zone contains but few species of plants, and the verdure of those countries which lie within the polar circle is confined chiefly to the hills having a southern aspect, and the trees are of very diminutive growth. Besides mosses and lichens, there exist ferns, creeping plants, and some shrubs yielding berries of an agreeable flavour. The arctic regions of Europe are peculiarly favoured; for in certain parts of Lapland there are fine forests, and even rye and leguminous plants are produced.

In the high latitudes of the northern temperate zone are the pine and the fir, which show their adaptation to a cold climate by retaining their verdure in the midst of the regions of winter. To these, as advancing southward, succeed the oak, the elm, the beech, the lime, and other forest-trees. Several fruit-trees, among which are the apple, the pear, the cherry, and the plum, grow better in the northern half of this zone; while to its more southern parts, especially, belong the more delicate fruits, such as the olive, the lemon, the orange, and the fig, and, among trees, the cedar, the cypress, and the cork.

The space comprised between the 30th and the 50th parallels of latitude may be considered as the country of the vine and the mulberry. Wheat extends as far north as the 60th degree; oats and barley a few degrees farther. In the southern parts of this zone maize and rice are more commonly cultivated.

The vegetation of the torrid zone is characterised by a wealth, a variety, and a magnificence, which are nowhere to be found in the regions of the globe. Under the beams of a tropical sun, the most juicy fruits arrive at perfection; and innumerable productions supply the wants and administer to the luxuries of man. There the grounds yield the sugar-cane, the coffee-tree, the palm, the bread-tree, the pisang, the immense baobab, the date, the cocoa, the vanilla, the cinnamon, the nutmeg, the pepper, the camphor, and numerous other fruits and aromatics. In South America is the remarkable tree called the *cow-tree*, which, when incisions are made in its trunk, yields abundance of a glutinous and nourishing milk.

The vegetable forms near the equator are in general more majestic and imposing, and the varnish of the leaves more brilliant. The largest trees are adorned with flowers, larger, more beautiful, and more odoriferous, than those of the herbaceous plants in our zone; and it is scarcely possible for an inhabitant of temperate regions to picture to himself the beauty and the grandeur of the vast forests of equinoctial America. Trees, which attain a stupendous height and size, are covered with a profusion of climbing plants, which, creeping on the surface of the earth, reach the tops of the trees, and pass from one another at the height of more than one hundred feet.

But we must hasten to conclude our interesting subject, which might, were we so inclined, extend our labours through several numbers of our Information for the People. Illustrations of design might be produced from the works of nature without end; every link in the chain of creation teems with proofs of it; in none can any one affirm with truth that it is wanting. Cursory as our remarks have been, they still must lead to the general conclusion that not only design, but unity of design and identity of operation, pervade the works of nature, in as far as relate to organised existences; and even among those circumstances of creation which are not organic, there even do we find the same unwearied labour, the same evident design to render them subservient to the wants and necessities of those which are. To several of these we have alluded, and it did not accord with our plan to allude to more; and we do think, that such is the innate force of the evidence we have adduced, that no candid person can rise from the perusal of these pages, without unhesitatingly according his assent to our proposition, that "verily it is a God who made and rules the universe."

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MORAL PHILOSOPHY.

The human being differs from all other animated creatures, not only in certain peculiarities of his physical formation, but by the possession of what is variously termed the mind, or the understanding, in which are comprehended the intellectual and moral faculties. The lower animals are furnished with a principle called instinct, by which they unerringly pursue those plans best suited for their subsistence and comfort; but such instinct is to be considered as an irrational, unimprovable faculty, and therein lies its inferiority to human intelligence. The lower animals, being thus for ever doomed to the possession of this inferior faculty, are consequently not responsible for any thing which they may do; they but follow their nature and propensities. Man, the higher animal, has very different destinies. His mind enables him to think, to reason, to improve; he can transmit his thoughts and his experience to his successors; and by education he can train the intellectual and moral faculties into vigour. But man, exalted as is his understanding, and lofty as are his conceptions and feelings, is still an animal. His reason may be a scintillation of divine intelligence, but it is associated with propensities or passions which are little, if at all, superior to those which characterise the brute and other species of animals, and which, if not kept in due subjection, weigh him down below the dignity of human nature.

A thing so remarkable as the human understanding, and the manner in which it operates, could not fail, long ere now, to attract the attention and employ the searching investigations of men endowed with superior degrees of intelligence. Nor can there be any doubt of the utility of making such inquiries. If the faculties be liable to improvement, as they certainly are, it becomes a duty to make ourselves acquainted with their nature and properties, for purposes of cultivation. The more that we can instruct ourselves in what composes the various animal, moral, and intellectual powers, the better shall we adapt ourselves to the circumstances in which we are placed, and the more happy shall we become. The desire to think, to reason on the understanding, is implanted in the soul of man; and the rudest as well as the most profound speculations are alike proofs that this desire cannot be extinguished, that this anxious feeling cannot be lulled into apathy. Unfortunately for the world, the desire to reason on the nature of mind, and the feelings which influence its operations, have in most instances, both in ancient and modern times, taken a direction the opposite of practical utility. Instead of endeavouring to convey an outline of the propensities and faculties, so that those which were discovered as having a tendency to evil might be depressed, and those which had a tendency to good might be more fully developed by culture, teachers and writers of philosophy have proceeded in the most wild and profitless researches into the causes of universal creation, the nature of the soul, and its alliance with spiritual essences. They have asked, What is time, space, cause, effect? What is truth, justice? What is necessity? How do we know any thing? Can we know any thing? Millions of thoughts and words, and thousands of volumes, have been spent in theorising upon these abstract questions, and at the end of thousands of years mankind are obviously not the wiser. They at present know as little of the precise nature of the soul, of time, space, cause, effect, and eternity, as they did five hundred years before the Christian era. It is our object, in the article now before us, to give a succinct view of what has thus been done in exposition of the human mind, and of what still remains to be accomplished, in the way of improvement.

Investigations into the nature of mind and ultimate causes are usually included under the term *Metaphysics*—a Greek compound, signifying *after*, or *beyond* physics, the latter being the observation of material nature. Such abstract investigations are likewise indicated by the term *Philosophy*, another Greek compound, traced to Pythagoras, a Grecian, who refused the title *sophos*, wise, as too assuming, and contented himself with the more modest appellation of *philo-sophos*, which means, a friend or lover of wisdom. The title of *Philosopher* was hence applied to men eminent for wisdom, and hence also the term *Philosophy*. In later times, for the sake of distinction, the kind of investigations we are speaking of have been frequently comprehended under the appellation *Moral Philosophy*, while investigations into physical and mathematical science were designated *Natural Philosophy*. Moral philosophy or metaphysics, therefore, means the science of mind. Yet there is something excessively vague in all that pertains to the definitions respecting philosophy, at least there is a great poverty in the nomenclature. Metaphysics, for instance, has been said to signify the science of the ultimate causes of all being; while the term *Ethics* has been applied to the science of the moral nature and destiny of man. In this sense, religion may be described as a system of ethics, though that is by no means a correct phrase when applied to Christianity. Again, in modern times, philosophy—that is, moral philosophy—has been divided into theoretical and practical. The theoretical philosophy was considered to have for its object the investigation of the highest truths respecting God, the world, nature, and mind; the practical, their application. Some call theoretical philosophy the explanatory or illustrative philosophy, as it has for its object that which exists without our aid, and is the subject of our knowledge; while they term practical philosophy the imperative or preceptive, as it gives precepts of human action. Further, the term *Æsthetics* (signifying *perception*) has been applied to that branch of philosophy which treats of the beautiful and the various applications of its principles. Finally, philosophy has in the above manner been divided, with reference to the three highest ideas of man—the ideas of the true, of the good, and of the beautiful—into the theoretical, practical, and æsthetical.

ANCIENT PHILOSOPHY.

The history of philosophy is commonly divided into the ancient, middle, and modern. The first period begins with the Greek, because, though the disposition to philosophise is confined to no particular nation, but is inherent in all, so that every tribe forms philosophical notions as soon as its religious conceptions pass over into reflection, and its feelings into doubt, yet philosophy was first studied scientifically by the Greeks. This was the earliest known demonstration of the free striving of reason for the knowledge of the ultimate causes of natural phenomena, and carries within it the germs of all the subsequent philosophies. From the time of Thales, six hundred years before Christ, for a period of from four to five hundred years, there flourished a series of philosophers, Pythagoras, Socrates, Plato, Aristotle, Zeno, Epicurus, &c., all of whom propounded their own theories, less or more peculiar, regarding mind, and the destiny of man. Each taught his own doctrines to pupils, and their several systems hence received the appellation of schools.

Philosophy of Socrates.

Socrates (about 422 B. C.) may be considered as having been the most profound of the Grecian philosophers, and his doctrines as the most excellent. He opposed the notions of a class called Sophists, whose theories threatened to destroy moral principle. He gave philosophy quite a new direction. Having been deeply impressed by the inscription on the temple of Apollo, at Delphi, "Know thyself," he began to study his own nature, to reflect upon the phenomena of his own mind, and to meditate on the destiny of mankind, and determined to devote his life to instructing his fellow-citizens in their highest good, by making them wise, honest, and pious.

All the Grecian philosophies sink into insignificance when compared with that of Socrates, whose moral teaching places him in a rank which far transcends that of mere theorists on cause and effect. The attention of Socrates was directed to practical philosophy, which had been previously neglected, and, according to Aristotle, he was the first to lay down general precepts of morality. In this view, it may well be said that he brought philosophy down from heaven to the abodes of men. All his inquiries took a practical turn, and he valued speculation and theory only as connected with practice; for the end of all knowledge, he affirmed, is virtue. He was fully convinced of the existence of an all-ruling, almighty, wise, good, omniscient, and invisible being. The system of nature, and especially the admirable structure of the human frame, seemed to him a positive proof of a Creator; and as man is capable of thought, the same power, he argued, must exist in a still higher degree in the author of reason. The existence of the Deity is as little to be doubted because he is neither visible nor tangible, as the existence of powers concealed from the senses, but known from their effects. He esteemed it rash to speculate upon the substance of this lofty being, and deemed it sufficient to set in a clear light his spiritual nature. It is evident that he worshipped one God, as the Creator of the world and the Judge of mankind, because Xenophon represents him as speaking expressly, several times, of one God only, although in other places he speaks of gods, which he seems to have regarded as subordinate to the Supreme Being. To the good providence of that God he traced all human blessings, and maintained that the omniscient and omnipresent Deity knows every thing, and observes all the secret thoughts and actions of men. For this reason, he esteemed it a sacred duty for men to worship him with all their powers, complying, indeed, with the forms of religious service prescribed by the customs or laws of their country, but particularly striving to do his will in all things. Socrates entertained no less elevated ideas concerning the human soul. He considered it certain that it is of divine origin, wholly distinct from every thing material, and connected with the Deity by reason and the power of thought. He did not deny the difference between it and the divine nature, but maintained that exercise and cultivation would improve the spiritual principle in men. To this cultivation he exhorted his hearers and friends with a godlike zeal. He declared the improvement of the mind to be the highest good of which man is capable. As the chief means, he recommended self-knowledge, and he esteemed those as consummately foolish who knew every thing but themselves. Socrates distinguished, also, a sensible and a reasonable soul. Of the immortality of the soul he was firmly convinced. This doctrine he inferred from its native dignity; likewise from the supposition that the soul gives life to the body; from the phenomena of dreaming; from the opinion of former ages, and from the nature of the Divine Being from whom the soul proceeds. Hence he viewed death to the good as merely a transition to a better life, and spoke of his hopes with affecting certainty and admirable clearness. His pure soul was enraptured with the thought of meeting the virtuous men of earlier ages. He feared not to stand before the holy Judge of the world; and, in the regions of the blessed, he hoped to find unmingled happiness, with the consciousness of having laboured after truth and struggled for virtue. The images and terms by which he describes the wretchedness of the vicious are terrible. Souls which have become diseased by wickedness, covered, as it were, with stains and ulcers, in consequence of their licentiousness, effeminacy, or unlawful desires, and stamped with the hateful impress of perjury and injustice, are plunged into abodes of pain, to be reformed by punishment, or to serve as examples to others. This account of the effect of vice on the substance of the soul, though all plainly symbolical, surpassed, in fearful distinctness, all that had been said on the subject. Socrates founded his morality on his religion. God wishes men to be virtuous, and therefore they should act well. The performance of duty is the only way to happiness. Although he did not exclude the desire of happiness from the motives to virtue, he was far from representing it as the only motive. He thus made an intimate connection between religion and virtue. The native dignity of virtue he painted in the most delightful colours. The dominion over the senses he declared to be the highest state of freedom; he said that virtue only was true wisdom, and that vice was insanity. He exhibited no regular system of morals; but this principle may be considered as lying at the foundation of his views of morality: Do what the Deity commands thee. The true interpreter of this command he considered to be a moral sense which distinguishes between justice and injustice, magnanimity and meanness; in short, between virtue and vice. He did not entertain the idea of moral freedom. On the contrary, he maintained that every man who is acquainted with good, practises it, because every one acts agreeably to his knowledge. Virtue he declared to be the striving to make one's self and others as perfect as possible. All virtue he reduced to two heads, temperance and justice; the former embracing all the duties which man owes to himself, and the latter those which he owes to his fellow-men. The temperance of Socrates included dominion over every sensual impulse. This self-government he regarded as the basis of all other virtues, which, by its aid, will unfold themselves from the promptings of the moral nature, and the increasing knowledge of good. The beneficial influence of this virtue he describes with a genuine inspiration, and draws a frightful picture of excess. His representation of a just man, one who faithfully performs all his duties to God and man, is highly interesting. Injustice he held to be a great evil. He declared that justice was due even towards enemies; and that a man should never transgress the laws of his country, however unjustly they might be administered. His views of friendship, society, conjugal affection, and the pleasures of life, were excellent. He maintained in every thing the golden mean. All his precepts were equally removed from excessive rigour and pernicious laxness; and whoever follows them will be a good man. To his precepts was added his example, so superior to all reproach, that Xenophon, his friend and disciple, in his Memorabilia, says none ever saw him perform a vicious or unworthy action. There can be no question that Socrates was the most faultless of all the great men in ancient times. The principal error into which he appears to have fallen, arose from his enthusiasm in the pursuit of a pure philosophy; he believed himself to be an ambassador sent by God, and that divine revelations were made to him by a genius, which always invisibly attended him. Socrates, like many benefactors to mankind, was ill rewarded for his valuable admonitions. He was falsely charged with denying the ancient divinities of the state, and of corrupting the youth, and, through the influence of the populace, was condemned to die by drinking poison, a fate to which he submitted with extraordinary magnanimity. Among his most distinguished disciples were Alcibiades, Crito, Xenophon, Antisthenes, Aristippus, Phædon, Æschines, Cebes, Euclid, and Plato. The sagacious and philanthropic propositions of Socrates were afterwards reduced to a system by his pupil Plato, the founder of the academic school; and this philosophic system was fully developed by Aristotle, the founder of the peripatetic school. Plato was distinguished for the warmth and vividness of his conceptions; Aristotle aimed at cool and patient reflection on the nature of things. By the side of the schools of Plato and Aristotle, the Stoic school, founded by Zeno, and the Epicurean, placed themselves in opposition.

Philosophy of Zeno.

According to Zeno, philosophy is the way to wisdom; wisdom itself is the knowledge of human and divine things; and virtue is the application of wisdom to life. The chief heads of his doctrine—logic, physics, and morals—were connected into a systematic whole. In logic, which he defined the science of distinguishing truth and falsehood, he made experience the basis of all knowledge; ideas, or conceptions, which in all respects resemble their objects, he called true, and the power of judging according to principles, the mark of a sound reason. In his physics, he refers to nature itself for the highest standard of human duties, and derives the moral precepts from the laws of the universe. He assumes two uncreated and eternal, but material principles of all things—the passive matter, and the active intelligence, or God, which resides in matter, and animates it. The Deity is the original intelligence, and of an ethereal fiery nature: he made the world, as an organic whole, out of matter and form, by the separation of the elements; and he also rules the world, but is limited in his operations by unchangeable fate or the necessary laws of nature. The universe, according to Zeno, is penetrated by the divine intelligence as by a soul, and is therefore living and rational, but destined to be destroyed by fire. He considers the heavenly bodies, and the powers of nature, of a divine character, and therefore admits the worship of several gods, and teaches that their connection with men may be beneficial to the latter. The human soul he considers as produced by the union of the creative fire with air, and endowed with eight faculties—the five senses, the powers of generation, speech, and reason: the latter, as the active principle, governs the whole soul. The ethics of the Stoics treats the will of God (which also animates the soul of man), or nature, as the source of the moral law, which binds men to aim at divine perfection, since this only can lead to a virtuous life, harmonising with God and nature, which is the only true happiness. Their practical maxim is, Follow nature, live according to nature, or, which amounts to the same thing, Live in accordance with the laws of consistent reason. They considered virtue the highest good, and vice the only evil; every thing else is indifferent, or only relatively agreeable or disagreeable. They call human actions honest, when they have a reasonable foundation in the nature of the agent; perfectly proper, and therefore obligatory, when good in themselves; intermediate or lawful, in so far as, indifferent in themselves, they are expedient or allowable only in certain relations, but criminal when they are inconsistent with the reason of the agent. Virtue they accordingly explain as the true harmony of man with himself, independent of reward or punishment, to be attained by correct moral judgment, and the mastery over the passions and affections: this virtue presupposes the highest inward tranquillity and elevation above the pleasures and pains of sense; it makes the wise man not destitute of feeling, but invulnerable, and gives him a dominion over his body which permits even suicide. Virtue, therefore, is represented chiefly under the character of self-denial. Such was the philosophy of Zeno, or the Stoics (from *stoa*, a porch, the place where it was taught), which it will be perceived contains a strange mixture of correct and improper principles. As if to prove the value of his theory, Zeno put himself to death at an advanced age, and his example was followed by his pupil Cleanthus, who killed himself by starvation.

Philosophy of Epicurus.

The philosophy of Epicurus had a resemblance in some points to that of Zeno, yet differed very considerably from it. After travelling through various countries, in order to cultivate his mind and to collect information, he settled in his thirty-sixth year at Athens, where he began to teach. He was soon surrounded by crowds of scholars. He taught that the greatest good consists in a happiness, springing not from sensual gratification or vicious pleasures, but from virtue, and consisting in the peace and harmony of the soul with itself. He accordingly renounced vice, and embraced virtue, not for their own sakes, but for their connection with happiness, vice being as incompatible with it as virtue is essential to it. He recommended wisdom, moderation, temperance, seclusion from political affairs, gentleness, forbearance towards the self-love of men, firmness of soul, the enjoyment of decent pleasures (so far as it does not incapacitate us for new pleasures), and contempt of life. Freedom from pain he regarded as desirable, but, at the same time, he bore with fortitude the most excruciating pains of body. Although he distinctly showed the meaning of his doctrines by his own exemplary life (which some, however, charged with pride and envy), yet they have been often misunderstood or misrepresented. His doctrine of the origin of the universe, borrowed from Democritus, is atomical and material. Proceeding upon the axiom, that nothing can be produced from nothing, he assumed two necessary, eternal, and infinite first causes—space, and atoms, or indivisible bodies, arranged in endless variety. These atoms, by virtue of their natural gravity, moved in space, and mingled with one another. To make the union possible, he supposed them to move, not in straight, but in curved lines. By these motions, they crossed and hit each other in all possible ways; and from their numberless combinations and intervolutions, arose bodies and beings of all kinds. Although single atoms had no other qualities than figure and gravity, they produced, when combined in bodies, the various qualities that affect the senses, as colour, sound, smell, &c. He further taught, that as all things arose from the union of atoms, so all things will be again destroyed by their dissolution; that there are multitudes of worlds, formed by chance, which are continually rising and falling. The world, as it has had a beginning, must have an end; and out of its ruins a new one will be formed. He found no difference between men and brutes, and ascribed the origin of the soul to the same material process above described. The gods, he thought, lived in eternal tranquillity, unconcerned about the world. This doctrine, which was not unjustly charged with atheism and materialism, drew upon him much opposition and calumny. He lived to the age of 72, dying 270 years before the Christian era. The philosophy of Epicurus, with much to condemn as conjectural and ridiculous, has, it will be noticed, several good points, and these certainly have been misunderstood. It has been supposed that it was the principle of the Epicureans to indulge in sensual gratifications, at whatever risk of after-pain or misery; whereas it is clear that Epicurus never taught so short-sighted a doctrine.

Plato and Aristotle.

We learn from the philosophical writings of Plato, that he was inspired with the most lofty and glowing desire to show the connection of the human soul with what he terms the original fountain of light and perfection; we see the conceptions of a mind to which the greatest earthly good appeared to be the union of kindred souls in the love and zealous search for truth—the Platonic love; of a mind which conceived the human soul to contain, in its present state of lost perfection, all the germs of regeneration. Plato first introduced the word *idea* into philosophy, but his doctrine upon this subject had somewhat peculiar. He agreed with the rest of the ancient philosophers in this, that all things consist of matter and form; and that the matter of which all things were made, existed from eternity, without form; but he likewise believed that there are eternal forms of all possible things which exist, without matter; and to these eternal and immaterial forms he gave the name of *ideas*; maintaining that they are the only object of true knowledge. It is of no great moment to us whether he borrowed these notions from Parmenides, or whether they were the issue of his own creative imagination. The later Platonists seem to have improved upon them, in conceiving those ideas, or eternal forms of things, to exist, not of themselves, but in the divine mind, and to be the models and patterns according to which all things were made.

Aristotle had no good affection to the word *idea*, and seldom or never uses it but in refuting Plato's notions about ideas. He thought that matter may exist without form, but that form cannot exist without matter. But at the same time he taught, that there can be no sensation, no imagination, nor intellection, without forms, phantasms, or species in the mind; and that things sensible are perceived by sensible species, and things intelligible by intelligible species. His followers taught more explicitly, that those sensible and intelligible species are sent forth by the objects, and make their impressions upon the passive intellect; and that the active intellect perceives them in the passive intellect. And this seems to have been the common opinion while the Peripatetic philosophy retained its authority.

The theories of Zeno, Epicurus, Plato, and other eminent Grecian sages, did not survive unhurt from the destruction of liberty in Greece. They were afterwards adopted by Cicero, Seneca, and other distinguished Romans; and among them they suffered still farther injury from the contests, or wars of opinion and words, of the sceptics and dogmatists. Grecian philosophy rallied, and took new forms at Alexandria, in Egypt, where an attempt was made to reconcile the Platonic philosophy with the Jewish Scriptures. After the promulgation of Christianity, a mixed system of ethics was similarly put together, entitled the Eclectic Philosophy, which was an attempt to combine the theories of the Grecians and the Jews with the doctrines of the Christians.

THE SCHOLASTIC PHILOSOPHY.

After this period, we hear no more of philosophy till it was taken up by a class of men who arose in the middle ages, and have since received the appellation of Scholastics, or Schoolmen. The name Scholastic Philosophy is derived from the circumstance that it originated in the schools instituted by Charlemagne for the education of the clergy. The philosophy therein taught consisted in a collection of logical rules and metaphysical notions, drawn from the Latin commentators on Aristotle. These, under the name of Dialectics, composed the theoretical philosophy, which had the defence of the dogmas of the church for its primary object. It is almost needless to add, that the scheme of nature in connection with the intellectual faculties, and the deductions therefrom, as propounded or compounded by the Scholastics, has met with the same oblivion, so far as practical utility is concerned, which attended the theories of the Grecian sages and their Roman followers.

MODERN PHILOSOPHY.

The philosophy of the schools sank in the fifteenth century, and then arose a third or modern period of philosophic investigation. A free and more independent mode of inquiring and penetrating deeper and deeper into ultimate causes now commenced. The human mind was let loose upon itself. Some reasoned from the results of experience; some took the consciousness of thought and existence as the foundation of their philosophy; many doubted every thing; and some went the length of attempting to prove that both mind and matter were equally imaginary—that good and evil were purely ideal.

Descartes.

Among those who in this manner came forward to establish new schools of philosophy, none became so conspicuous as Descartes, a Frenchman (born 1596, died 1650), who did much to give metaphysical inquiry a new direction, and whose theories have generally received the appellation of the Cartesian system of philosophy. Descartes founds his belief of the existence of a thinking being on the consciousness of thought: "I think, therefore I exist" (*cogito, ergo sum*). He developed his system with much ingenuity, in opposition to the empiric philosophy of the English and the Aristotelian Scholastics, and adopted the rigorous, systematic, or mathematical method of reasoning. From his system originated the notion among the moderns, that the very existence and certainty of philosophy consists in definitions, arguments, and a methodical arrangement of them. "The thinking being," says Descartes, "or the soul, evidently differs from the body, whose existence consists in space or extension, by its simplicity and immateriality (whence also its immortality), and by the freedom that pertains to it. But every perception of the soul is not clear and distinct; it is in a great degree involved in doubt, and is so far an imperfect, finite being. This imperfection of its own leads it to the idea of an absolutely perfect being." He placed at the head of his system the idea of an absolutely perfect being, which he considers as an innate idea, and deduces from it all farther knowledge of truth. The principal problems of metaphysics he conceived to be substantiality and causality. He contributed greatly to the advancement of mathematics and physics. He made use of the discoveries and observations of others, defining them accurately, and assigning them their place in his system. The higher departments of geometry (to which he successfully applied analysis), as well as optics, dioptrics, and mechanics, were greatly extended by him, their method simplified, and thereby the way prepared for the great discoveries made in the sciences by Newton and Leibnitz.

Spinoza.

The propositions of Descartes met with approval in different parts of Europe, and were at first followed by none more zealously than Baruch Spinoza, who was born in 1632 at Amsterdam, of a Jewish Portuguese family, and early gave proofs of a reflecting mind and an independent spirit. Becoming dissatisfied with the instructions of his Jewish teachers, Spinoza sought out new doctrines, and for this met with no small degree of persecution. He nevertheless, in following a humble profession, pursued his philosophical investigations, and published his theories concerning the connection of mind with matter. The doctrines of Spinoza are so abstruse as to be beyond our comprehension, and we must refer to his works for a perfect knowledge of his system. He seems to have felt, like every other philosopher, the longing to elevate himself to a point at which the struggle between matter and mind, liberty and necessity, &c. is done away, and all discord ceases. This led him to the idea of an original substance embracing all existence. Substance, of course, in this sense, means something very different from what we usually understand by the word. This original substance, in which all contradictions cease, and all subjects of finite consciousness disappear, he called God; by which he understood that which has an independent existence, and the understanding of which requires not the idea of any thing else. This substance, according to him, is infinite, and nought else exists; it is incapable of creating any thing material or intellectual, for all matter and mind are comprehended in itself; its attributes are infinite thought and infinite extension. God, this all-embracing being, can act only in accordance with the established order, for otherwise we must suppose him capable of a change of nature, or that there exists a nature different from his own. Thought and extension, spirit and matter, the finite and infinite, motion and repose, good and evil, causes and effects, are attributes of this sole substance, which produces nothing but modifications of itself. All that exists is only a necessary succession of modes of being in a substance for ever the same. Such is something like the idea which he endeavoured to illustrate and establish, which it will be allowed is by no means intelligible, or consistent with observation and experience. His extravagant theories, which have been called Spinozism, are now considered to be synonymous with atheism. Spinoza also wrote a political and theological treatise, which does not come under our notice, and is only mentioned from its containing the proposition, "that freedom of thought can exist without endangering the public peace and virtue, but that it must necessarily stand or fall with it." Spinoza died in 1677, before which period philosophical inquiry had considerably advanced in this country.

ENGLISH PHILOSOPHY.

Bacon.

Modern philosophy in England is dated from Bacon, who flourished at the beginning of the seventeenth century, and was thus coeval with Descartes. In his *Novum Organum*, published in 1620, he takes a path directly opposite to that universally followed in his time; and instead of appealing by dialectics to the notions of the understanding, he attempts to restore knowledge by the aid of observation through induction. He was not the founder of a sect; he did not deliver opinions; he taught no modes of philosophising; he did not attempt to discover new principles, but to render observation and experience the predominant character of philosophy. His services consist in his dethroning scholastic theorems, directing the attention to nature and observation, and rejecting final causes from physical inquiries. Bacon was friendly to the culture of the human faculties, and his notions regarding civil society and government were what would now be termed liberal. His observations on the laws of memory and imagination are considered to be among the best of his writings on the nature of mind.

Hobbes.

Thomas Hobbes, born in the latter part of the sixteenth century, and the friend of Bacon, was the next to propound his theories respecting the nature of the human understanding. If Bacon was a liberal, Hobbes was an advocate for despotism; and in all his writings he lays down the precise laws which regulate mind in a way not to be disputed. He was a dogmatist, and the founder of the sensual school of philosophy. Bacon was the friend, Hobbes the enemy, of virtue. According to this "bold thinker," "all knowledge is derived from the sense by motion; thoughts are representations of the qualities of bodies without us; the cause of sense is the pressure of the external object on the organ of sense; what we call *sensible* qualities are nothing but motion in us; imagination is nothing but decaying sense, and understanding is imagination raised by words or other voluntary signs. Besides sense and thought, and train of thoughts, the mind has no other motion. Whatever we imagine is finite; therefore there is no idea of any thing infinite. Reasoning is nothing but reckoning; that is, adding or subtracting. The passions are internal voluntary motions; when appetites and aversions, hopes and fears, arise alternately about the same thing, the whole sum of these motions is deliberation; and the last appetite or aversion in deliberation is will, not the faculty, but the act of willing." This may be exceedingly excellent, but we are compelled to confess that it is beyond our comprehension. Sir James Mackintosh, in his invaluable Treatise on English Philosophy (Dissertation Second, Encyclopædia Brit. vol. I. new edit.) thus speaks of Hobbes's confusion of the principle of *thought* and *feeling*:—"The multiplicity of errors which have flowed into moral science from this original confusion, is very great. They have spread over many schools of philosophy, and many of them are prevalent at this day. Hence the laws of the understanding have been applied to the affections; virtuous feelings have been considered as just reasonings; evil passions represented as mistaken judgments; and it has been laid down as a principle, that the will always follows the last decision of the practical intellect. By this great error, Hobbes was led to represent all the variety of the desires of man, as being only so many instances of objects deliberately and solely pursued; because they were the means, and at the time perceived to be so, of directly or indirectly procuring organic gratification to the individual. The human passions are described as if they reasoned accurately, deliberated coolly, and calculated exactly. It is assumed that, in performing these operations, there is and can be no act of life in which a man does not bring distinctly before his eyes the pleasure which is to accrue to himself from the act. From this single and simple principle, all human conduct may, according to him, be explained, and even foretold. Many besides him have really represented *self* as the ultimate object of every action; but none ever so hardily thrust forward the selfish system in its harshest and coarsest shape. Having thus struck the affections out of the map of human nature, it is no wonder that we should find in it not a trace of the moral sentiments. Moral good he considers merely as consisting in the signs of a power to produce pleasure; and repentance is no more than regret at having missed the way: so that, according to this system, a disinterested approbation of, and reverence for, virtue, are no more possible than disinterested affections towards our fellow-creatures. There is no sense of duty, no compunction for our offences, no indignation against the crimes of others, unless they affect our own safety; no secret cheerfulness shed over the heart by the practice of well-doing. From his philosophical writings, it would be impossible to conclude that there are in man a set of emotions, desires, and aversions, of which the sole and final objects are the voluntary actions and habitual dispositions of himself, and of all other voluntary agents, which are properly called *moral sentiments*; and which, though they may vary more in degree, and depend more on cultivation than some other parts of human nature, are as seldom as most of them found to be entirely wanting."

Locke.

The paradoxes of Hobbes excited general alarm among moralists, and were answered or refuted by Cudworth with considerable effect, and they have at length come to be looked upon as beautifully and correctly written fallacies. After Hobbes came Locke (born 1632, died 1704), one of the greatest of our writers on the mental faculties. In order to study the human soul, he went neither to ancient nor modern philosophers for advice, but turned within himself, and after having long contemplated his own mind he gave his reflections to the world. He considers that the understanding attains the knowledge of itself through experience and observation. Rejecting innate ideas, Locke teaches that sensation and reflection are the only sources of knowledge, external objects furnishing the mind with the ideas of sensible qualities, and the mind furnishing the understanding with ideas of its own operations. Sensation convinces us of the existence of solid extended substance, and reflection of the existence of thinking ones, of the cause and nature of which two kinds of being we can know nothing. Perception is a communication between the mind and external objects carried on by means of images present to the mind; these he calls *ideas*, which he defines to be the immediate objects about which the mind is employed in thinking. Having treated at length of the origin, nature, and qualities of ideas, he proceeds to consider the instrument by which men communicate their ideas to each other; and his remarks on this subject (Book iii., of Language) form the most valuable dogmatic part of his work. Knowledge is the perception of the agreement or disagreement of ideas, which consists in identity or diversity, relation, coëxistence, and real existence. Of the existence of ourselves and of God we have intuitive knowledge, which is the immediate perception of the agreement or disagreement of ideas: demonstrative knowledge is the discovery of it by the intermediation of other ideas: and these two sorts of knowledge yield complete certainty. Sensitive knowledge leads to the belief of the existence of other beings, and carries with it a reasonable confidence. Judgment is a supposition or opinion of the agreement or disagreement of ideas, and supplies the want of knowledge. Its conclusions are only probable. By thus making experience, or the conviction of our senses, the basis of our knowledge, both of mind and matter, Locke has been called an empiric or quack in the schools of philosophy; and his system was keenly opposed by Leibnitz, Hume, and others. It would appear that Locke had it less in view to extend our knowledge of the nature of the mind than to make us sensible how little we possibly can know. He expresses his desire "to prevail with the busy mind of man to be cautious in meddling with things exceeding its comprehension; to stop when it is at the utmost extent of its tether; and to sit down in quiet ignorance of those things, which, upon examination, are found to be beyond the reach of our capacities." He continues in a strain which it would have been creditable to the common sense of philosophers had they duly regarded. "My right hand writes, whilst my left hand is still. What causes rest in one and motion in the other? Nothing but my will, or thought of my mind; my thought only changing, my right hand rests, and the left hand moves. *This is matter of fact, which cannot be denied.* Explain this, and make it intelligible, and then the next step will be to understand creation. . . . . . In the meantime, it is an overvaluing ourselves, to reduce all to the narrow measure of our capacities; and to conclude all things impossible to be done, whose manner of doing exceeds our comprehension. . . . . If you do not understand the operations of your own finite mind, that thinking thing within you, do not deem it strange that you cannot comprehend that eternal infinite mind, who made and governs all things, and whom the heaven of heavens cannot contain." Whatever may be said of the empiricism of Locke, it is acknowledged by all that he was an acute thinker, and his labours, as demonstrated in his Essay on the Human Understanding, which was nineteen years in preparing, will always be acknowledged with gratitude in the history of philosophy; but at the same time it must be remembered, that, in attempting to analyse the human soul, as an anatomist proceeds in investigating a body piece by piece, and to derive all ideas from experience, he has unintentionally supported materialism. His declaration, that God, by his omnipotence, can make matter capable of thinking, has been considered dangerous in a religious point of view.

Shaftesbury.

During the period in which Locke flourished, English ethical philosophy was considerably advanced by Anthony Ashley Cooper, third Earl of Shaftesbury, whose writings appeared between the years 1709 and 1713, when he died. In the last-mentioned year, his collected works were published, under the title of Characteristics of Men, Manners, Opinions, and Times. The attention of Shaftesbury was directed principally to the writings of antiquity, on which he built a civil, social, and theistic kind of philosophy; one of his chief aims seems to have been to write elegantly and neatly, and he often indulges in a vein of humour altogether at variance with sound reasoning. According to the opinion of one who, it will be allowed, was well able to judge in matters of this nature—the late Sir James Mackintosh—Shaftesbury's "Inquiry Concerning Virtue" is entitled to a place in the first rank of English tracts on moral philosophy. "Among the most important of Shaftesbury's suggestions (says Sir James, in his already quoted dissertation, Encyclopædia Britannica, vol. i., new edition, which we here take the opportunity of recommending to perusal), is, that goodness consists in the prevalence of love for the system of which we are a part, over the passions, pointing to our individual welfare; a proposition which somewhat confounds the motives of right acts with their tendency, and seems to favour the melting of all particular affections into general benevolence, because the tendency of these affections is to general good. The next, and certainly the most original, as well as important, is, that there are certain affections of the mind, which, being contemplated by the mind itself through what he calls a *reflex sense*, become the objects of love, or the contrary, according to their nature. So approved and loved, they constitute *virtue* or *merit*, as distinguished from mere goodness, of which there are traces in animals who do not appear to *reflect* on the state of their own minds, and who seem therefore destitute of what he elsewhere calls a moral sense. . . . It should never be forgotten that we owe to these hints the reception into ethical philosophy of a moral sense, which, whatever may be thought of its origin, or in whatever words it may be described, must always retain its place in such theory as a main principle of our moral nature. His demonstration of the utility of virtue to the individual far surpasses all attempts of the same nature, being founded, not on a calculation of outward advantages or inconveniences, alike uncertain, precarious, and degrading, but on the unshaken foundation of the delight, which is the very essence of social affection and virtuous sentiment; on the dreadful agony inflicted by all malevolent passions, upon every soul that harbours the hellish inmates; on the all-important truth, that to love is to be happy, and to hate is to be miserable—that affection is its own reward, and ill will its own punishment; or, as it has been more simply and more affectingly, as well as with more sacred authority, taught, that to give is more blessed than to receive, and that to love one another is the sum of all human virtue. The relation of religion to morality, as far as it can be discovered by human reason, was never more justly or more beautifully stated. If he represented the mere hope of reward and dread of punishment as selfish, and therefore inferior motives to virtue and piety, he distinctly owns their efficacy in reclaiming from vice, in rousing from lethargy, and in guarding a feeble penitence; in all which he coincides with illustrious and zealous Christian writers." Yet, according to Shaftesbury, "if by the hope of reward be understood the love and desire of virtuous enjoyment, or of the very practice and exercise of virtue in another life, an expectation or hope of this kind is so far from being derogatory from virtue, that it is an evidence of our loving it the more sincerely *for its own sake*." This elegantly expressed sentiment bears a resemblance to that of Jeremy Taylor, when he says, in his Sermon on Growth in Grace, "he that is grown in grace pursues virtue purely and simply for its own interest. When persons come to that height of grace, and love God for himself, that is but heaven in another sense." Shaftesbury's Characteristics were received with enthusiastic favour by Leibnitz, the German philosopher.

Berkley.

The sensualism or materialism of Locke led Berkley (who flourished during Queen Anne's reign, and was bishop of Cloyne in Ireland) to form a peculiar theory regarding ideas. His Theory of Vision, which is reckoned the most valuable part of his labours, was the first exposition of the difference between the original and acquired perceptions of the eye, and now forms an essential part of the science of optics. Berkley was an exceedingly amiable man, and elegant writer; but his ideas about ideas can only now be considered an amusing absurdity. He maintains that the belief in the existence of an exterior material world is false and inconsistent with itself; that those things which are called sensible material objects are not external, but exist in the mind, and are merely impressions made on our minds by the immediate act of God, according to certain rules, termed laws of nature, from which he never deviates; and that the steady adherence of the Supreme Spirit to those rules is what constitutes the reality of things to his creatures. It is very difficult to understand what the philosopher means by this denial of the existence of matter; he is more intelligible when he tells us, "that the end to which God requires the concurrence of human actions must be carried on by the observation of certain determinate and universal rules or moral precepts, which in their own nature have a necessary tendency to promote the well-being of mankind, taking in all nations and ages, from the beginning to the end of the world."

Hume.

The visionary ideas of Berkley brought David Hume forward to combat the whole system of Locke and his followers. About the year 1738, he published his Treatise of Human Nature, which was an attack on all the principles of knowledge and belief. Discarding experience and observation as utterly futile, he proved to his own satisfaction, and perhaps that of many others, that nothing was known, and that nothing could be known; demonstrating that we are doomed for ever to remain in total ignorance of ourselves, of God, and of all nature. He laid down the proposition, that whatever has a beginning has a cause, is not intuitively certain, but is derived only from custom and belief, and is rather an act of the sensitive than of the cogitative part of our nature. In this argument he proceeds on the ground that all certainty arises from a comparison of ideas, and the discovery of their unalterable relations, which are resemblance, proportions in quantity and number, degrees of quality and contrariety, and none of which is implied in the proposition above stated. All the objects of knowledge are impressions and ideas; the former are our more lively perceptions, when we hear or see, love or hate, or desire or will; the latter are the less lively perceptions of which we are conscious when we reflect on the former, and are copies of impressions. The existence of these perceptions as objects of consciousness cannot be denied; but to admit the existence of a percipient being, the I, is to assume that of mind, which is no more an object of knowledge than matter. There can therefore be no objective knowledge; and we are reduced to consciousness, the phenomena of which it takes cognisance, and their subjective relations. Hume's system of scepticism is not scepticism antecedent to study and philosophy, but consequent to science and inquiry, holding the absolute fallaciousness of the mental faculties, bringing the senses themselves into dispute, and thus sapping the foundations of all knowledge, and rejecting the existence of God, a providence, and a future state. "It is true (says Sir James Mackintosh, in the work to which we formerly referred) that such a system of universal scepticism never can be more than an intellectual amusement—an exercise of subtlety—of which the only use is to check dogmatism, but which perhaps oftener provokes and produces that much more common evil. As those dictates of experience which regulate conduct must be the objects of belief, all objections which attack them in common with the principles of reasoning must be utterly ineffectual. Whatever attacks every principle of belief can destroy none. As long as the foundations of knowledge are allowed to remain on the same level (be it called certainty or uncertainty) with the maxims of life, the whole system of human conviction must continue undisturbed. When the sceptic boasts of having involved the results of experience and the elements of geometry in the same ruin with the doctrines of religion and the principles of philosophy, he may be answered, that no dogmatist ever claimed more than the same degree of certainty for these various convictions and opinions; and that his scepticism, therefore, leaves them in the relative condition in which it found them. No man knew better, or owned more frankly, than Mr Hume, that to this answer there is no serious reply. Universal scepticism involves a contradiction in terms—*it is a belief that there can be no belief*. It is an attempt of the mind to act without its structure, and by other laws than those to which its nature has subjected its operations. To reason without assenting to the principles on which reasoning is founded, is not unlike an effort to feel without nerves, or to move without muscles. *No man can be allowed to be an opponent in reasoning, who does not set out with admitting all the principles, without the admission of which it is impossible to reason*. It is indeed a puerile, nay, in the eye of wisdom, a childish play, to attempt either to establish or to confute principles by argument, which every step of that argument must presuppose. The only difference between the two cases is, that he who tries to prove them can do so only by first taking them for granted; and that he who attempts to impugn them falls at the very first step into a contradiction from which he never can rise." It is impossible to withhold a tribute of admiration to the genius and logical powers of Hume, as they are developed in his celebrated Essay on Cause and Effect, and other papers; but his works in the main must be considered as little else than elegant quibbles, and, as such, may be safely left to the appreciation of the recluse.

Hartley.

At about the same time with Hume, a new philosophic writer sprung up, under the name of Hartley. This individual attempted to account for all the phenomena of the mind, by the single principle of the association of the ideas, and for this principle, by vibrations and vibratiuncles in the medullary substance of the brain. In connection with this plan of materialism, he defended the doctrine of necessity, representing God as the only cause of all natural effects and all human actions. To this Hartleian school belonged Priestley, Darwin, and Horne Tooke.

THE SCOTCH PHILOSOPHERS.

Speculations upon the nature of mind are considered to have originated in Scotland with Dr Francis Hutcheson, of the University of Glasgow. Hutcheson, who was a man of cultivated understanding, and delivered some valuable lectures, is, however, less remembered than Dr Thomas Reid, of the same eminent seminary, who in 1764 published his Inquiry into the Human Mind, and in 1785, his Essay on the Intellectual Powers. Philosophic inquiry was subsequently advanced by Dr Thomas Brown, and, more lately, by Dugald Stewart, both professors in the University of Edinburgh. This class of inquirers has the merit of having first strongly and largely inculcated the absolute necessity of admitting certain principles as the foundation of all reasoning, and as being the indispensable condition of thought itself. According to the Scotch philosophers, certain simple ideas are implied and involved in certain intuitive judgments of the mind; thus, identity, cause, time, number, truth, certainty, probability, are ideas peculiar to a rational mind, and necessarily arise in the human understanding, when employed in the exercise of its different faculties. Reid, therefore, while he rejected the Cartesian theory of ideas or images in the mind being the only objects of thought, directed his inquiries to an analysis of the various powers and principles of our constitution, in order to discover the fundamental laws of belief, which form the groundwork of human knowledge. Though professing to build only on experience, he did not limit experience to the relations of sense and its objects. Without claiming for man more than a relative knowledge of existence, and restricting the science of mind to an observation of the fact of consciousness, he analysed that fact into a greater number of more important elements than had been recognised in the sensualist school. He showed that phenomena are revealed in thought, which cannot be resolved into any modification of sense; that intelligence supposes principles, which, as the conditions of its activity, cannot be the result of its operations; and that the mind contains notions, which, as primitive, necessary, and universal, are not to be explained as generalisations from the contingent and particular, about which alone our external experience is conversant. His enumeration of the faculties of the mind, which he does not, however, give as complete, comprises perception, memory, conception, abstraction, judgment, reason, taste, moral perception, consciousness. The representation of consciousness as a special faculty, when in reality it is the generic condition of all mental activity, was a pregnant error in Reid's philosophy; while his doctrine of the immediate or intuitive knowledge of mind and matter, which involved the overthrow of the ideal system, and the scepticism (or rather *nothingism*) deduced from it, was an important step in the progress of philosophy. Stewart, with some deviations, followed in the track of his master; but Brown, while he adopted many of the principles of Reid, departed, in many points of fundamental importance, from his philosophy. He assumes the existence of the primary intuitions of direct belief, which are not only necessary to reasoning, but to thought itself; all our conceptions imply the idea of form, which is derived from relation in space (*coëxistence*), and of power, which is derived from relation in time (successive existence); cause is only the invariable antecedent, effect the invariable consequent, power the invariable antecedence, in any sequence of phenomena. All feelings and thoughts are the mind itself existing in certain states; consciousness is not a distinct faculty, but a general term for all the states of the mind. Mental (personal) identity is an intuitive law of thought, it being impossible to conceive of successive states but as modifications of the permanent being—the I. The different states are divided by Brown into the external states (sensations) produced by the presence of external objects, and the internal states, arising in consequence of preceding affections of the mind itself. The latter class is divided into intellectual states and emotions, which are all referable to one generic susceptibility—suggestion (association of ideas). The laws of suggestion are resemblance, contrast, and nearness in time or place, which are all reducible to proximity. That capacity of suggestion which revives conceptions, Brown terms simple suggestion, and that which gives rise to feelings of relation, relative suggestion. To the former are reducible those mental states commonly called the faculties of conception, memory, imagination, and habit; to the latter, those of judgment, reasoning, and abstraction. Brown's philosophy is considered to involve many radical inconsistencies, which cannot be particularised in so general a sketch. With the death of Stewart (1828), the Scotch school of philosophy may be said to have become extinct.

It is worthy of observation that Scotland has been much more indebted to Dr Adam Smith, who, besides his well-known treatise on the Wealth of Nations, composed a work entitled the "Theory of Moral Sentiments," than to those eminent individuals whose attention was almost exclusively directed to metaphysics. The Wealth of Nations is a work which abounds in valuable truths in relation to the welfare of mankind in communities, and ought to be carefully perused by all young men.

FRENCH PHILOSOPHY.

Mallebranche.

We have already mentioned Descartes, whose inquiries into the nature of mind had such an effect upon the philosophy of modern times. From him we pass to Mallebranche, a priest and a philosopher, who published his famous Treatise on the Search after Truth, in the year 1673. This elegant writer held doctrines founded upon Cartesian principles, and in some particulars Platonic. His theory is principally distinguished by the maintenance of a mysterious union betwixt God and the soul of man, and the doctrine that the human mind immediately perceives God, and sees all things. Mallebranche was highly venerated for his elevated genius; and nothing could be more amiable and simple than his conversation and manners. As a philosopher, although he agreed with those who preceded him, in conceiving ideas to be the immediate objects of perception, he distinguished, more than any previous metaphysician, the object from the sensation which it creates, and thereby led the way to a right understanding, both of our external senses and mental powers.

Bayle.

It is necessary that we should mention Bayle in the history of French philosophy, although little else can be said of him than that he was one of the most insidious doubters who ever published his opinions on the nature of mind. Bayle was born in Languedoc in 1647, and died in 1706. In 1696, while a refugee in Holland, where he was known to Shaftesbury, he published his celebrated Historical and Critical Dictionary, which was forthwith attacked on account of the religious opinions which it developed. Bayle was most subtile in his metaphysical disquisitions, and possessed a powerful spirit of critical sagacity in treating of historical characters. His writings therefore had a mischievous tendency in unsettling the minds of superficial inquirers. He moreover professed himself to be a follower of no sect in philosophy; but in thus preserving an independence in reasoning, it seemed only to be for the purpose of sneering at the opinions of all other men, and of indulging his humour in setting the various classes of thinkers at variance with each other. Bayle is described by Voltaire as being "the first of logicians and sceptics;" but this was said before Hume made his appearance in the philosophical world.

Condillac.

Stephen Bonnot de Condillac (born in 1715, died in 1780) was the founder of the sensual school of French philosophy. He taught that the basis, the principle of all that is developed in our mind, is sensation (*la faculté de sentir*). All ideas, knowledge, faculties, even reflection, actions, and customs, are successive transformations of this principle. In all his works he strongly argues this point; and the simplicity of his theory awakened the greatest interest. He was supported by Diderot, d'Alembert, and Helvetius, and the influence of his writings on society generally was most striking. The most difficult of all sciences, which requires the deepest study and the most persevering reflection, was brought within the reach of the multitude; every one could talk about metaphysics. But it was overlooked that this system did not lead men a step nearer to the solution of the highest and most important problems. The system was carried farther and farther, not always in accordance with the views of the author, but according to the direction given by him. Sensation (the lowest degree of intellectual action, and that in which we are most dependent upon the external world) being now considered the essential principle in all the operations of the mind, the distinction between sensation and perception, which Locke had made, being rejected, and man being regarded only as an animal of a somewhat finer organisation than the others, but moved only by sensual impulses (as in the system of Helvetius), the consequence was, that the material world was considered as the only form of existence, mind as only a connection of atoms, the basis of its actions egotism, and the end of these actions a refined sensuality; thence the belief in moral freedom, virtue, God, providence, and immortality, was looked upon as a folly unworthy of a reflecting mind, and a complete materialism became predominant. Since the time of Condillac, new theorists have arisen, among whom Victor Cousin is the more prominent. At present, France cannot be said to have any system of intellectual philosophy properly its own.

GERMAN PHILOSOPHY.

Leibnitz.

German philosophy is distinguished by an incessant striving for a systematic character, and the deduction of scientific conclusions from the simplest and most comprehensive principles. It must be considered to begin with Gottfried Wilhelm, Baron of Leibnitz (born at Leipsic 1646, died 1716), one of the most celebrated philosophers and scholars which Germany has ever produced. This eminent visionary, who was coeval with Locke and Newton, endeavoured to deduce philosophical truth from necessary and innate ideas of reason, by way of mathematical demonstration. The basis of his theory is, that there are in philosophy, as in mathematics, necessary truths, which cannot be learned from experience, but must be grounded in the soul itself, as they rest on principles, the proof of which is independent of the evidence of the senses. Such is the substructure of the rationalism of Leibnitz, whose singular line of reasoning on the nature and operations of the mind and senses it may be curious to follow. The principal characteristics of his rationalism are a peculiar theory of knowledge, the doctrine of monadology, and the theodicea, or doctrine of optimism. With regard to knowledge, according to this system—1. The necessary truths are innate to the soul, not indeed actually forming objects of knowledge, but capable of being called forth by circumstances. Whatever is derived from the senses is confused, and distinct knowledge is possessed only by the understanding. These views are opposed to the empiricism of Locke. In order to attain truth, it is necessary to use the rules of logic, as mathematicians also use them, by unfolding, analytically, the simple truths contained in a subject, until the fundamental truth is attained. The Cartesian criterion—clearness and distinctness—is not sufficient. "Our conclusions," says Leibnitz, "rest on two great principles—the principle of contradiction (according to which we deem that false which involves a contradiction, and that true which is opposed to falsehood), and the principle of the sufficient reason (which teaches that no assertion is true, if no sufficient reason can be given why it is true, rather than false), which leads to an absolute final reason, independent of accidental circumstances. But the final reason of the certainty of innate necessary truths is in God, as the source of all necessary and eternal truth. 2. Monadology forms the central point of the system, and Leibnitz believed that in this he had discovered the fundamental basis of actual knowledge. All experience teaches us that there are compound substances; consequently there must be simple ones. The senses give us only confused, the understanding distinct, knowledge; and the simple, which cannot be recognised by the senses, is the ground of the compound. These simple substances, from which the compound are formed, and each of which differs in its qualities from all others, since there are no two things exactly alike, Leibnitz calls *monads*, of which he assumes four sorts—pure monads (or living beings), the souls of beasts, the souls of men, and God, who, as the origin of all knowledge, of reality, and of the existence of things, the eternal, original Monad, he calls the *Monas monadum*. All created monads are united with bodies, or rather all finite beings are aggregates of monads, some having a central and governing monad. The different classes of monads conceive of the universe with different degrees of distinctness; God alone conceives it perfectly. There is no actual influence of one thing on another, but only an ideal connection; *i. e.* the internal changes of each monad are so arranged as to agree with the changes in the monads immediately connected with it. The cause of this agreement is the infinite wisdom and almighty power of the Deity. The divine understanding is the prototype of all truth, beauty, and absolute good, and by it all the interior changes in the monads were so predetermined, that there is a perfect harmony in their succession. This predetermination or established harmony was arranged by the Godhead when the plan of the world was formed. 3. The theodicea is the defence of the supreme wisdom of the Creator of the world, which had been impugned on account of the existence of evil. Such a theodicea Leibnitz attempted, particularly on account of the contrary views brought forward by Bayle. According to the Leibnitzian system, an infinite number of worlds are possible in the divine understanding; but, of all possible ones, God has chosen and formed the best. Every thing which really is, is best in connection, even if, by itself, it is imperfect. This system is therefore denominated optimism. Each being is intended to attain the highest degree of happiness of which it is capable, and is to contribute, as a part, to the perfection of the whole. We have not room to follow Leibnitz through his intricate theories regarding the existence of moral evil, the operation of finite spirits, &c. He obtained many followers, some of whom, by means of logic, carried his system to absurdity. The Leibnitzian school was followed by a period of eclectic philosophy, in which the scepticism of Hume, the examination of the understanding by Locke, the psychological investigations of Feder, Garve, and Mendelssohn, together with the sentimentality which reigned in poetry as well as in religion, prepared the way for the system of Immanuel Kant.

Kant.

This eminent German (born 1724, died 1804), who first published his theories of the human understanding in 1781, gave quite a new character to the philosophy of his country. Kant set out with an eager search after truth. He perceived that the idea of cause and effect is by no means the only one which the mind makes use of with the consciousness of its necessity, yet without having derived it from experience. This he found in his endeavours to ascertain what we can know, which led him to the fundamental laws of the mind. Having arrived at this conclusion, he strove to ascertain the exact number of these original or transcendental ideas or imperative forms—that is, such ideas as we do not derive from experience, but by which, on the contrary, we acquire experience. In the first rank of these are space and time. Kant shows that all our perceptions are submitted to these two forms; hence he concludes that they are within us, and not in the objects; they are necessary and pure intuitions of the internal sense. Truths acquired by experience never carry with them that absolute certainty—for instance, experience teaches us that the sun rises every day, that all men are mortal; yet we may imagine a day when the sun does not rise, and a man who does not die; but imagination itself cannot suppose any thing unconnected with space and time. This primitive intuition must have as its basis the primary laws of the understanding, without which we can comprehend nothing. As far as the transcendental ideas, or, as Kant calls them, categories, extend, so far extends the knowledge of the understanding *a priori*. Kant was at great pains in endeavouring to ascertain the number of these categories, and he found them to be all comprehended under the four classes of quantity, quality, relation, and modality. The categories themselves are twelve in number:—Under the first head are comprised, unity, multitude, totality; under the second, reality, negation, limitation; under the third, substance and accident, cause and effect, action and reaction; under the fourth, possibility, existence, necessity. These categories are necessary and indispensable for our understanding, as the forms of space and time were for our perceptions. We cannot figure to ourselves any thing without the relations of cause and effect, of possibility, quantity, &c.; which, with other words, is, we cannot perceive any thing except by those original, necessary, unchangeable forms of thought. Hence the demonstrative certainty of mathematics, the objects of which—space, time, quantity, &c.—lie in the necessity of the forms of thought, and not in the range of error to which experience is subject. To produce results, the categories are applied to exterior objects—objects of experience—in which application they are subject to error. The three original faculties, through the medium of which we acquire knowledge, are sense, understanding, reason. Sense, a passive and receptive faculty, has, as has been already stated, for its forms or conditions, space and time. Understanding is an active or spontaneous faculty, and consists in the power of forming conceptions, according to the categories already given, which categories are applied to objects of experience through the medium of the two forms of perception, space and time. Reason is the third or highest degree of mental spontaneity, and consists in the power of forming ideas.—Besides what are considered to be the merits of Kant in regard to intellectual philosophy, much is owing to him for his virtue and inflexible morality, which he anxiously endeavoured to place on their true elevated basis, after they had been referred exclusively to interest by Helvetius and others. His philosophy has been taught in all the German universities, excepting some Catholic ones.

We have now presented a sketch, which has been necessarily brief, of the principal leading philosophies in ancient and modern times; but it has been given more with the view of affording our readers an idea of what has been done in the way of exploring the hidden mysteries of mind, than with the hope that any benefit will be reaped from the perusal. The sketch, such as it is, exhibits a lamentable picture of misdirected ability—of valuable time spent in a search as vain as that after the "philosopher's stone." From the days of Zeno and Epicurus to those of Immanuel Kant, the world has been the theatre of successive systems of metaphysics, each of which, as we have seen, has met with followers of greater or less distinction, in schools and colleges, without having, either individually or collectively, been of any sensible benefit to the mass of the community. Logic, the design of which is to teach the right use of our reason, or intellectual and moral faculties, and the improvement of them in ourselves and others, has been actively employed in the endeavour to subvert the most obvious truths. Zeno demonstrated the impossibility of motion; Spinoza, that there was no God; Hobbes, that there was no difference between right and wrong; Hume, that belief was imaginary; Descartes, Mallebranche, and Locke, that mind was matter, or, in other words, that when we lose our consciousness of existence, we no longer preserve our identity. Well may the untaught reader inquire, What does all this mean? We may answer him in the words of Reid—"Poor untaught mortals believe undoubtedly that there is a sun, moon, and stars; an earth which we inhabit; country, friends, and relations, which we enjoy; land, houses, and moveables, which we possess. But philosophers, pitying the credulity of the vulgar, resolve to have no faith but what is founded on reason. They apply to philosophy to furnish them with reason for the belief of those things which all mankind have believed, without being able to give any reason for it. And surely one would expect that, in matters of such importance, the proof would not be difficult; but it is the most difficult thing in the world; for these three great men—Descartes, Mallebranche, and Locke—with the best good will, have not been able, from all the treasures of philosophy, to draw one argument that is fit to convince a man that can reason, of the existence of any one thing without him. Admired philosophy!—daughter of light!—parent of wisdom and knowledge!—if thou art she, surely thou hast not yet arisen upon the human mind, nor blessed us with more of thy rays than are sufficient to shed a 'darkness visible' upon the human faculties, and to disturb that repose and serenity which happier mortals enjoy, who never approached thine altar, nor felt thine influence! But if indeed thou hast not power to dispel those clouds and phantoms which thou hast discovered or created, withdraw this pernicious and malignant ray—I despise philosophy, and renounce its guidance; let my soul dwell with common sense." These are no doubt severe expressions of reproof from one of the most eminent inquirers into the nature of mind in modern times, but they are obviously no less severe than just. Professor Dugald Stewart has admitted with the Abbé de Bonald that "diversity of doctrine has increased from age to age, with the numbers of masters, and with the progress of knowledge; and Europe, which at present possesses libraries filled with philosophical works, and which reckons up almost as many philosophers as writers, poor in the midst of so much riches, and uncertain, with the aid of all its guides, which road it should follow—Europe, the centre and focus of all the lights of the world, has yet its PHILOSOPHY only in expectation."

While professors of moral philosophy have thus left the people in ignorance of the nature of mind, or presented them with disquisitions too abstruse for their comprehension, other authors, not connected with the schools, have come forward with the enlightened and philanthropic view of explaining the operation of the intellectual faculties, of cultivating the moral feelings, and subduing the animal propensities. Among the various writers who have thus endeavoured to benefit society, we may refer to Dr John Abercrombie, of Edinburgh, whose recent work, though scarcely systematic, abounds in valuable matter. We shall now notice the extraordinary exertions which for the last few years have been made by the phrenologists, whose system of mind, laying the question of its physiological origin and alleged foundation entirely aside, has perhaps better claims to notice than many who are repelled by the startling question as to that origin, may be aware of. Their system, at the hazard of appearing tautological, we shall term the

PHRENOLOGICAL PHILOSOPHY.

This new science of mind was first developed by Dr Gall, a German physician, who about the year 1791 attracted considerable attention to his anatomical and physiological inquiries respecting the brain and nerves. Gall had remarked at school, that some boys, who excelled him in spite of his efforts in committing words to memory, were distinguished by prominent eyes. Thence he inferred that the talent or the organ of verbal memory must reside in this part of the head. He afterwards became convinced that this and other talents actually depend on the formation of certain parts of the head. He collected skulls, carefully comparing the prominences common to all, and those which distinguish them from each other. He compared also the skulls of animals, studied the habits of beasts and men, the formation of their brain, and thus arrived by degrees to assign the particular localities of above twenty organs, or as many seats of the most prominent operations of the mind. This new system was called *Phrenology*, from two Greek words signifying the science of mind. Along with his friend

Dr Spurzheim, Gall subsequently delivered lectures in Germany and France, exhibiting his discoveries and views. Before his death, in 1828, phrenology had obtained many converts on the Continent, in Great Britain, and North America. The science, however, has not been more indebted to these philosophers for the advances which it has made, than to Mr George Combe, of Edinburgh, who embraced its doctrines about the year 1817, and has ever since exerted himself to extend the knowledge of them to others. Mr Combe not only equals his preceptors in reach and profundity of thought, exactness of observation, and the clearness and method with which he explains his views, but in these qualities has very few equals among the thinking men of the age. In a work which he published in 1828, under the title of "An Essay on the Constitution of Man, considered in relation of external objects," he gave a view of the phrenological scheme of mind apart from the question of its organological truth, and pointed out how it might be applied practically to the improvement of the condition of the human race.

This treatise has presented the science in a new aspect, and one under which it seems likely to make a far more rapid advance than formerly. Down to this period the great stumbling-block of phrenology evidently was its supposed pretensions to what appeared a kind of divination: it bore the appearance of one of those sciences which men have long considered false, from their not being founded in nature. As if disposed to compensate the credulity which their ancestors displayed respecting alchemy and astrology, the public have been perhaps too eager to condemn a science which, though at first sight one of the same order, never yet has made any pretensions that were not based on observation of facts patent to the senses. So much we can say in a spirit of fairness, without having ourselves so much acquaintance with the organological part of the science as to say whether it is to be believed or not. Since the publication of Mr Combe's Essay, which has been understood and practically applied by multitudes without regard to particular localities in the brain, the case has evidently been much altered. Phrenology may now be taken into consideration, not as a means of vaticinating upon the characters of men by an inspection of their heads, but as a scheme of the mental constitution; in short, a system of metaphysics, and, consequently, of morals. Considered in this light, it appears to us to have, in the first place, the important quality of intelligibility, which no other system altogether has. It seems for the first time to make plain the perplexing mixture of tendencies, feelings, and powers, which has heretofore rendered men such a riddle to himself. This it does by rigidly tracing the powers of mind to their *primitive* functions, and reducing them to a kind of democratic level, allowing each an agency independent of the rest, but which may be exerted in company with others, and dividing the whole into three great classes—propensities, moral sentiments, and intellectual faculties. While Mr Combe has treated these with a regard to the general improvement of the race, they have more recently been described by Mr James Simpson, in his eloquent and convincing work on education, to which that author thinks them eminently applicable, as analysing the being to be educated. As they are detailed in the latter work with the author's characteristic liveliness and point, and with the advantage of some additional observations made since the appearance of Mr Combe's treatise, we shall prefer taking our account of them from that source. The frequent allusions to the treatment of particular faculties in education made by Mr Simpson will incidentally serve to show that the science is practical as well as intelligible:—

"It is plain, that until an approximation shall be made to something like a practical analysis of the mind of man, until the faculties to be improved by education are known, education must continue to be vague, misdirected, and inefficient, as it has hitherto been. If, as is evident, we can make no practical use of a great part of the catalogue of faculties which we studied at college, may we not meet upon some admitted common ground? May we not adopt those impulses or powers of mind which directly constitute the view of man taken by necessity, although very unsystematically, in the common affairs of life; but by philosophers rejected, and therefore never reduced to any thing like system, and, above all, never resorted to in education. Let any one think what are the tendencies or characteristics in his fellow-men to which he traces their actions, and upon which he relies with the utmost confidence for certain expected results. Let us turn to our most successful portrayers of *nature*, a Shakspeare and a Scott, and observe what are their constituent characteristics of that nature, to which the same faculties in ourselves echo with such delighted sympathy. Assuredly these will not be found in the catalogues of the metaphysicians. I should be safe in conditioning, that I shall not need to claim for human nature any one impulse not recognised and dealt with—practically though not systematically—by Shakspeare and Scott. These are capable, we think, of a much more satisfactory analysis than might be supposed; an analysis which I only require to be granted to me, even for argument's sake, to obtain a basis for education which would advance its efficiency to a degree almost beyond our calculation. I feel so confident that all my postulates as to human powers, impulses, instincts, or faculties—for we need not dispute about names—will be conceded to me, from the impossibility, as I humbly view it, of refusing the concession, that I am content to peril the whole argument upon the admission by every educated person—First, that the impulses now to be enumerated form constituent parts of man; and, secondly, that, as is true of the physical structure and organic functions, each is related to some object or objects in nature, moral or physical, external to itself, but directly pointing to it, upon which it is exercised. I wish it, however, to be distinctly understood that I do not found upon physiological evidence of the truth of the analysis of faculties which I am humbly to offer, because that evidence is not generally admitted; I do not require to trace each faculty to a disputed cerebral origin; the faculties shall be merely metaphysically submitted *seriatim* to the reader's judgment, and his own experience appealed to; and any one which he does not recognise in man, I am quite contented that he shall reject. If, too, he does not think the relative object correctly added to each faculty as we advance, that, too, he is at perfect liberty to disallow.

1st, I do not fear denial, when I claim for man AN APPETITE FOR FOOD, an instinct which directs him, even when new-born, to remove the pain of hunger, the only pain then removeable by an act of his own. Forming a variety or mode of the instinct of food, which last includes hunger and thirst, is the desire of the stimulus of alcohol in wine or some other shape. The abuses of these appetites are gluttony and drunkenness. That this instinct is primitive, is demonstrated by its often existing in a state of disease; the insatiable craving of hunger, even when the stomach is full, is a common lunatic symptom; while the temptations of wine and ardent spirits often become altogether beyond the control of the will. The relative objects of that instinct are edible animal and vegetable matter; while the juice of the grape, and other extracts capable of being fermented and distilled, gratify the taste for alcohol alluded to.

2d, For the preservation of his species, man is endowed with AN INSTINCT OF SEX. As the abuse of this impulse leads to much evil and suffering, individual and social, it requires much more educational watching and regulation than it ever receives. The consequences to body and mind of this neglect are often horrible. Its derangement is known in lunatic asylums, and detailed in works on insanity. Its object, relatively, is the other sex.

3d, Man has an IMPULSE TO CHERISH HIS OFFSPRING. There are cases in which this propensity has been morbidly excited. Its relative object is the helplessness and innocence of childhood; the feeling and the object were intended for each other.

4th, A PROPENSITY OF ATTACHMENT to his fellow-men, in the alliances of society and friendship, is a part of man's constitution. This feeling is so strong that solitude has often produced mental alienation, as has the unmitigated silence of some penitentiaries. Man's fellows exist in manifest relation to this social tendency.

5th, No impulse requires more the restraining hand of education than the PROPENSITY TO CONTEND AND FIGHT. We are made most aware of its being part of man, by seeing it in the various forms of its abuse, contentiousness, contradiction, violence, assault, and war. But as no instinct or faculty was given for the purposes of abuse, we shall find the use of this propensity in self-defence, courage, enterprise, and general activity. This impulse has a marked relation to external objects; it was given to man that he may repel the dangers which often assail him from other animals, and the passions of his fellow-men.

6th, It is not enough that man shall contend and fight; it is often imperative upon him to destroy. Besides killing for food, he must, in self-defence, kill dangerous animals, and more dangerous men, that assail him; and to fit him for this, he has AN INSTINCT TO DESTROY. The feelings which prompt this extreme, with regard to his own species at least, are resentment, anger, and rage; these are often abuses, and certainly so is a cruel delight in giving pain, and even depriving of life. In disease, it is the most dangerous form of madness; it produces murder without motive, appetite for blood, ungovernable violence, and indiscriminate destruction of every thing within its reach. Much short of disease, it is a troublesome propensity; cruelty to animals, and the tendency to deface and destroy, are its manifestations; while the irascible tempers which disquiet the domestic circle are its most ordinary form of abuse. It requires for its regulation, if not its repression, the firmest and the gentlest educational management. The impulse is widely spread in the animal creation; it is the instinct of prey; and teeth, tusks, beaks, and claws, are its instruments. It prompts man, too, to arm himself with *destructive* weapons, from the rude club to the battery of cannon. Lastly, it constitutes the impulse to punish, to inflict pain, torture, and death.

7th, In nothing will the observant instructor of youth perceive more diversity among individuals than in the characteristics of reserve or openness. Some individuals are so close, that nothing can be extracted from them; others apparently conceal nothing. The truth is, that all conceal much more than they declare, and an IMPULSE TO CONCEAL is a constituent part of man, for the wise end of preventing that constant exposure of thought and purpose, which would not only render society intolerable, but would remove a material guard against the evils which, by their selfish passions, men are inclined to inflict upon each other. The right use of the impulse to conceal is a prudent reserve; its abuse is cunning, duplicity, and deceit. Those who are conversant with the insane are too well aware how often a morbid habitual cunning calls for increased vigilance. The related objects of the faculty are the other faculties whose outward manifestations it restrains: the perfection of what is called *acting*, in both a favourable and unfavourable sense, depends partly on the energy of this power: some children are consummate actors, and thereby greatly perplex their teachers, who are ignorant of the spring and origin of that deceptive character.

8th, Man has A DESIRE TO POSSESS the material things that contribute to his well-being, and loves to accumulate them in exclusive property. When the advantages to society of this accumulation are reflected upon, it is evident that what is called *capital* is an institution of nature, confined to man as to indefinite accumulation, though observed in bees, beavers, and some other animals, as to annual store. It is only necessary to think what would be the condition of social man if he lived, like most animals, on the chance of each day, to be convinced of the connection between accumulation and social power and enjoyment. The use of the faculty to each individual is the attainment of the means of regular subsistence for a family, and the benefit of inheritance: its abuse is avarice; its grosser abuse theft: its disease every one has heard of or witnessed in an impulse, not created by necessity, but beyond the control of the will, to appropriate things of value, and, in the worst cases, whether of value or not. The related objects of the propensity are material things which afford enjoyment in some way to the faculties, and money their sign and convertible value. The regulation of the propensity ought to be an important object of attention in education.

9th, Independently of his reason, man has an IMPULSE TO CONSTRUCT, to change the forms and combinations of matter into instruments and accommodations. Franklin called him a 'tool-making animal.' The faculty is often possessed in uncommon power by cretins and other idiots without an atom of intellect to guide it. Reason and imagination greatly aid the faculty in man, as is evident when we compare the wigwam with the palace. Individuals differ greatly in this primitive power; some can make whatever they see, others cannot fold a letter neatly. The relative objects of the impulse are manifest in the material world. This power the judicious instructor will recognise and call forth in his pupil.

It must have occurred to the reader, that in the inferior animals are found *all* the nine propensities now described, for they are well nigh essential to animal existence. On this ground I ask leave to distinguish them as a class, and refer to them in the sequel, by the name of the ANIMAL PROPENSITIES. Before leaving this class of faculties, it seems the best time to appeal to the reader's experience if it be not truth, and press the fact on the attention of the educationist, that vice and crime, in all their phases and varieties, are but other terms for the abuse of one or more of these specified impulses. The enumeration of a few will sufficiently illustrate this; every one can apply each instance to the impulse abused, for they are set down in the order adopted—namely, gluttony, drunkenness, incontinence, contention, violence, cruelty, murder, robbery, fraud, theft, &c.

10th, Scarcely anticipating the possibility of the rejection of any of the nine impulses already submitted, I would next, with not less confidence, claim for the man we are compounding, a sentiment of SELF-LOVE, in which is included as well self-elevation as self-preference. In due and beneficial endowment, it is a legitimate attention to our own well-being; it is self-respect, independence, and confidence in our own powers and capacities. In abuse, it is pride, self-sufficiency, disdain, insolence, love of power, tyranny, and general selfishness. It is a great exciting cause of the activity of the impulse to resentment and rage, and then it takes the deeper colour of revenge; and, when combined with the impulse to appropriate, it renders that propensity yet more steady, grasping, and exclusive. It is the special faculty of quarrels and duels, and forms the ingredient of turbulence and tyranny, which is a nuisance in public, and a curse in private, life. No faculty of man is more apt to run into abuse, and half the moral evils of man's lot spring from that abuse. The guide of youth cannot therefore too early begin to watch and repress its unamiable manifestations, and regulate its legitimate exercise. Under the present system of education, this important part of man is left to its own guidance. Need it be added, that it is often manifested in a form of insanity not to be mistaken; morbid self-exaltation accounts for the straw crowns and wooden sceptres of Bedlam. The related objects of the feeling are obviously self and its concerns.

11th, Another sentiment, often but improperly confounded with self-love, exercises a mighty influence over man, and furnishes the key to much of the pursuit of his life; and that is, DESIRE OF ESTIMATION. By the one, a man esteems himself; by the other, he courts the esteem of others. They are best distinguished in their abuse. The one is pride, the other vanity: the one assumes, the other begs; hence it is truly remarked, that an individual is too proud to be vain. The use of the sentiment now considered, as intended by the All-Wise who endowed man with it, is a proper regard to character, the feeling of shame, and, under proper regulation, the incitement to worthy conduct in the love of praise. The feeling shrinks from reproach, censure, ridicule, and exposure. It leads to a careful concealment of vices, follies, and weaknesses, and, better yet, often to their cure. The laws which enact disgraceful punishments, as the pillory, address it directly. It is essentially the love of glory, and, in combination with self-exaltation, it constitutes ambition. Finally, it often runs into disease, of which any one who has visited a large lunatic asylum must have been rather annoyingly made aware, by the eager competition of the vain patients to detail and display to him their merits, each at the same time pitying his neighbour for his vain-glory. What, it may be asked, has education ever done to regulate this and the previous powerful and all-pervading feeling? The answer is—Nothing! On the contrary, it has carefully *instituted* the means of aggravating the evils of both, by all the competitions, prizes, preferences, and 'honours' of our schools and colleges. The related object of this feeling is found in the tendency of mankind to observe and judge each other.

12th, That a SENTIMENT OF FEAR is a part of man, no one will deny, and least of all the teacher of the old school, whose ever-brandished rod and cane make a personal appeal to the feeling. The sentiment is given as a self-protector from dangers, physical and moral, with which we are surrounded. Its abuse is cowardice, terror, and panic. Punishment, for example's sake, implies our belief of its power as a motive. Its external objects are danger and evil in general. When diseased, it occasions the groundless fears and horrors of hypochondria, and is essentially that insane melancholy which furnishes the impulse to suicide, by sufferings far more intense than man is ever visited with in what is erroneously distinguished as reality.

The last and two preceding sentiments of self-love, and desire of estimation, evidently regard *self*, and, therefore, although very important constituent faculties in man, and intended, in their proper use, for the wisest ends, have nothing in them amiable or exalted. They are as self-seeking as any of the nine animal propensities, and therefore may conveniently be classed with these, under the general denomination of the INFERIOR FEELINGS. The whole twelve instincts make up and constitute the Scriptural entity of the 'law in the members warring against the law in the mind.'

13th, That there *is* a law in the mind, is beautifully implied in the very distinction of Scripture alluded to; and it is the object of education, while it represses and regulates the law in the members, to strengthen and confirm the law in the mind. The first element of the law in the mind is BENEVOLENCE—the benign parent of a catalogue of graces, in kindness, desire of the good of others, generosity, compassion, mercy, and all the sympathies of brotherly love. It is the charity which 'suffereth long and is kind,' which 'is gentle and easy to be entreated,' and which, in its expansiveness and sincerity, 'is without partiality and without hypocrisy.' It is impossible to conceive a description of benevolence more just, as well as beautiful, than the Scriptural. Sentient beings, generally, are the related objects of this exalted sentiment, and their happiness is its scope and delight. It is an error to suppose its function confined to compassion and relief to distress and misery. It goes much beyond this: it is a well-spring of good-will to men, and reaps positive delight from the increase and extension of human happiness. Its manifestations appear to the selfish to be mere sentimental enthusiasm, or weak sacrifice of substance and ease; yet *their* most exclusive joys are vapid, in comparison with the delights of benevolence. Truly, the field of benevolence is boundless, for it embraces all that can aid or advance human happiness, physical and moral. It desires to see man free, enlightened, morally and religiously elevated, and placed in physical comfort and safety. It descends also to kindness to the lower animals. Even this high sentiment is capable of abuse. This appears in facility, indiscriminate alms-giving, and profusion. In disease, it is beyond the power of the will of the individual, to whom, therefore, the law appoints a guardian.

14th, A sentiment of JUSTICE or conscientiousness belongs to man; it respects the rights of others, and is also manifested in truth and candour. Its deficiency is a great defect of character, unamended even by benevolence. The individual so endowed is apt to be generous before he is just, according to an everyday expression. It is a mistake to recognise a defective conscientiousness in that palpable dishonesty only which calls for the interference of the law. It is a wide-spreading evil in society, far short of that degree of its manifestation. It shows itself in a way and manner against which the law cannot make provision, in the great variety of modes in which men, for selfish ends, are *unfair* to each other, by taking advantages which they would not give; concealing the truth which ought to be told, or misleading with regard to it; disallowing others' claims, not capable of easy proof; shrouding others' merit; misstating or distorting others' argument; resenting fair competition; envying success; manifesting a selfish jealousy; indulging in evil-speaking and ridicule; and, in a thousand ways, 'doing to others that which we would *not* they should do to us.' The severest satire on mankind is really found in the distinction conceded to the fair, open, candid, and considerate character, to the Aristides of his circle, who is marked for his whiteness (the etymology of candour), in the midst of the various shades of discoloration in his fellows, with which he is surrounded. The disease of the feeling, for even conscientiousness may be over-excited, is observed in the melancholy self-accusatory ravings of some maniacs, especially in those too numerous cases in which religious terrors have driven reason from its seat. The related objects of the sentiment of justice are the rights and feelings of our fellow-men. It acknowledges the justice of God.

15th, The most superficial observer of man cannot have failed to feel in himself, and observe the signs in others, of a sentiment of VENERATION, a feeling of deference, submission, and reverence. Signs of these are shown by almost all in their converse with those they feel to be their superiors in intellect or conventional rank, as something that is their due; and the whole strength of the feeling can be testified by those whom it has deprived of utterance when suddenly brought into the presence of majesty.

But there is a higher related object of this feeling than earthly kings. The King of kings is its great end and object: it is then veneration, and constitutes the chief ingredient in the adoration of religious worship. A large natural endowment of the sentiment often carries mere external sanctity to excess, and, mistaking it for religion, claims, and often receives, consideration and homage for it, to the inconvenient crowding of the calendar.

The three feelings of *benevolence*, *justice*, and *veneration*, predominating over the inferior and selfish propensities, present us at once with an intelligible system of ethics. This is that supremacy of the moral sentiments which is partially admitted by ethical writers, from Butler to Chalmers; the latter in his Bridgewater Treatise constitutes conscience the sole ruler; but benevolence is not less offended by vice and crime than justice; while veneration is shocked with the daring disobedience to God's will which these aberrations involve. The three sentiments of justice, benevolence, and veneration, are powerfully combined in that preceptive keystone of Christianity, 'to do justly, to love mercy, and walk humbly with your God.' The humility so beautifully glanced at is that repression of self-exaltation (the tenth impulse I have treated of) which the instructor should never lose sight of; remembering that 'pride was not made for man;' self-love was intended for him, but not its abuse, 'which bringeth a snare.' The energy of these three feelings, acting as they always do in combination, constitutes the moral impossibility of committing crime; for a man in whom they are supreme is restrained from criminal acts more effectually than if fetters of triple brass were on his hands. If there be means—and it will appear in the sequel that there are beautifully simple and effectual means—of increasing the power of these invaluable sentiments, by the exercise of practical moral training, does it not vitally concern society to apply them? I shall offer a few words more on the supremacy of the higher feelings, after treating of the Intellect.

16th, I claim no more for man than almost all metaphysicians do, and all the non-metaphysical world, in attributing to him a sentiment of HOPE, the source of much worldly happiness, and the *natural* foundation of our prospects of a life to come. Hope is a chief ingredient in religious feeling; while, in common life, it is not confined to expectations and anticipations of the future, but is a permanent gaiety, lightness of heart, and buoyancy of spirits, which is contented with the present, dreads no evil, and constitutes in itself real happiness. Children, as well as adults, differ widely in this character of mind; an enlightened teacher of youth will convert the feeling to useful purposes.

17th, The teacher will find his pupils to differ in another respect: he will meet with some of them pliant and obedient, and others obstinate and impracticable; there is, in different degrees, in man, a sentiment of FIRMNESS, the use of which is perseverance and fortitude, the abuse of which is obstinacy. It is of importance that this should be recognised in education as an innate feeling, by which much labour to the teacher, and suffering to the young, might be prevented, by avoiding vain contests with obstinacy, persevered in by the teacher in the expectation of curing the defect, while he is only strengthening the feeling and confirming the habit. The struggle with an obstinate child, who is further fortified by pride and self-sufficiency, may be compared to an attempt to extract a nail by striking it on the head; every stroke only drives it faster. The judicious teacher will take care never to bring the matter to that issue, but will address himself to other faculties, especially justice, benevolence, and reflection; keeping in mind the fable, that the storm could not induce the traveller to part with his cloak, which he only held the faster, but the sun was more successful.

18th, Man loves the wonderful. That the sentiment of WONDER is innate, will scarcely be doubted by any one who observes its power as a motive, and the fortunes that are made by appeals to it. Well does the charlatan know the effect produced by his cry of 'wonder!' It is evidently bestowed as a source of delight in contemplating the wonders of creation, and as an impulse to inquiry. With veneration and hope, it constitutes the religious combination of faculties; I mean what is called religious *feeling*, for conscience and reflection are the bases of religious *duty*. The joint operation, in due proportion, of the two sets of faculties, makes up the perfection, humanly speaking, of the religious character; while a separation of them is always more or less to be regretted. Take away or impair reflection, and the remaining feelings will be apt to run into enthusiasm, and even fanaticism; take away or diminish conscience, and we have the apparent anomaly of sanctity without honesty, of religious excitement with much unfairness, censoriousness, intolerance, and persecution. Wonder is met with in morbid activity; its madness sees visions, and dreams dreams, nay, attempts miracles; in combination with a high estimate of self, it constitutes the prophet of special revelation, and the angel of light admitted to the counsels of heaven. Of this we have not to go far for examples—the leaders and their followers are all over-excited *wonderers*. Education is called upon to watch this faculty; it will show itself in a child, in a tendency to exaggerate and embellish, a marked delight to surprise and occasion wonder, with often an utter sacrifice of truth to attain that end.

19th, I do not anticipate objection to a faculty for the sublime, the beautiful, the elegant, the perfect, the poetical, as a constituent of the mind of man. The imagination of the metaphysicians comes nearest this sentiment, but it does not fully express it. Imagination is considered as a power which produces ideal creations; the feeling in question is a mere sentiment or habit of mind which aspires to the beautiful and perfect, and communicates an elegant refinement to the whole character; it prompts other faculties to create, while itself merely feels, and views all nature with associations of beauty and of poetry. Its abuse is romantic enthusiasm, unguided by reflection. Its related objects are all that is beautiful and sublime in nature; it is one of the gifts of Divine Benevolence which points directly at high enjoyment; like music, it is something superadded to the necessary faculties. When it is absent or deficient, the individual is gross and unrefined. Infant education takes much care of this feeling, and in various ingenious ways calls it into exercise, with different success, according to the degree of natural endowment; for in nothing do individuals differ more from each other. With the explanation now given, shall call this faculty IMAGINATION.

20th, THE LOVE OF THE LUDICROUS requires a judicious educational management. Man is the only laughing animal, the only one gifted with a specific enjoyment from the contemplation of incongruity. It is greatly abused in satire, tricks, and mischief, and requires watching: it operates severely on the tempers of many who are made its butts, and often withers every purpose of exertion or improvement. Certainly it has been greatly neglected in education. Its relative objects are found in the exhaustless field of incongruity.

21st, IMITATION is a marked faculty in man, which shows itself even in the youngest children. Its purpose is manifestly to bring society to a convenient uniformity of manners, without which it would present a scene of inextricable contrariety, and to aid in educing the powers of the young, by the energy of an impulse to do what they see done by their seniors. It aids, as is most obvious, the imitative arts, and has for its related objects no narrower field than universal nature.

The reader is requested to glance back at the faculties just treated of, beginning with 13 and ending with 21, which, like the animal propensities, happen to be *nine* in number, and oblige the author, by recollecting that, whenever he speaks of the MORAL SENTIMENTS, he means these nine faculties. The reader will at once observe that Nos. 10, 11, and 12, viz. Self-Love, Desire of Estimation, and Fear, are not of dignity sufficient to be classed with the moral sentiments; but, being as selfish in their nature as the nine animal propensities, and being also plainly discernible in the inferior animals, they are classed with the propensities under the general name of the INFERIOR FEELINGS; it follows that the moral sentiments are meant, when the term superior or HIGHER FEELINGS is used. These last distinguish man on this earth from all the creatures of God.

But the 'Law in the Mind' would be an imperfect regulator of the 'Law in the Members,' if it consisted even of the moral sentiments alone. Sentiments are but feelings, and feelings, however virtuous, are blind, and depend upon intellect for their proper direction. For example, benevolence prompts us to succour poverty; but that feeling makes no inquiry into the cause of that poverty which it profusely relieves. It therefore requires to be itself directed by another class of faculties, namely, the intellectual, which, observing, perceiving, knowing, and reasoning, can ascertain, if so it be, that the poverty is the result of idle and profligate habits, that the poor man is perfectly able-bodied and fit for labour, and that therefore the benevolence is wasted, and worse, upon the encouragement of an unworthy object. Man is endowed with intellectual faculties, and these may be divided into the KNOWING and REFLECTING. It is undeniable that, intellectually, we *know* and we *reflect*. It is a common observation that knowledge is not wisdom, till it is compared and reasoned on by reflection. It is its combination with reflection which constitutes that knowledge which is power. The weakest reflecting powers often co-exist in the same individual, with a store of knowledge which excites our wonder.

The KNOWING POWERS cognise two classes of objects; namely, *existences* and *events*; in other words, things that *are*, and things that *happen*. Let any one reflect for a moment, and he will find that whatever he knows, must be either an existence or an event. The paper on which I write is an existence—a thing that *is*; if I drop it on the carpet, it is an event, a thing that *has happened*, a change has taken place; soldiers are existences, their battle is an event; the acid and the alkali are existences, their effervescence on mixture is an event. Natural history concerns existences, civil history records events. From observing that the power of perceiving and remembering these two classes of objects, respectively, varies in a marked degree in different individuals, we may consider them as distinct faculties, which will require in education a separate range of study and exercise, the one improving the faculty for existences, the other the faculty for events. I claim, then, for man—

22d, A POWER TO COGNISE AND REMEMBER EXISTENCES.

23d, A POWER TO COGNISE AND REMEMBER EVENTS.

There are other knowing faculties, of marked distinction in the different degrees of manifestation by different individuals, which aid in the acquisition of knowledge; such as a perceptive power for each quality of matter, as its form, size, colour, gravitation, sound, &c.; and on these the talents of drawing, painting, sculpture, mechanics, and music, depend. But these manifestations must be so obvious to the enlightened and judicious educationist, that I shall not occupy time and space with a detail of them.

The REFLECTING POWERS suffer a twofold division, like the knowing, and we find individuals manifesting these powers differently, according to that division. The reflecting make use of the materials stored by the knowing faculties, for the purpose of performing the operation of REASONING—that consists in comparing two existences or two events, and concluding that something else exists, existed, *or* will or may exist, or that something else happens, happened, or will or may happen, in consequence; in which range are comprehended all the TRUTHS of the physical and moral world.

24th, The process of reasoning, of conclusion drawing, is sometimes performed by a simple act of comparison, or perception of analogy; a vast majority of mankind reason in this way: such a truth follows from the resemblance of two truths which they have compared. The whole of the brilliant field of what a reasoning is called *illustration* is nothing more than his process of comparison; and as many writers and speakers manifest almost an exclusive preference for analogical and illustrative reasoning, I feel that I am warranted in distinguishing in man the reflecting faculty of COMPARISON.

25th, Some reasoners, but comparatively few, are more severe, and are contented with no conclusions which do not stand in the relation of *necessary consequence* to their premises. This is truth, they reason, because it is deducible necessarily from the consideration of these other known truths brought together. These are the logicians who distrust analogy and comparison. The faculty they use is the highest intellectual power, the percipient of the relation of cause and effect, which I beg to be indulged in designating by the name of THE FACULTY OF NECESSARY CONSEQUENCE.

It is a metaphysical error to distinguish *Memory* as a primitive faculty, seeing that the cognising and reasoning powers must necessarily be the remembering powers; remembrance being nothing else but the continued impression of cognition and reasoning, varying according to the energy of those powers. If memory were a distinctive power, it would, in each individual, be alike *strong*, and *regard all* subjects of recollection alike. But as this is not consistent with fact, as one individual remembers existences, and another forgets existences and remembers events, while a third recalls with ease a train of reasoning, another musical airs, and another the faces of persons he has seen, or the scenes he has surveyed, each perhaps weakly remembering something *else* of the matters now enumerated, we are forced to the conclusion that there is no general faculty called memory, but that each faculty has its own power of recalling its impressions. The instructor of youth should ponder this truth well, and he will save himself and his pupil much time and labour in the indefinite and desultory exercise of a supposed general faculty of memory, when in truth he will actually improve the memory of each faculty in the proper direct cultivation of the faculty itself.

The reader is, it is trusted, now in a condition to see the propriety of disallowing *Perception* as a primitive faculty. Both the knowing and reflective *percipient* powers have now been explained and distinguished: the faculty of existences perceives existences; that of events, events; that of comparison, resemblances; that of necessary consequence, cause and effect; so that a general faculty of perception is necessarily a nonentity.

Last of all, I claim for man, whose composition we have now finished, the man-distinguishing faculty of LANGUAGE, whereby he converts his thoughts into the conventional signs called words, and, in oral and written discourse, excites the faculties of his fellow-men in the boundless extent of social intercourse. Language is a mighty instrument, but great evil follows the error of mistaking it for more.

The whole faculties which have been described are now brought under the reader's eye in a table for the convenience of reference:—

INFERIOR FEELINGS.

Animal Propensities.

Propensity of	*Food.*	Propensity to	*Conceal.*
.. ..	*Sex.*	.. ..	*Acquire.*
.. ..	*Offspring.*	.. ..	*Construct.*
.. ..	*Attachment*	Sentiment of	*Self-Love.*
.. .. to	*Fight.*	.. ..	*Desire of Estimation.*
.. ..	*Destroy.*	.. ..	*Fear.*

HIGHER FEELINGS.

Moral Sentiments.

Sentiment of	*Benevolence.*	Sentiment of	*Wonder.*
.. ..	*Justice.*	.. ..	*Imagination.*
.. ..	*Veneration.*	.. ..	*The Ludicrous.*
.. ..	*Hope.*	.. ..	*Imitation.*
.. ..	*Firmness.*		

INTELLECT.

Knowing Faculties.	Reflecting Faculties.
Cognition of existences.	*Comparison.*
.. .. *events.*	*Necessary Consequence.*
Percipients of Form, Colour, Sound, &c.	LANGUAGE.

Several general points require a moment's attention. 1. All the faculties in the preceding table belong to every sane individual of the human race; the want of any of them would be the imperfection of partial idiocy. 2. They are possessed in very different degrees of endowment in different individuals. It is this difference which constitutes the endless varieties in the characters of men. Taking the faculties in groups, it is evident that individuals in whom the inferior feelings predominate, will be coarse, sensual, and animal; while those in whom the higher feelings are the strongest, will be moral and refined. In each individual, some faculty, or combination of faculties, is always so powerful as to mark the character; and observation and discussion of these characterising peculiarities, in each other, constitute half the subject of human intercourse.

3. It must occur to the reader, and he is requested to remember it as a fundamental truth, that these characteristics of individuals arise from *innate* faculties, which are *permanent*, and, however improveable, not liable to be eradicated. The faculties modify each other, but the *general* character is fixed. The irascible man of to-day was so twenty years ago; so was the selfish; though higher feelings cultivated render the *conduct* of the one milder and of the other more liberal.

4. Another point is to be kept in mind by the reader—namely, that the human faculties are capable of acting in *combination* with each other, at least of *simultaneous activity*; the effect of which will be an increased tendency to a common end when the faculties acting are in harmony; or a modification of power, so that the balance in favour of the strongest will be the remaining force, when they antagonise each other. This is the state of what is called mixed motives, which scarcely needs illustration. In a public subscription for a charity, for example, benevolence prompts to give, and often much more strongly does vanity; but their united operation manifestly strengthens the impulse; self-love and avarice would save the money. Now, it is perfectly obvious that it will be given or withheld, according as one combination or the other prevails. Other examples might be supplied, but they can be easily figured. It is plain that what is called individual character must essentially be the product of a sort of balance of power among all the faculties; the strongest will stand out most prominent, as 'the ruling passion,' modified by others, and therefore only presenting itself as a remainder. It must be manifest that education should address itself pointedly to these combinations.

5. The last general observation which requires to be made, is one which will at once be admitted—namely, that there are degrees of value and rank in the faculties of man. It is a law of our nature to look upon the moral sentiments with more respect than the animal propensities, while the profound powers of reflection and reasoning are more elevated than the acutest faculties of observation. When superiority involves control, it is called supremacy; this control is exercised by the moral faculties, guided by the intellect, and constitutes what we call ethics. I was pledged to return to this important subject when I had explained the intellect, for the control is properly called the SUPREMACY OF THE MORAL SENTIMENTS AND INTELLECT."

So far as we have acquainted ourselves with the views of the phrenologists, they seem to us to hold the following doctrines in reference to the above scheme:—Every human being possesses a greater or less development of each faculty; those who have the inferior in greatest strength are apt to be low and sensual characters, while those who are strongest in the higher sentiments will probably be good moral men, and those who possess the intellectual powers in largest proportion are likely to manifest the greatest degree of what is called talent. Individual character is the product of a sort of balance of power among all the faculties, liable, however, to be modified by education and other circumstances. The phrenologists hold that every faculty is good in itself—that is to say, it has some utility in reference to the affairs of human life, and the concerns of the external world; only it is necessary that the inferior be controlled by the higher, so as to be exercised in those degrees which are allowable and useful. The higher may also have their excess of manifestation: benevolence, for instance, may be carried to extravagance. Here some other faculty may be trained to act as a guard upon that which is running to such extremes: for instance, cautiousness or conscientiousness—a due regard to our own necessities, and the claims of those depending upon us—may check the improper manifestation of benevolence. In general, the moral and intellectual faculties are considered by the phrenologists as being superior to the others, and as possessing a regulating power over them. But the intellectual powers require to be cultivated, and the moral sentiments to be fostered and guided by education, in order to arrive at their full efficacy.

The faculties are held by this class of philosophers to bear an exact relation to the external world. Each has its objects, which, when presented to it, excite it to activity, and delight it with agreeable emotions. "Human happiness and misery," says Mr Combe, "are resolvable into the gratification or denial of one or more of our active faculties." This writer has devoted a large portion of his Essay to delineate the ways of the world, which in too many instances are a cultivation of the inferior faculties, forming the causes of much of the misery which we endure; while the cultivation of the higher feelings renders life a scene of comparative felicity. He then proceeds to demonstrate the application of his system to the laws of nature, which he distinguishes into the three classes of Physical, Organic, and Moral, and each of which he shows to work independently of the others. "For example," says Mr Simpson, "an individual who neglects or carelessly observes the corresponding *physical* law of nature, will be drowned, or burnt, or crushed, or fractured, or lacerated, and that inevitably, however strictly he may obey the moral laws, even to the extent of the utmost reach of human virtue. Again, if he obeys the organic laws, he will reap bodily health, which is the specific reward of *that* obedience, nor will any degree of moral turpitude (if he avoids sensual excess, which is a breach of the organic as well as the moral laws) materially diminish his health. But his moral defects will bring their own punishment; and from these his health of body will not protect him. This principle affords a key to much that appears inscrutable in the moral government of this world. Whatever man may be permitted to hope with regard to another, he must study and obey the laws which regulate this world, else no degree of piety and worth will save him from the evils which follow neglect of the physical and organic laws; while no compliance with these last will shield him from moral suffering, if he contemns the moral laws. Whenever we get the principle of the *independent operation* of the different departments of the natural laws, the apparent confusion of life is explained, and we see why the bad man often prospers *externally* in this world, and the good man is overwhelmed with misfortune;—I say externally, for the bad man cannot reap higher enjoyment than physical and organic, while at the same time he suffers all the penalties of a low morality. On the other hand, the good and pious man, however physically and organically afflicted, is compensated, even here, with the direct consolations of virtue and religion. But the *kind* of happiness enjoyed, or misery suffered, will be found invariably to result to each character directly and separately, and without the possibility of interference of any of the others, from the specific law or laws obeyed or contemned. This theory of the independent operation of the different classes of the laws of nature, which is itself sufficient, when practically applied to the affairs of man, to work a momentous change in his condition in the present world, is not, it is believed, to be found in any previous author, and therefore belongs to Mr Combe.

In order to perceive the wise relation of the natural laws to the human constitution in body and mind, *both* these related objects must be understood. On the one hand, the laws, physical, organic, and moral, must be observed, and their independent operation demonstrated; and on the other, the *mind* of man, as well as his body, must be known; yet that knowledge, according to Mr Stewart, was down to his time 'yet in expectation.' Mr Combe has adopted the faculties which have now been detailed, as primitive in man, and comparing *these* with external nature and nature's laws, he at once saw and made plain to his countrymen and the world, the perfect correspondence and harmony which was the eternal design of an omnipotent Creator.

The same gifted writer has shown, that while each natural law acts separately, there is a beautiful combination in their action, having for its object the cultivation of the moral and intellectual powers of man, and the establishment of their supremacy over the animal propensities; in other words, THAT THE WORLD IS ACTUALLY ARRANGED ON THE PRINCIPLE OF FAVOURING VIRTUE AND PUNISHING VICE, AND THAT IT IS, THOROUGHOUT ITS CONSTITUTION, FRAMED IN ADMIRABLE ADAPTATION TO THE FACULTIES OF MAN AS A MORAL, INTELLIGENT, AND RELIGIOUS BEING."

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COTTAGE ECONOMY.

COTTAGE ECONOMY is that species of management by which the out-of-door concerns of a country residence or cottage are regulated on the most approved principles, and applies in a particular manner to the keeping of cows; the preparation of dairy produce for the table and for market; the rearing of pigs and curing of bacon; the practice of keeping hens, ducks, turkeys, and geese; the cultivation of gardens; and other similar objects—all of which, when rightly followed, tend to make the cottager more wealthy and more comfortable in his circumstances. With our limited scope in a single sheet, we cannot pretend to illustrate the whole of this important subject, but we believe that the following brief view of Cottage Economy and the hints we are able to give, will be found useful in directing industrious housewives and their husbands in the best modes of managing their establishments.

Before saying one word in detail, we consider it absolutely necessary to state that the most essential requisites connected with the economy of a cottage, are orderliness and cleanliness. To the disgrace and serious loss of many individuals in the country, these matters meet with by far too little attention. It may frequently be noticed in travelling through the country, that the inhabitants of cottages *seem* to live as if they despised habits of orderliness and neatness, and consider that slovenliness and dirt are productive of comfort. We take this opportunity of recommending a very different practice. If any thing is expected to be made by cottage economy, things must be kept not only in proper repair by active exertion at spare hours, but rigorously clean in their condition. The utmost regard to this is certainly indispensable in the keeping of cows and pigs. Both these animals love to be kept dry and clean. The cow requires to be rubbed down or curried like a horse, for its skin contracts vermin, which, with the loose hairs, which should also be removed, give it great uneasiness. In the same manner, the hog, as is afterwards fully mentioned, must be kept clean, dry, and warm, otherwise it will not thrive or be of any great value. Nothing speaks so emphatically of the prosperity and good management of a farmer or cottager, as a sty full of sleek, thriving, contented pigs, who seem to enjoy existence, and whose good care and quiet demeanour speak eulogies of their keeper.

We need not say how clean and tidy all things ought to be in the interior of the cottage; but we may point out how commendable is the practice of clearing away all foul puddles and other impurities from before or near the dwelling, of trimming the paths which lead up to the doorways, and of whitewashing the walls, and decorating them with flowering shrubs. A certain degree of attention to all this demonstrates a well-regulated mind on the part of the cottager and his family, and even while "little is coming in," render his humble abode a kind of rural paradise, and the delight and admiration of every passer-by. In order the better to accomplish this desirable result, cottagers should act upon some well-organised plan of procedure. They should make arrangements to devote certain days and snatches of time to the cultivation of their gardens, the mending of their fences, and the preservation of neatness about their premises. They should likewise make a point of setting their youngsters early to work in giving them assistance; for this will confirm them in habits of industry, and will greatly benefit their bodily health and moral feelings. Not a few cottagers encourage, or at least allow, the keeping of useless dogs about their households, greatly to the annoyance of the neighbourhood and passing traveller. We consider that the many curs which are thus kept are a serious nuisance, and greatly encumber the cottage economy, unless when kept as watch or sheep dogs. The cottager should not by any means throw away his valuable time—for time is to him as good as money—in cultivating breeds of dogs or game cocks, which can only lead to loss in the end, but act, as we say, on a systematic plan of practical utility, setting a good example to the rising generation around him, and bestowing all that part of his time not directed to actual labour and harmless recreation on the storing of his mind with general knowledge suitable to his capacity or taste.

THE COW.

No subject is of greater importance to the cottager than a perfect knowledge of the management of cows, and an acquaintance with those breeds which in the end turn out most profitable. It has long been ascertained beyond a doubt, that certain breeds of cattle are more susceptible of increasing in bulk than others. The same quantity of food may be given to those which have a tendency to be lean, and to those which take on fat and muscle easily, and, consequently, the food given to the former is lost to the feeder.

The whole of the cow kind—of which there are about nine different species—are ranked among those quadrupeds which naturalists term *ruminating animals*, in consequence of their chewing the cud—an operation which they always perform to grind their food more thoroughly, for the purpose of fitting it for being converted into chyle, for the nourishment and support of their bodies. As animals of this kind are entirely confined to grain and herbage for food, it is necessary that they should receive a large quantity into the stomach, as well as to retain it a considerable time before it is reduced into proper chyle; for this purpose their intestines are remarkably long and capacious, and formed into a variety of foldings. They are provided with no less than four stomachs. The food, after being masticated or ground, is conveyed into the first stomach, where it remains for some time; after which it is forced up again into the mouth, and undergoes a second chewing; it is then sent directly into the second stomach, and gradually passes into the third and fourth; from whence it is transmitted through the convolutions of the intestines. By this conformation, ruminating animals are enabled to devour large quantities of vegetable food, to retain it long in their bowels, and consequently extract from it a quantity of nutritious matter, sufficient for their growth and support.

Being destitute of the upper fore-teeth, the cow prefers the high and rich grass in pastures, to the short and more delicate herbage generally selected by the horse. For this reason, in our British pastures where the grass is rather high and flourishing than succulent and nutritious, the cow thrives admirably; and there is no part of Europe in which this animal grazes longer, yields more milk, or fattens sooner. The age of the cow is known by its horns; at the age of three years, the animal scales off a very slight external shell or coating from them, and at four years a ring is formed at their roots. Every succeeding year, another ring is added. Thus, by allowing three years before their appearance, and then reckoning the number of rings, the creature's age may be exactly known. The quantity of milk given by cows is very various; some will yield about six quarts in one day, while others give from ten to fifteen, and sometimes even twenty. The richness of the pasture contributes not a little to its increase. There have been instances of cows giving upwards of thirty quarts of milk in one day. In such cases there is a necessity for milking them thrice. From the milk of some cows, fourteen pounds of butter are made in a week.

It is well known that the cow will yield her milk freely, and will continue to give it as long without the aid of a calf as if it were permitted to suck her constantly. This is not the case with the ass, which will soon grow dry if her foal be not permitted to suck part of her milk every day. Cows go with young about nine months, and seldom produce more than one at a time. For a week or so previous to calving, they ought to be kept in an outhouse, which may be the means of preventing many accidents that occur during this critical period to both cow and calf. But if the cow should happen to have been left out in a cold night when in this state, and catch cold, which not unfrequently happens—and which may be ascertained by a trembling in the joints and her refusing food—the sooner she is driven into a warm situation the better. She should be provided with warm draughts of ale and beer, and good hay given her; but upon no account to drink till she has recovered, which will generally be effected in a few days by careful treatment: but when this process is ineffectual, balls of aromatic cordial substances should be given.

Until modern times, the cows of Britain were lank and thin in comparison to those of Holland or the Low Countries, and a great improvement has been wrought in our breed by the introduction of the Holstein or Dutch breed. This breed continued for a number of years the prevailing stock in all the counties on the eastern coast of Britain. In good pastures cattle of this kind grew to a large size, and the cows yielded a greater abundance of milk than those of almost any other kind. The first general principle laid down and adhered to in the improvement of the several breeds of cattle, and which has been so successfully brought into practice, was the most obvious—that is, the beauty of form; a principle which has been in common applied to every species of domestic cattle, and, with great seeming propriety, was supposed to form the basis of every kind of improvement, under an idea that beauty of form and utility were inseparable. But at present a distinction is made, by men who have long been conversant in practice, between a useful sort and that which is merely handsome. Utility of form is therefore the next general principle, and may be considered as arising from a larger proportion of those parts which are the most useful; thus, for instance, all those parts which are deemed offal, or which bear an inferior price, should be small in proportion to the better parts. A third principle of improvement laid down by breeders consists in the fineness of the muscular fibre, or what is termed flesh. But the great object which occupies the attention of breeders at present, is the fattening quality, or a natural propensity in cattle to arrive at a state of fatness at an early age, and in a short space of time; and it appears from observation, that beauty and utility of form, the quality of the flesh and its propensity to fatness, are principles consistent with each other, and are frequently found united in the same individual, and hereditary in particular lines or families of cattle. In regard to the means of improvement, it has long been an established maxim, that to improve the breed it is necessary to cross it with others of an alien stock, under an opinion that continuing to breed from the same line weakens the stock and produces degeneracy.

Mr Aiton, in a paper on the Dairy Cattle of Ayrshire, in the Journal of Agriculture for March 1834, has made the following useful observations on the system pursued in regard to cows in that county:—"It is certainly best to breed from bulls of good shape, and of a size suited to the cows to which they are put, otherwise their offspring will have large coarse bones, and never will be strong and spirited, in proportion to their size. They will be in fact ill shaped, dull, unhealthy mongrels. The most skilful breeders of dairy-stock in Ayrshire prefer bulls that have least of a masculine shape, and which have the greatest resemblance to a cow. The shapes that are most approved of in the Ayrshire dairy-stock, are, head small, but rather long and narrow at the muzzle; the eye small, but quick and lively; the horns small, clear, bended, and their roots at a considerable distance from each other; neck long and slender, tapering towards the head, with little loose skin hanging below; shoulders thin; fore-quarters light and thin; hind-quarters large and capacious; back straight, broad behind, and the joints of the chine rather loose and open; carcass deep; pelvis capacious and wide over the hips, with fleshy buttocks; tail long and small; legs small and short, with firm joints; udder large, broad, and square, stretching forward, and neither fleshy, low hung, nor loose, with large and prominent milk-veins; teats short, pointing outwards, and at a considerable distance from each other; the skin thin and loose; hair soft and woolly; the head, horns, and parts of least value small, and the general figure compact and well proportioned. It is not to be understood that every dairy-cow, or that any one of them, has all these fine shapes. But these are given merely as the perfection of the breed, or the shapes most desired and sought after."

PRODUCE OF THE DAIRY.

Where people are of the humbler walks of life, and keep a single cow, the most obvious purpose of its milk is to use it in the first place as food. Where there are young children, it is of much utility, and furnishes the family with a very nourishing article of diet. Where but one cow is kept, and the family consists of from two to three children, besides supplying them sufficiently with skim-milk, a certain portion of butter may be made; and the butter-milk will afford an agreeable and wholesome variety as a liquid to bread or oatmeal porridge, and also as a drink. Where there is too much skim-milk to be consumed by the family, the rest may be employed in making bread, as a substitute for water. It greatly improves the bread, and keeps it longer moist than when baked with water. In very hot weather, however, bread made with milk is more liable to become sour. Another use to which it may be applied with great benefit is in feeding pigs, more especially some time before they are killed, as it not only assists in rendering their flesh whiter, but also has a tendency to firm it.

Milk is a delicate article, and requires, as well as the cows which yield it, very great nicety of management. A great mistake is often committed in keeping a cowhouse close and foul in its atmosphere. Whatever be the extent of the cowhouse, it ought to be at least ten or twelve feet high in the side-walls, with proper apertures, and have no lofts above, so that the cows may have that which is absolutely necessary for their health, a plentiful supply of pure air. Cows should be kept dry, but not warm; they ought to be well rubbed down daily; the dung should also be removed carefully, and the urine carried off in a paved channel to the dungheap, or into the cottage garden—not permitted to exhale, and therefore lost for purposes of agriculture. The best way to tie up a cow is to attach it by a moveable chain to an upright iron rod; but it must possess as much liberty as will allow it to lick itself. After the milk is procured from the cow and properly sieved—but not strained till nearly cool if in warm weather—it should be placed in vessels in a cool milkhouse, where there is a free atmosphere, and properly secluded from flies and other insects by means of gauze on the windows. The milk-pans or vessels should be large and broad, and it is said that, if made of a metal called zinc, the cream will be more effectually thrown up. The addition of a little hot water will also tend to produce cream in greater abundance. Intense care must be taken to clean the milk-vessels. If they be in the least degree soured, the sweet milk is undone. The milk should never be suffered to sour in sweet-milk pans, but skimmed and carried off within twenty-four hours if in summer. The same or still greater care should be taken in cleansing the churn from all milky particles after being used. It is inattention to these points that causes nine-tenths of all the bad butter and cheese in this country. All milk-vessels should be well rinsed with hot water, and exposed to the open air to dry.

In feeding cows which are kept within doors, the following has been the most effectual way for inducing a large supply of milk:—They are fed with a bushel of grains, mixed with about an ounce of salt, at three o'clock in the morning; they are afterwards milked about six o'clock, and a quantity of turnips given to them, and shortly afterwards a proportion of meadow hay, equal to a tenth part of a truss. The cows are then turned out into the open air in a yard or some such convenient place, where they remain till about twelve at noon, and supplied with the same quantity of grass as in the morning, and again milked about half-past one o'clock, after which they are again supplied with the same quantity of turnips as before, and in an hour thereafter with hay, equal in quantity to the former meal. This is the system pursued in feeding from September till May, while turnips are in season. In the summer months they are fed upon cabbages, tares, grains, and second-cut meadow hay; and where it suits the cowfeeder, they are turned out to grass, and kept both day and night in the field. The daily average of milk given by a London cow is estimated at nine quarts, or the great quantity of 3285 quarts annually: which is, however, never sold in its pure state, but generally plentifully mixed with water.

In Edinburgh, milch cows are generally of the Northumberland, Ayrshire, and Roxburgh breeds. These are seldom kept by the feeders for more than a single year, by which time they contrive to fatten them for sale. In London, on the contrary, they are retained from five to seven years. The feeders in Scotland find that the quickest and most effectual method of putting them in selling condition is to feed them on brewers' wash, and the residue of the grains, called draff, which has the quality not only of fattening quickly, but also producing a greater supply of milk. To these are added hay, shellings, and bran; and in the spring and summer, bundles of fresh-cut grass are given to them; and when the cowfeeders reside at a convenient distance from grass parks, they are sent to them, where they continue night and day during the summer months. When, however, cows are kept constantly in the house, the feeders, in giving them grass, take care always to place straw or hay beneath it, and this is constantly eaten by the cow after it has finished the grass. In Edinburgh, cows are usually milked twice a-day, namely, at half-past five in the morning and three in the afternoon, although it is sometimes necessary to do it three times. The produce may be averaged at twenty-four English pints daily, each cow. This quantity is obtained from cows of the best breeds, but those of a smaller kind give much less, varying from twelve to eighteen English pints a-day. These latter consume as much meat as cows of the largest kind; hence it is obvious that there is much more profit in keeping those of a superior breed, not only from giving a larger quantity of milk, but they besides feed faster, and consequently turn out to greater account in the end.

It must be obvious to those cottars and farm-servants who possess a single cow, that the more improved the breed, the better. It may be difficult at first to raise a sum sufficient to purchase a large cow; but it will be much their interest to accomplish this desirable object by the strictest economy; and having once obtained their object, they will thereby be certain to improve their means. In villages where there is a right of commonty, the keep of a cow will be trifling compared with the yield; for where the milk cannot be sold sweet (which is the most productive method of getting quit of it), it can either be made into butter or cheese. The former of these is the next best way of selling the produce, and that fresh if possible. If managed with prudence, there are few pursuits in a country way more profitable than cows. We knew a frugal housewife, in the county of Perth, whose mode of managing her domestic concerns is well worthy of imitation. It was this:—Her first ambition after marriage was to obtain a cow; and what cash her husband and she had after furnishing their house, with six months' after-saving, enabled her to purchase a small cow: and as she lived at some distance from a small town, she was obliged to churn the milk, and carry the butter to market. She sold as much of the butter-milk as she could, and with the rest she fed pigs; she also made cheese from the skim-milk. Her greatest difficulty was in obtaining bedding for her cow and pigs during the first year. This she overcame, by cutting rushes from the side of a stream, and the grass which grew in a fir plantation at a little distance from her residence. She made a determined resolution to lay aside every farthing of the cow's produce, for the purpose of obtaining a superior animal when her first one ceased to give milk. The first winter's meat was also heavy upon her. This she took care to provide for in the following summer. She had carefully accumulated all the manure of her cow-house and piggery; this she would not dispose of, but agreed with a neighbouring farmer for the use of as much ground as would supply her cow with winter turnips and potatoes, and manured and planted it. This not only served her own purpose, but also benefited the farmer; as it is well known that the best crops of wheat or oats are obtained after a green crop, and the ground is also cleaned in consequence of the mode of culture necessary for green crops. This so completely answered her expectations, that she had ample provisions for her cow, had as many potatoes as served her family, and with the small ones fed her cow and pigs. By determined economy, she soon was able to purchase an additional cow, and continued during a long life to pursue the same course, greatly to the benefit of her family.

If a cottager has forty rods of land, it should be dug or trenched in the spring, always keeping the top earth at the top. In April or May, it should be laid out in high and sharp ridges, about two feet apart. When the weeds appear, and have got about three inches high, if the weather is dry, the ridges should be turned into furrows, whereby the weeds are buried. This should be repeated again and again as the weeds appear, until about the 26th of August, at which time the ground must be dug anew, supplied with manure, and raked. One half of it is then to be sown with early York cabbage seed, and the other with sugar-loaf cabbage seed, in drills eight inches apart, taking care not to put the seed too thickly into the drills, but sufficiently so that there may be no blanks. The seed requires to be only a quarter of an inch below the surface. Rake it smooth, but do not tread the ground at this early season. Treading may be proper in light soils in summer, but in spring and autumn it is hurtful. When they have acquired six leaves, they should be hoed with care. In the course of a few days they ought to be thinned; those left to be two inches apart, and with those taken out another rod of ground ought to be planted—four thousand in each row, and eight inches apart, and three inches in the row—after having prepared it as above directed. The ground between them should be frequently hoed, not only to keep the weeds down, but also to encourage the growth of the plants; and they will thereby become straight and strong. The remaining thirty-six rods should be manured and turned over early in November; and then transplant the plants on the ridges, at fifteen inches apart, taking care to replace any of the plants which fail. These plants should be protected against the rigour of a hard winter by means of straw, ferns, litter, or rushes. These must be laid between the rows and the plants, taking care not to cover the leaves; and plants that die from the effects of frost must be replaced from the bed.

A great enemy to cabbages is the slug, and the utmost pains ought to be taken to destroy these wherever they appear. Many plans have been suggested for destroying these animals, but none is so effectual as to search for and destroy them. The evening is the time they generally crawl abroad, or after a shower, at any time of day. During winter, many of the outside leaves will turn black and decay; but whenever they begin to show a disposition to do so, they should be cut off and given to the cow, otherwise they will go to waste. It has been computed, and indeed experience has proved it, that the above number of cabbages should keep a cow for about two hundred days, supposing she is allowed eight pounds of these each day. This, it must be observed, is sufficient for a large cow; and a small one may be kept perfectly on from seventy to seventy-five pounds a-day. Care must be taken to use those which have not grown solid, in the first place, as they are most liable to decay. In the month of March, more early York cabbages should be sown, and also in April. The ground which has been cleared of plants must now be dug and thoroughly manured; and continue to do so as the cabbages are cut and well covered in. These spots should be planted with strong plants, which will bring a succession of cabbages fit for use at different times. In selecting the cabbage-plants for transplanting at this late season, strong ones only should be used. This need not be continued after the middle of August, as what has already been recommended will give food till November, by which time from three to four thousand turnips will have arrived at maturity. It is supposed that these turnips are full-sized, that is, averaging about from four pounds and three-quarters to five pounds each; consequently, at fifteen pounds a-day, this will serve a cow for six months, independently of the cabbage. During summer, the best kind of food for cows is of course grass pasture, but this may be greatly assisted by the industry of the cottager.

MAKING CHEESE.

In situations where sweet milk cannot be conveniently disposed of, the making of cheese is a most important method of converting the milk to the best advantage. The coagulation of milk is produced by several substances; but that in most general use is the preparation of the stomach of a sucking calf, properly cleaned and soaked in a brine of salt and water. The following is the method of preparing this by Mr Marshall, a celebrated agriculturist:—"Take a calf's bag, maw, or stomach, and having taken out the curd contained therein, wash it clean and salt it thoroughly, inside and out, leaving a white coat of salt over every part of it. Put it into an earthen jar or other vessel, and let it stand three or four days, in which time it will have formed the salt and its own natural juice into a pickle. Take it out of the jar, and hang it up for two or three days, to let the pickle drain from it; resalt it, place it again in a jar, cover it tight down with a paper pierced with a large pin, and in this state let it remain till it be wanted for use. In this state it ought to be kept twelve months: it may, however, in case of necessity, be used in a few days after it has received the second salting; but it will not be so strong as if kept a longer time. To prepare the rennet for use, take a handful of the leaves of sweet briar, the same quantity of the leaves of dogrose, and the like quantity of bramble leaves; boil them in a gallon of water, with three or four handfuls of salt, about a quarter of an hour; strain off the liquor, and having let it stand until perfectly cool, put it into an earthen vessel, and add to it the maw prepared as above. To this is added a sound good lemon, stuck round with about a quarter of an ounce of cloves, which gives the rennet an agreeable flavour. The longer the bag remains in the liquor, the stronger of course will be the rennet. The quantity, therefore, requisite to turn a given quantity of milk, can only be ascertained by daily use and observation." In Gloucestershire, a third of a pint is used to coagulate fifty gallons of milk; but as a general average, it is perhaps safer to take something less than half an English pint; much, however, depends upon the strength of the rennet. To make milk coagulate properly, it should be heated to from eighty-five to ninety degrees; and after the rennet is applied, it ought to stand two hours, during which time it should be covered, so as to allow about five degrees of its original heat to escape. But the season of the year, the heat of the weather, and the kind of pasture, all tend to make the necessary length of time differ.

Considerable caution is necessary in separating the whey from the curd. If the milk be much heated when put to coagulate, and the curd be broken, and the whey quickly and strongly pressed out, the cheese will be very poor, as much of the rich part of the milk is pressed out. The whey ought therefore to be cautiously removed, and a gentle pressure used; then the cheese will be good. The quality of cheese is extremely variable, and the goodness of its quality depends greatly on the manner in which it has been made; such as, whether it has been made of milk of one meal, of two meals, or skimmed milk. The method of milking also affects it, as well as the season of the year; the preparation of the rennet, the manner in which it has been coagulated, the gathering of the curd, the salting, and its management in the press. We shall endeavour to give some hints on these particulars.

Milking.—The cows should be milked in summer at four o'clock in the morning and four in the afternoon. Every drop of the milk should be taken away, as the last drawn is by far the richest in quality. The utmost regularity must be kept as to the hour of milking; and the cows should never be allowed to run about, as this materially affects the milk. In Gloucestershire, all the best cheeses are made from one meal of milk.

Temperature of the Curd.—It is found that milk which has been produced on poor clay soils requires to be coagulated at a higher temperature than that which is the produce of rich pastures; ninety degrees being what is considered the best for the latter kind of soils; for those of the former the heat may be ninety-five degrees.

Gathering the Curd.—Whenever the process of coagulation has been completed, the curd is broken and gathered. A cheese-knife is taken, and with it the curd is cut in various directions. It is then allowed to stand for a minute or two, when the operation is renewed, and the curd cut into smaller pieces, which is again and again repeated till the curd is reduced into very small portions. In this operation about forty minutes are usually expended. The cheese-tub is then covered with a cloth, and allowed to remain undisturbed for forty minutes or half an hour. When the curd has subsided, the whey is skimmed off with a wooden skimming-ladle or dish, and the curd well pressed by the bottom of the ladle, assisted by the hands, or a semicircular board made nearly to fit the tub. The curd is again cut with the cheese-knife, to allow the whey fairly to escape, and pressure is again employed till the whey is entirely drained off. The curd is now put into one or more vessels, and broken with the hands as small as possible. During this process salt is thrown over the curd, and thoroughly mixed with it. The proportion of salt is not well ascertained, but it must be guessed by estimation and tasting the curd. It is then put into a vat or mould, usually made of elm, adapted to the form of the intended cheese, and perforated with very small holes in the bottom for the escape of the whey. The vat must be filled at least an inch above the brim; this is to prevent the curd from shrinking below its sides when the whey is squeezed out; because, if the curd should be thus shrunk, the pressure would be on the brim of the vat, and the necessary weight prevented from reaching the cheese, which would render it open and spongy. Before the curds are put into the vat, a cheese-cloth is spread over it, sufficiently large when turned up to cover the whole cheese. A smooth circular board is then placed on the top of the vat, and the whole are placed in the cheese-press and allowed to remain two hours. The cheese, after being taken out and a dry cloth substituted, is turned upside down in the vat, and again put in the press, where it is allowed to remain for eight hours, when it is again taken out, rubbed with salt, a clean cloth again applied, and then put into the press a third time, and allowed to remain for twelve or fourteen hours. When it is taken out, if any of the curd has forced its way beyond the shape of the vat, it is pared off. The cheese is then placed upon a shelf, and regularly turned every day till sufficiently dry.

Skewering.—In the process of forming very large cheeses, it becomes necessary to have perforations in the sides of the vat, for the reception of iron skewers, which must be thrust through them in all directions to facilitate the escape of the whey. This must be repeatedly done during the first day's pressing, because it is quite necessary that every drop of the whey should be expelled, otherwise the cheese will not keep.

Cheese-Press.—There are now many very well-contrived cheese-presses. Perhaps one of the most convenient and cheapest is that manufactured at the Shotts Ironworks, Scotland. It costs only three pounds five shillings. In this machine the pressure is produced by the combination of a rack-wheel and pinions, with a lever and weight. By this the pressure can be regulated to the greatest nicety. It has also great powers, and is capable of communicating pressure of from a ton and a half to two tons and a half, which is sufficient for much larger cheeses than are made in Britain.

Gloucester Cheese.—In this county the best cheeses are always made of a single meal of milk. These go by the name of one-meal cheeses. Cheeses are made of two sizes, the double and the single; the one thin and the other thick; the former having eight to the hundredweight, and the thick four. Single cheeses are made from April till November, but the thick are made only in May, June, and the early part of July. Good cheese can, however, be made all winter, although not equal in quality to that made during the summer months. The inferior qualities of cheese made in this county are produced with half new milk and half skim-milk. Gloucester cheese is coloured with Spanish arnotto. The red pulp which covers the seeds of that plant is suspended in vessels of hot water, and is allowed to subside at the bottom of the vessel, and afterwards dried and formed into cakes or balls. To every hundredweight of cheese an ounce of this substance is used. A piece of this arnotto is rubbed upon a smooth stone, and it is mixed with the milk before the rennet is applied.

Cheshire Cheese.—The cheeses of this county are generally made of a very large size, weighing from sixty to one hundred pounds. They are usually made from the milk of two meals; and in the winter, sometimes five or six meals are employed in making curd. The cream is withdrawn from the evening's milk, and again added in the morning; others do not add the cream at all. There are various opinions respecting the propriety of this proceeding, which are still undecided. When two meals of milk are made use of, a part of the creamed milk of the former meal, to the proportion of a half, a third, or only some four or six gallons, are kept, and made scalding hot over a fire. Half of this is then poured into the cheese-tub among the cold milk, and the remainder into the vessel in which the cream of this milk had been placed. All these are thrown into the cheese-tub together, and to them is added the fresh milk which has just come from the cow. They term this process melting the cream, and is considered the best method of uniting different meals of milk. The rennet is now added.

Arnotto is also used in Cheshire as a colouring matter; this is added by tying up a sufficient quantity in a linen rag, and placing it in half a pint of warm water, in which it is allowed to remain during the night. The water, after the rag has been well squeezed into it, is now added to the milk in the cheese-tub. The same method of breaking the curd is pursued as we have above noticed. They make a practice of shifting the cheese very often when in the press; frequently not allowing it to remain more than half an hour at a time for the first half day; after which it is taken out of its cloth, and placed in a tub of hot whey or water, and permitted to remain from an hour and a half to two hours; this is to give tenacity to the skin, and to prevent blistering; it is then dried, and, being covered with a dry cloth, is again placed in the vat, and put into the press. It is sometimes pricked all over to allow the escape of air, which might blister it. For two days thereafter, it is removed twice a-day, and rolled in a dry cloth; after which it is taken out and placed on the drying shelf. In the operation of the two last turnings, finer cloths are employed, to prevent any coarse marks from the threads being seen on the surface. Some are so particular as to place the cheese for some hours in the vat without a cloth, so as to efface all the thread-marks. In Cheshire they have two methods of salting cheese, very different from that pursued in Gloucestershire: the first of which is to place the cheese in the vat, in a cloth which has been immersed in brine, and then allow it to remain for several days, turning it at least once a-day; another method is to cover the upper surface of the cheese with salt every time it is turned, for three days; during which time the cloth must be twice changed. Both of these processes are completed by afterwards placing the cheese upon a salting bench, and then rubbing the whole external surface with salt for eight or ten days successively. It is then washed with warm whey or water, and placed on the drying shelf, where it remains for three weeks in summer, and a month or five weeks in winter. Three pounds of salt are required for a cheese of sixty pounds. The next operation is to smear the whole surface of the cheese with butter; they are placed on shelves, and firmly rubbed, and again smeared daily for fifteen days. However long the farmer keeps his cheese, the turning daily is constantly kept up, and rubbing employed thrice a-week in summer, and twice in winter.

Stilton Cheese.—The evening's meal of milk is allowed to stand; it is creamed next morning, and added to the morning's meal along with the rennet. When it has coagulated, the curd is not broken in the ordinary way, but is taken out whole, and placed in a sieve to drain gradually. During this process, a gentle pressure is applied; and when it is divested of all the whey, it is placed in the vat, and kept on a dry board. Stilton cheeses generally weigh from six to twelve pounds; they require two years to ripen sufficiently for sale, and are never considered to be so till they are blue inside. To hasten ripeness, some farmers add wine to the curd. These cheeses are sometimes made in a net, which gives them the form of a melon, and these are reversed daily in the process of drying. They are the most valuable of all the British cheeses.

Lincolnshire Cheese.—An excellent cream cheese is made in this county, by retaining the cream of a former meal of milk, and adding to that which is immediately from the cow. This cheese is only pressed two or three times, and, when only a few days old, is sold to be eaten with salads, such as lettuces and radishes.

Dunlop Cheese.—This cheese took its name from the parish of Dunlop, in Ayrshire, Scotland, where it was originally manufactured; but cheese equal in quality, and made on the same principles, is produced in various parts of Scotland. It is said that cheese from unskimmed milk was not made in Scotland till after the revolution. Tradition says that it was first made by a woman named Barbara Gilmour, who, having fled Scotland from religious persecution, and taken refuge in Ireland, returned from thence to her native parish Dunlop, in Ayrshire, and introduced the making of this cheese. How she acquired a knowledge of this in Ireland at so early a period, we cannot conjecture, as at the present day it is a notorious fact that good cheese is seldom produced in that country, which is remarkable in an eminent degree for the richness of its pasture, and, consequently, the superior quality of its butter.

In this district of Ayrshire the cows are of the small improved breed, the average living weight varying from thirty to forty stone. They are kept constantly in the fields from May till October, which may have a tendency to give a richness to their milk, as they enjoy the best health and vigour from this continual exposure to the free air. They produce from nine to ten English gallons of milk daily, and are milked twice a day, namely, at six in the morning, and the same hour in the evening. The best quality of cheese is made by those who have such a number of cows as can produce as much milk as to enable them to make cheese daily. About a dozen will effect this. This is made by mixing the evening's milk with the new morning's milk, or *vice versa*; that is, they never mix two meals together of more than twelve hours' standing. The milk is brought to its natural heat, and the rennet applied; and as soon as it has coagulated, which seldom requires more than fifteen minutes, the curd is stirred gently with a roller, and then pressed softly by the skimming dish, and the whey removed as it gathers, until the curd assumes a solid appearance. To complete the process of removing the whey, it is sometimes put into a drainer, and pressure applied above to force all the whey out. The curd is then returned into the cheese-tub, and cut into very small portions by means of a four-bladed knife; indeed, some individuals use one with six blades. A sufficient proportion of salt is then added, and well mixed with the hands. As this is generally done by guess, there must of course be considerable variety in the saltness of the cheese; which perhaps is as well, as there is much variety of taste in this respect. After these operations, it is put into the vat or cheese-mould, which is called a cheesit, chessel, or chesser, in Scotland. The curd is not put in in lumps, but rubbed as small as possible between the hands. It is then put into a press, and afterwards frequently removed, and the cloth changed, and replaced by a dry one. This process is usually continued for from two to three days, and the cheese is then taken out and placed on a shelf, turned and rubbed carefully with a coarse cloth daily. Dunlop cheese has always been made without any colouring, but of late years the practice of colouring has been introduced by many of our Scottish farmers; but the true lover of Dunlop cheese prefers them in their unsophisticated and unadorned state; for however colour may please the eye, it adds nothing to the pleasure of the palate. Dunlop cheeses are made of various sizes, from twenty to sixty pounds; and it has been calculated that a dozen cows will produce upwards of a ton and a half in a season. The cheese-press which has been long used in Ayrshire is of a simple construction. It consists of a large cubical stone, from half a ton to a ton in weight, placed in a framework of wood, and raised and depressed by means of a screw; and cottagers content themselves with a large flat stone, which is lifted off and on the vat with the hands.

Mr Robison, secretary of the Royal Society of Edinburgh, has discovered a mode of speedily rendering any cheese blue, which is by perforating it with an instrument, and introducing a little of the blue of another cheese into it, which has the effect of inoculating even the newest cheese.

Wiltshire Green Cheese.—This is a fanciful kind of cheese, which is produced by steeping in a given quantity of milk, one part of marigold leaves, with two parts of sage leaves, allowing them to remain one night; to this are added a few parsley leaves. This decoction is then coagulated, and afterwards mixed with a certain quantity of curd made in the usual manner. The cheese is then formed in the ordinary way. We have seen a cheese of this kind in France, which was said to have been made in Switzerland, which had, besides the above ingredients, the flavour of wild thyme and rosemary. But we confess it needs an acquired taste to relish these.

Ewe-milk Cheese.—This cheese is made by a mixture of ewe-milk and cow-milk, in the proportion of two parts of the former to one of the latter. The process of coagulation and formation of the cheese is in the ordinary manner. It is generally made salter than cow-milk cheese, and has a strong and pungent taste. An imitation of Parmesan or Italian cheese has been made from ewe-milk, in the same manner as the true cheese of that name is made.

MAKING AND CURING BUTTER.

Churning.—There are various methods practised in this operation. Some persons put the new milk directly into the churn, and permit it to stand until the cream is thrown up on its surface, and then churn the whole together; others put the milk into large flat dishes, and permit it to stand from seven to eight hours (some permit it to stand twelve hours), till the cream has risen, and then skim it off, and churn it alone, which is reckoned the best mode of conducting the process. In creaming, the cream should if possible be lifted off the dish all in one unbroken mass. This may be accomplished by loosing it all round with the creaming-spoon, and drawing it to one side of the dish, when it may be easily lifted. Cream may be kept from three to seven days before being churned, depending upon the state of the weather. It requires more labour and time to make butter from the milk and cream churned together, but it has been found that a greater quantity of butter is produced from this practice. Great steadiness in the motion of the stick, or driving of the handle in barrel-churns, is required. Want of attention in this respect has been known entirely to spoil the butter. In summer, butter should be churned early in the morning. If the common upright churn is used, it should be placed in a tub of cold water, which ought to extend for a foot up its sides, and be kept in this situation during the whole operation of churning. By using this precaution, the butter will be firmer, and will more easily separate from the milk. In winter, on the contrary, heat is necessary for the accomplishment of churning more easily; the kitchen fireside is a very proper place for the purpose; while care must be taken to prevent the one side of the churn from getting heated, as this would have a tendency to render the butter rancid and ill tasted. When the butter has fully come, it is taken out of the churn with the skimming-dish, and put into a wooden or crockery vessel; if the former, it should be previously well rubbed with salt, to prevent it sticking to the sides. The milk is now carefully pressed out of the butter; to effect which, it requires considerable pressure; for if any of the milk remains, the butter will soon spoil. Some are in the habit of washing the butter with cold water, but this is an unnecessary practice.

Making up.—The butter is now made up into rolls or small prints cast from flat moulds of wood, on which are relieved figures of some kind. If the butter is soft, it may be placed in wooden or other vessels, and there allowed to swim in cold water, but it is considered bad to allow the butter itself to come in contact with water.

Curing or Salting Butter.—Wooden vessels are the best for preserving butter when salted. These should be internally rubbed firmly with salt, and the cavity round the margin of the bottom should be filled up with melted butter which has been salted. The best preparation for preserving butter is one part of sugar, one part of nitre, and two parts of salt. These are all finely pounded together, and to every pound of butter an ounce of this composition is used, and completely mixed with the butter as soon as it is made; it is then placed in the kit or firkin, and closely pressed down, and rendered quite even on the surface, and carefully covered with a cloth which has been smeared with melted butter, to prevent the air from affecting it. Some use parchment for this purpose. This operation should be repeated till the vessel is completely filled, when it must be covered with a double piece of cloth, over which has been poured melted butter, and all the cavities completely filled up with the same, and some salt sprinkled over the surface. The firkin should then have a wooden lid or covering, which must fit it as tightly as possible, so as totally to exclude the air, for it is this element which destroys the butter by coming in contact with it. Every time, therefore, that butter is taken out of the firkin, it should be closely covered up. The more effectually to guard against rancidity when curing salt butter, a strong brine of salt is poured over its surface. Winter-made butter is always very pale; to give it a richer appearance, a dye is frequently added. The best and safest are the leaves of marigold and carrot juice, which are placed in a cloth, and squeezed amongst the cream when put into the churn.

REARING CATTLE.

Although this department of our subject more properly belongs to farming and grazing than to Cottage Economy, we shall give a few of the leading points to be attended to.

Calves should be allowed to suck their dams for some time, at least two or three weeks; but in lieu of this, milk may be given to them to drink from a pail. After the first fortnight, half or even the whole may be skimmed milk, and in many parts even this is mixed with water; and no other food is given them till they are able to graze. In Cheshire they are suckled for three weeks, and afterwards fed on whey, buttermilk, or skimmed milk, mixed with flour, pea or bean meal, or oatmeal. Sometimes they get a mixture of all these, and at other times separately; but this depends upon the fancy of the feeder. Many persons think calves should never be allowed to suck their dam at all, but at once be taught to drink from a pail, by which means they are not liable to fall off or suffer by weaning. The quantity allowed to a calf is about two gallons of milk daily at first; this, however, must be increased as they advance in age, and farinaceous substances, as above recommended, added to it. The best winter feeding for calves is hay, and clover hay is decidedly the fittest for the purpose. It has been found sometimes that feeding very young calves on old milk has the effect of scouring them for some time, but it will soon go off. The following is the Duke of Northumberland's method of feeding calves:—Take one gallon of skimmed milk, and to about half a pint of it add half an ounce of treacle, and mix them thoroughly; then take one ounce of linseed oilcake, finely pounded, and sprinkle it into the milk, while it is stirred all the time with a spoon. When properly incorporated, mix the whole together, and place it on the fire till it is about the warmth of new milk. This must then be given to the calf. The quantity of powdered oilcake may be increased as occasion requires.

Spring has long been found to be the best time for rearing calves, but this will depend much upon the time the animals are calved. It has been noticed that those which have been weaned late in the autumn or in the winter seldom thrive well. When a calf is weaned from the teat in spring, it should be turned out during the day into an inclosure where it will be free from harm, and where it can have tolerably good grass to nibble at. If there are more than one calf, it is found they sooner become reconciled to their privation in being separated from their dams. For this purpose, also, they ought to be at some distance from where the dams are fed, so that they may not hear each other's lowing; and there ought to be neither ponds nor ditches where the young animals may injure themselves. They should be provided with milk porridge at their feeding hours, and for the first six months they should be removed under cover during the night, after which they may be left out night and day. Their pasture should be frequently changed, and finally removed into a yard at Michaelmas. After this they may be fed in the same manner as cows and other cattle. By the following summer they will, having been properly fed, have acquired strength and substance, and, by way of economy, may be fed on the coarser pastures which may be in possession or within reach of the owner. It has been found of great benefit to feed young cattle on turnips for three months during winter, for the first two or three years.

DISEASES OF COWS.

There are many diseases to which horned cattle are liable, and some of these are of a dangerous kind. These are

Field Fever.—The cure for this is bleeding, and in their drink half an ounce of nitre is given twice a-day. In warm weather they need not be housed.

Inflammatory Fever is often induced by over-driving and other causes: it prevails most in young animals. Bleeding and purgatives, with fever-powder as a drink, are the cures. It has been found that four drachms of muriatic acid, with a decoction of three pints of oak bark, have proved salutary as a drink in this complaint.

Epidemic Influenza.—This is a disorder to which cattle are very liable, and has long been known as a scourge of these animals. It is caused by very stormy weather, and frequent changes of temperature. This disease at first commences by itching of the ears, shaking of the head, and difficulty in swallowing, staggering in their walk, great weakness, and a constant desire to lie down; with a discharge from the eyes and nostrils, a strong and frequent cough, and an almost constant discharge of thin green fæces. Bleeding for the first two days is recommended; clean litter given frequently, and the animal kept in a situation where there is a free circulation of air; and fumigating the place often; green boughs burnt with pitch have been efficacious. The body should be washed with aromatic herbs in water, or, what is still better, vinegar. Saline purgatives in the early stages have frequently been found beneficial; these may consist of from ten to twenty ounces of Epsom salts. When, however, the disease assumes an alarming appearance, a farrier must be applied to, as it is unsafe for unskilful persons to attempt a cure.

Inflammation of the lungs and of the stomach, frenzy fever, and the hove or blown (an inflammation of the paunch, ending in ruptures), are also common; but to discriminate these, requires much judgment, and it is safer to apply to those skilled in the diseases and cure of cattle. Indeed, to give a satisfactory account of these, and to mark such treatment as is requisite in all the maladies of cattle, would require a pretty large volume.

The principal disease of calves is a kind of convulsions, occasioned either by worms or cold. The best specific for worms are doses of turpentine of half an ounce at night, and the same quantity next morning. Sometimes a simple dose of aloes will dislodge the worms. When the convulsions proceed from cold, the calf should be rolled in a warm blanket, and a dose of a drachm of laudanum in ale given. When they are attacked with diarrhœa, the following prescription may be administered in the shape of a drink, which may consist of beer, or brewer's wash, and draff:—Glauber salts, dissolved, two ounces; castor oil, four ounces; powdered rhubarb, half a drachm; powdered opium, four grains; gruel, one pint. If they will take the above without any other liquid, so much the better.

BREEDING AND FEEDING PIGS.

Animals of the hog kind possess a middle nature between those that live upon grass and such as are carnivorous, and unite in themselves most of those distinctions which are peculiar to each class. Like the one, they will feed on animal substances, and do not ruminate; like the other, they are cloven-hoofed, live chiefly on vegetables, and seldom seek after animal food, except when urged by necessity. The most numerous breed of hogs in Great Britain is that generally known by the name of the Berkshire pigs, now spread through almost every part of England and many parts of Scotland. They are in general of a reddish-brown colour, spotted with black; have large hanging ears, nearly covering their eyes; are short-legged, small-boned, and easily made fat. Some of these have been fed to an almost incredible size.

In country situations, where woods are extensive, and the grass of them of no value to the farmer, the feeding and breeding of pigs will be found very profitable to the cottager; for where they have a wide range, they will require but little food, save what they find for themselves in grazing upon the coarse grass, and in digging in the ground for worms and roots of various kinds, for which their long and curiously formed snout peculiarly fits them; and it is only in the fattening that any particular attention requires to be devoted to the mode of feeding them. If there happens to be a mill near at hand, the dust, shellings, and bran, will be procured easily and cheaply. We cannot give a better instance of the profit of a good breed of pigs than one which occurred near Drogheda in Ireland, in 1813. It was of a sow which was fed for nine months. The following was its produce:—

July 1813, it produced a litter of eleven, seven of which were sold at 30s. each,	L.10	10	0
July 1814, a litter of eleven; nine sold at 40s. . . .	18	0	0
March, three of first litter sold in market at	31	0	0
April, sow sold fat at . .	20	5	5
	L.79	15	5

And a breeding sow was kept, valued at L.20.

The domestic pig generally brings forth twice a-year, and produces from ten to twenty at a litter; she goes with young four months, and farrows early in the fifth. At that time she must be carefully watched, to prevent her from devouring her young; still greater attention is necessary to keep off the male, as he would devour the whole litter. The flesh of the hog is a wholesome food for those who take much exercise, but not for such as lead a sedentary life. It is of great importance to this country as a mercantile nation; for it takes on salt better than any other kind of flesh, and consequently is capable of being preserved longer; it is therefore in great use in ships, and makes a principal part of the provisions of the British navy.

By a mixture of the Chinese black swine with others of the larger British breed, a kind has been produced which possesses many qualities superior to either of the original stocks. They are very prolific, are sooner made fat than the larger kinds, upon less provisions, and are cut up, when killed, into more useful and convenient portions. Arthur Mowbray, Esq. of Sherburn, in the county of Durham, had a pig of this breed which littered within ten months three times, producing in all fifty pigs; the last litter consisted of nineteen. The Chinese or black breed is now very common in Britain. They are smaller, have shorter legs, and their flesh is whiter and sweeter than the common kind. A kind similar to this were those found in New Guinea, which proved so seasonable a relief to our circumnavigators when that country was first visited by them. An unceasing attention to improvement has produced or new-modelled the Chinese breed in this country, to what is deemed to be nearer perfection. The delicacy of appearance, the thin transparent ears, small head, short legs, and even the colour of the hair, are all considered as requisite qualities, which ought to be attended to in this kind. They are seldom fed for the same purposes as the larger breeds of swine, being considered too small to be dried into bacon, but they are preferred as the best and most delicate for pork and roasting pigs.

Although swine are found to succeed in all countries, and their constitutions have been accommodated to every climate, yet they are found to degenerate and not thrive well either in the extremes of heat or cold. In a native state we find them, when inhabiting countries towards either extreme, seeking situations most adapted to their constitution. Swine, in a domesticated state, require to be kept very dry and warm, otherwise they will never thrive. It will be noticed that in cold weather they invariably bury themselves among the straw and litter with which they are supplied as bedding, thus pointing out their natural desire for heat. The piggery should therefore be in some well-sheltered spot, and if possible with a south or west exposure. If kept in small sties, there should be a small aperture at each end of them, so as to permit the free passage of air through them for ventilation. These may be kept open constantly during the summer months, but only allowed to be open for air once every second day in winter, and that in the forenoon, while they must be carefully shut up in the evening. Pigs will be found to grow notwithstanding the neglect of all these precautions, but we know from experience that they will grow much faster and will be more healthy with them. We cannot too strongly impress the necessity of cleanliness in the management and rearing of pigs. There is not a more mistaken idea than that a pig is naturally a filthy animal. If they are dirty in their habits, it is from the education which they receive from those who are careless in keeping their piggeries clean. The floor of the sty in which they sleep ought to be some inches above the level of the small enclosure in front, for feeding and exercise; and as much room as possible should be afforded for the latter purpose. When pigs are not kept very clean, they are liable to a disease in the skin, something like itch or mange. This can only be averted by what we have above recommended.

Cottagers should purchase their young pigs either in April or the month of January; and if four months old at any of these periods when bought, he will be a year old by the time that pigs are generally killed—namely, commencing at Christmas. No pig should be killed sooner; and even if eighteen months old, so much the better, as the flesh is more solid at that age. During the summer, the pig may be fed on all kinds of refuse from a garden; and if allowed to go at liberty, he will find plenty of food for himself, either in woods, road-sides, or lanes. If cottagers brew their own beer, the grains which are the refuse of it will greatly assist in rearing them. When the season approaches for feeding, which ought to be about the beginning of November, something more nourishing must be given. But care must be taken not to commence with feeding too rapidly, otherwise surfeit may be produced. The best materials for feeding are barley and peas meal; and if milk, either skimmed or churned, can be given at same time, it will greatly facilitate the feeding, and improve the quality of the flesh. Many persons feed their pigs on potatoes, but in that case the flesh is never so solid and good, and the fat is loose and flabby. Soft meat may do very well as a meal for pigs when they are growing, but upon no account should it be given when they are to be fed for killing. Those who feed pigs for their own use generally give them a feed or two of corn daily for fourteen days before they are killed, and give them nothing else but churned or skimmed milk to drink; and for a day before killing, the pig should not get any food. Where people's circumstances will not permit any of the modes of feeding for killing which we have above pointed out, a good substitute will be found in boiled potatoes, mixed with a handful or two of oatmeal. Indeed we have seen good pork in Ireland which had been fed entirely on potatoes; and although it was not very fat, the texture of the flesh was fine, solid, and well tasted, and more palatable to a stomach unaccustomed to strong food than that which is fatter.

Fattening for Bacon.—The pigs selected for this purpose should never be less than from eighteen months to two years of age. Although bacon may be cured from animals which are not more than a year old, yet it wants that solidity which gives a zest to this excellent food; and, besides, it does not keep so long when young. Three to four months' feeding is necessary. Where persons are near a distillery or brewery, the refuse grains and wash will be found an excellent thing to begin with, and the process is finished with hard food, as we have above pointed out. For even one of the largest sized pigs, Mr Henderson, a late writer on this subject, thinks, that, in the process of feeding, not more than six Winchester bushels of oats made into meal should be consumed. It ought to be shelled before grinding, but not sifted.

Fattening Sucking Pigs.—The sow ought to be well fed, and kept in a warm comfortable situation. When pigs which have been weaned are fattened for killing, they should be constantly fed on skimmed or butter milk, mixed with peas, barley, or oat meal. Pigs at six months old are fit for killing as pork, and may be eaten either fresh or pickled. It cannot, however, be long kept at so early an age.

In all cases there are general rules which ought to be strictly attended to. These are, to keep the feeding-troughs at all times clean and sweet, and the food should be given in small quantities, and frequently. It should be occasionally changed, as they feed better on variety; and salt should at all times be added to their food. Swedish turnips and carrots are excellent food for pigs, both of which are eaten by them with great avidity. Some persons are in the habit of boiling these roots before giving them to pigs.

Curing Pork and Bacon.—A brine is made of salt and water, so strong that an egg will swim in it. It is then boiled and poured upon the pork when cold. The meat should be entirely covered with this brine, otherwise it will require to be turned every day. In curing bacon, when the animal has been properly cut up into its various divisions, it is placed in a tub and strewed with pounded saltpetre, and afterwards plentifully covered with salt. It should lie in that state for about a week, when those parts which were undermost should be brought to the top, and those that have been above put beneath, at the same time giving them another plentiful supply of salt. They are permitted to lie for three weeks longer, and then taken out and hung up to dry. The side of a kitchen chimney, where it is not too hot, will be found the best place for this purpose; or if bacon is cured to a great extent, a smoking-house must be constructed for this purpose. Should it not be convenient to hang them up at the time above pointed out, they may be turned over and kept in the tub for a couple of months longer, without suffering any injury.

Breeding Swine.—The boar should never be less than twelve months, and the sow ten months old. For a cottager's purpose, the smaller or Berkshire breed will be found the best. The sow ought to have an ample abdomen, but not a tendency to much fat. At the same time, a sow ought to be in good condition when she is breeding, otherwise little good can be expected of her progeny. Many persons labour under the mistaken notion that swine while breeding should be kept lean, but nothing can be more erroneous; for, after farrowing, great part of those juices which would be converted into milk, were she in good condition, will naturally go towards nourishing her system. The time of gestation being four months, care should be taken that her time of farrowing shall be in September and March. The first of the litter will be two months old before very cold weather sets in, and the second will have the advantage of all the summer months, and will make much greater progress in their growth than during the winter months. Pigs brought forth in winter seldom do much good, unless kept in houses where there is a constant fire.

Before farrowing, the sow should be provided with very short straw or hay, as the pigs are apt to conceal themselves beneath the litter, and not being seen by the sow, are frequently smothered by her. When pigs are weaned, great care is necessary to prevent them falling off; and they ought therefore to be fed with the richest milk, mixed with either barley, peas, or oat meal. Much of the after progress in feeding depends upon the care that is taken of pigs at weaning. If starved at this period, they seldom fairly recover it. Where the cottager has not the means of giving milk, the next best thing is meal and water, and that should not be too thin, and repeated six or eight times a-day. Swine are subject to a variety of diseases, but these cannot be treated of to any advantage here; they must be studied from books written expressly for the purpose. The dung of the hog, owing to the nature of its food and other circumstances, forms the richest of the animal manures, and will prove of great value to the cottager's garden if carefully attended to.

THE GOAT.

Where cottagers have not the means of keeping a cow, a goat will be found a very useful animal; it is easily fed, and generally pastures on such grasses as are rejected by the cow and the sheep. To those peasants who live in the neighbourhood of high mountainous countries, the trouble and expense of keeping a couple of goats will be nothing, as they will find sufficient nourishment in the most heathy and barren grounds. Heaths, also, which are unfit for any kind of pasture, will afford this animal an ample supply of food; and it requires no care or attention, easily providing for itself proper and sufficient food. In mountainous countries goats render considerable service to mankind, the flesh of the old ones being salted as winter provision, and the milk is used in many places for the making of cheese. The flesh of the kid is highly palatable, being equal, if not superior, in flavour to the most delicate lamb.

In Britain the goat produces generally two young at a time, sometimes three, rarely four. In warmer climates it is more prolific, and produces four or five at once, though the breed is found to degenerate. The time of gestation is five months. The male is capable of propagating at one year old, and the female at seven months, but the fruits of a generation so premature are generally weak and defective; their best time is at the age of two years, or eighteen months at soonest. A goat is old at six years, although the life of this genus extends to fifteen years.

If goats are properly trained, they will return to their owners twice a-day to be milked, and prefer sleeping under a roof when accustomed to it. The milk of the goat is sweet, nourishing, and medicinal; not so apt to curdle upon the stomach as that of the cow, and therefore preferable to those whose digestion is but weak. The peculiarity of this animal's food gives the milk a flavour different from that either of the cow or the sheep; for as it generally feeds upon shrubby pastures and heathy mountains, there is an agreeable mildness in the taste, very pleasing to such as are fond of that aliment. The quantity of milk produced daily by a goat is from three half pints to a quart, which yields rich and excellent cream. If properly attended to, a goat will yield milk for eleven months in the year. In several parts of Ireland and the Highlands of Scotland, the goat is the chief possession of the inhabitants. On those mountains where no other useful animal could find subsistence, the goat continues to glean sufficient living, and supplies the hardy natives with what they consider a varied luxury. They lie upon beds made of their skins, which are soft, clean, and wholesome; they live upon their milk, with oatbread; they convert a part of it into butter, and some into cheese; and the flesh furnishes an excellent food, if killed in the proper season and salted. They are fattened in the same manner as sheep; but taking every precaution, their flesh is never so good or so sweet in our climate as that of mutton. It is otherwise between the tropics. The sheep there becomes flabby and lean, while the flesh of the goat rather seems to improve, and in some places is cultivated in preference to that of the sheep. The cream of goat's milk coagulates as easily as that of cow's, and yields a larger proportion of curd. The cheese is of an excellent quality, and high flavoured; and although in appearance it looks poor, it has a very delicate relish, and strongly resembles Parmezan cheese. Some farmers have been in the practice of adding a little goat's milk to that of cows, which materially improves the flavour. In winter, when native food becomes scarce, the goat will feed upon turnip-peelings, potato-peelings, cabbage-leaves, and other refuse of a house.

THE RABBIT.

In a wild state, the rabbit lives in holes in the earth, where it brings forth its young, and retires on the approach of danger. Its fecundity is truly astonishing. It breeds seven times in the year, and generally produces eight young at a time; from which it is calculated that one pair may increase, in the course of four years, to the amazing number of *one million two hundred and seventy-four thousand eight hundred and forty*. The rabbit produces at the age of five or six months · the female goes with young about thirty days. Previous to her bringing forth, she makes a bed with down, which she pulls off her own coat. She never leaves her young but when pressed with hunger, and returns as soon as that is allayed, which she effects with surprising quickness. During the time she suckles her young, she carefully conceals them from the male lest he should devour them, and frequently covers up the mouth of the hole that her retreat may not be discovered. The rabbit lives to the age of eight or nine years, and prefers warm and temperate climates.

Such is the account of the rabbit in a wild state, and the same will apply in all respects to that in a domesticated condition, which, however, grows to a much larger size than the wild rabbit, from which it originally sprung. The domestic rabbit is of various colours, such as fawn-colour, black, white, brown, and frequently variegated. The skin of the rabbit is of value for making hats, and a ready market can in consequence be found for them at all times. In country situations the breeding of rabbits may be cultivated to much advantage; they will eat a great many wild plants, which can be easily procured as food, such as dandelion, sour docks, colewort blades, grass, clover, strawberry leaves, cabbage blades, turnips, carrots, the leaves of turnips and greens, and other succulent plants. The hog-weed is also a favourite food with them, as they will eat root, stem, and leaves; it is a tall plant, which grows abundantly in hedgerows and coppices in many counties of England; its flower and seed are exactly like those of the parsnip. Previous to fattening rabbits for food, they should be fed on hay, and afterwards on shallings and oats, when the flesh will be more delicate in flavour than even that of the wild rabbit. We knew a family in the country which had a small garden surrounded by a wall; part of this was separated by the tenant (a labouring man) from the rest by a railing, and trenched to the base of the foundation of the wall, and laid with slabs. In the corner was erected a small wooden house, well thatched, for the rabbits to live in; and on this spot, with the assistance of his children, he fed a great many rabbits annually, which served them for flesh, and he sold the skins. The usual annual number which he killed was about twenty dozen. During the time the doe has young ones, she will require a plentiful supply of green meat, and that of the most succulent kind, and should besides get a few oats once a-day. The houses in which rabbits are kept should be well aired every day if possible, and all rotten vegetable substances swept carefully away, as the effluvia from these produce diseases in the young ones.

FOWLS.

They must be considered careless cottagers who do not contrive to keep a few domestic fowls; even one good laying hen is a treasure to a humble family. The ordinary fecundity of this useful bird is truly astonishing, as it usually lays, in the course of a year, two hundred eggs, provided it be allowed to go at liberty, is well fed, and has a plentiful supply of water. Many instances have been known of hens laying three hundred in a year. This is a singular provision in nature, and it would appear to have been intended peculiarly for the use of man, as the hen usually incubates only once in a year, although she will occasionally bring out two broods. Few hens are capable of hatching more than from twelve to fifteen eggs; so that, allowing they were all to sit twice a-year, and bring out fifteen at a time, there would still be at least one hundred and seventy spare eggs for the use of man. It is therefore evident, that in situations where hens can pick up their food, they must prove very profitable; for, supposing that the eggs of one fowl during the year were sold, without any of them being hatched, they would bring on an average ninepence per dozen, or fourteen shillings, and the hen herself would be worth two shillings at least. As the number of eggs which are annually brought out by a hen bear no proportion to the number which she lays, schemes have been imagined to hatch all the eggs of a hen, and thus turn her produce to the greatest advantage; so that, in place of twelve or fourteen chickens, upwards of two hundred may be produced.

The hen's nest is made without any care, if left to herself; a hole scratched in the ground among a few bushes is the only preparation she makes for the season of incubation. Nature, almost exhausted by its own fecundity, seems to inform her of the proper time for hatching, which she herself testifies by a clucking note, and by discontinuing to lay. The good housewives, who often get more by their hens laying than by their chickens, artificially protract this clucking season, and sometimes entirely remove it. As soon as their hen begins to cluck, they stint her in her provisions; and if that fails, they plunge her into cold water; this for the time effectually puts back the desire for incubating, but then it often kills the poor bird, who takes cold, and dies under the operation.

General Management of Poultry.—On the general management of poultry, Mr Main gives the following interesting particulars, resulting from his own experience:—"Every kind of poultry should be kept in a separate house, different kinds being exceedingly pugnacious towards one another. The individuals of every species are also pugnacious among themselves; and on this account the number of cock birds is always limited. One cock to seven hens, one gander to six geese, one drake to six ducks, are the general proportions with regard to the commoner kinds of fowls; and one turkey-cock, and one peacock, are considered quite enough, on a moderately sized farm, for breeding purposes. The turkey, guinea-hen, and pea-hen, are very fastidious in the choice of nests, and therefore require watching. If the latter fix on some secluded spot in the wood or hedges, she must not be removed; and, while sitting, she will come home, call for food, and fly back to her nest. In such places they are in danger of being killed by the fox; but if a circle of peeled rods be placed archwise on the ground, at some distance round the nest, it will scare the marauder. Pea-fowls seldom roost in houses, preferring the tops of buildings or the branches of trees. Every farm should have a place for fattening poultry, containing coops. Fowls are usually fattened with barleymeal and milk or water; and if this is made thin enough, they need no drink. Geese are fattened with oats, given them in shallow earthen pans of water. Turkeys are best fattened with barleymeal and milk; but with professional feeders, many rich and unnatural ingredients are mixed with their food, and forced down the throats of the helpless birds. Ducks are fattened like fowls, but must be allowed plenty of water. The flesh of poultry acquires flavour according to the quality of the food on which they have been fed. Musty or otherwise damaged grain is sure to be tasted in the fowl, goose, turkey, or duck, that has been fed on it, however dressed; on the other hand, general cleanliness and sweet food improve the flavour of the flesh. Rotten or musty litter will taint the birds as well as their eggs. In fact, no poultry of any kind will thrive if not kept perfectly clean; and even with the utmost care, a place where poultry have been long kept becomes what the housewives call tainted, and where they will thrive no longer. The surface of the ground becomes saturated with their exuviæ, and is therefore no longer healthy. To avoid this effect, some poulterers in the country frequently change the sites of their poultry-houses, to obtain fresh ground; and to guard against the same misfortune, farmers who cannot change their henhouses and yards, purify the houses by fumigations of blazing pitch, by washing with hot lime-water, and by strewing large quantities of pure sand both within and without the poultry-houses. Washing the floor of the house every week is necessary; for which purpose it is also necessary that it be paved either with stones, bricks, or tiles."

But as these three modes are expensive, we would recommend to the cottager an equally good flooring, which is much cheaper: that is, by making a composition composed of lime and smithy-ashes, together with the riddlings of common kitchen ashes; and these having been all finely broken, must be mixed together with water, and put on the floor with a mason's trowel, and nicely smoothed on the surface. If this is put on a floor which is in a tolerably dry situation, and allowed to harden before being used, it will become nearly as solid and compact as stone, and is almost as durable. The floors of such houses should be washed out with a mop, which is much more easily done than with a washing-cloth. The inside of the laying-boxes requires frequent washing with hot lime-water to free them from vermin, which greatly torment the sitting hens. For the same purpose, poultry should always have a heap of dry sand laid under some covered place, or thick tree, near their yard, for them to dust themselves in; this being their resource for getting rid of the vermin with which they are annoyed. Geese may hatch eleven or thirteen eggs; ducks the same; fowls thirteen; turkeys, guinea-hens, and peafowls, choose their own number. Turkey chicks cannot be reared if hatched after the end of September. Chickens are subject to a disease called the roop or croup, which seizes them when about three weeks old, or just as the feathers appear on the head. It is caused by small worms breeding in the windpipe in such numbers as to stop respiration, and which, if they cannot cough them up, soon kill them. An infusion of yellow toad-flax, a nauseous and bitter weed, is given as a preventive, but is seldom successful. The disease mentioned by Mr Main is also called the gapes. The worm by which it is produced has a round body, which is acuminated at the posterior end, the lower aperture projecting on a long stalk or arm, that extends rather beyond the anterior end of the body where the other aperture is placed, and is about half the size of that part; these openings spread a little, or are somewhat funnel-shaped, by which the animal adheres to the trachea, from which it cannot be removed without considerable difficulty. It is of a deep blood-red colour, and about an inch in length. The cause of this malady has not yet been ascertained, and it obtains in high as well as in low situations; but whether the nature of the soil or that of the water is productive of it, remains yet to be discovered. We have seen it in all situations. The place of the throat to which these worms adhere becomes much inflamed, which also produces inflammation in the lungs, although none of the worms themselves have been found so low down. But as this disease is confined to the trachea, we consider that no specifics can reach it. We have, however, cured chickens by thrusting a feather stript to within a little of the point down their throat, and turning it quickly round several times, which has had the effect of removing the worm, and in several instances it has been brought out on the feather. Care must be taken not to put the feather lower down than the bottom of the trachea, otherwise, by entering the lungs, it may cause immediate death. This operation is a very painful one to the poor chicken, but it is less than the pain it endures from the worm. The turkey in America, while in a young state, is also subject to this distemper.

There is no species of live stock so suitable to a farm-labourer or cottager as poultry. It has frequently been remarked, "that none but Scotch Highlanders or Irish cottagers have the luxury of fresh eggs in winter, or very early chickens in spring: and as their poultry are of the common breeds, the cause of their continuing to lay eggs when others stop can only be, that they roost in the same rooms with their owners, enjoy some little warmth, and probably live partly on cooked food. On the other hand, the poultry which are lodged in places fitted up for them in farm buildings, or other outhouses, are forced to endure a much lower temperature during winter than is suitable for their laying at that season, and to live almost entirely on uncooked food." Another powerful reason is, that the poultry which live in the same apartments with their owners enjoy a superior degree of cleanliness, even more so than those which are kept in the best conducted poultry-houses.

When a cottager desires to have his hens to lay all winter, he must take care to place his poultry-house somewhere near the fireplace, so that the hens may derive heat from it. This may be accomplished in several ways, both in cottages which are already built, and in those which are yet to construct. The fireplace in almost all cottages is placed either in the exterior or in one of the interior walls. When it is in the outer wall, a poultry-house can be constructed so as to lean against it on the outside of the house, immediately opposite to the fireplace; and if the wall of the house be too thick to admit of the heat passing through, so as to warm the henhouse, then a part of the wall may be taken out, and a fire-brick or stone partition placed in the aperture, which will allow sufficient heat to pass through. But what is still better, a cast-iron plate, being a more effective conductor of heat, will answer a great deal better. Take care to have the walls of the poultry-house so thick that they will retain the heat, and the roof ought also to be well and effectually closed, so as to prevent the escape of heat or the entrance of cold air. A very effectual method is to have the space between the slates or ceiling filled with hay or straw, which is a plan universally pursued in Holland. It would be well also to hang the walls and door round with straw mats. The Dutch thatch the whole roof and sides of the fowlhouse during winter.

Where the fireplace is in the interior wall of the house, the best method for warming the poultry-house is to have a small pit dug in the bottom of the floor, over which is placed a stone or plate of iron, and this pit should be filled with hot embers, of which a supply once a-day will effectually warm the apartments. Another method is to communicate heat to a cistern of water under the floor of the poultry-house, by means of pipes passing from the kitchen fire; but this, although comparatively simple, is too much out of the common way to be adopted by labouring people. Poultry-houses may be made of any form or size; but let them be invariably in warm and dry situations, for even ducks, geese, and other aquatic birds, thrive best when kept dry and warm. All fowls of the gallinaceous kinds roost in elevated situations, and perches should therefore be made for them at a distance from the ground. The rods or rails should be roundish, and of such a diameter that they can grasp them with their feet; it is not, however, necessary that they should be either perfectly round or smooth. Geese and ducks, on the contrary, prefer sitting low; and as their feet are flat and webbed, and consequently incapable of grasping round surfaces, the flatter the place on which they sit the better.

During incubation, fowls should be kept very quiet and retired, and in a dark situation if possible. It is also essential, while fowls are under the process of fattening, that they be kept solitary, and also in a dark situation. All kinds of poultry, when young, are possessed of great activity, and hence require a considerable range to preserve them in health and vigour; consequently, it will be found that they grow faster, larger, and stronger, in situations where they are not confined within the limits of a poultry-yard. They also require the use of salt, sand, and small pebbles, to promote digestion; and their food should consist of green vegetable substances as well as grain, meal, &c. A complete poultry-yard should have a variety of ground, such as dry soil for fowls, turkeys, and guinea-hens, and a damp low situation, with a pond or running stream, for geese and ducks. The poultry-yard should also have a shed for the birds sheltering under, both in the heat of the day and during rain, as much heat is injurious to fowls; and even geese and ducks cannot stand much rain without being injured, although the oily nature of the feathers will protect them from being wet through much longer than those of fowls.

In general, far too little care is taken of poultry. They are often suffered to live "any way," and to eat any thing that hunger compels them to have recourse to. In some parts of Surrey the fowls are admirably managed; and it may be safely asserted that the Scotch are a hundred years behind their neighbours in this profitable branch of cottage economy. At least one-half of the fowls brought to the Edinburgh market would be considered uneatable in London. To improve the breed ought to be a primary object in different parts of the country; and this might be done by procuring eggs from Dorking, in Surrey. Besides this, a better system of feeding on more nutritious aliment should be adopted. Hens are particularly fond of shred particles of flesh meat, the refuse of the table; and if such nutriment be given to them after moulting in the autumn, they will immediately commence laying. Chickens ought to be in a good condition for market when twelve months old. If too little attention is paid to poultry, less is given to the proper preservation of eggs, which often come to market with a strong flavour of rank straw, if not absolutely rotten. As eggs easily contract a bad flavour, they ought to be carefully put aside in some clean place after being taken from the nest. Bran is a good material to lay them amongst for a certain length of time before sending them to market.

GEESE.

Our common tame goose is the wild species domesticated, known to naturalists by the name of the fen or stubble goose. Where people have a right of common, or live in the vicinity of marshy heaths, the breeding and rearing of geese will prove very profitable, for in such situations they are kept at a very trifling expense; they are very hardy, and live to a great age. If properly kept and fed regularly, although sparingly, they will lay upwards of a hundred eggs yearly. If these are set under large hens, each having half a dozen, with the assistance of the goose herself, they may be nearly all hatched. For the first three or four days they must be kept warm and dry, and fed on barleymeal or oatmeal mixed with milk, if it is easily procured; if not, let these ingredients be mixed with water. They will begin to grow in about a week. For a week or two the goslings should not be turned out till late in the morning, and taken in early in the evening. In Ireland the tenantry depend much on the breeding of these birds and turkeys to pay their rent; and with those who are industrious and favourably situated for rearing geese, they even do more in many instances. In the early part of the year they are allowed to feed on grass, on heaths, meadows, and commons; and as most of the peasantry have small bits of corn land of their own, the geese are turned out on the stubble to pluck what grass is left; and they also fatten upon it, and improve the flavour of their flesh.

Although water be the natural element of geese, yet it is a curious fact that they feed much faster in situations remote from rivers and streams. To fatten geese it is necessary to give them a little corn daily, with the addition of some raw Swedish turnips, carrots, mangel-wurzel leaves, lucerne, tares, cabbage leaves, and lettuces. They should not be allowed to run at large when they are fattening, as they do not acquire flesh nearly so fast when allowed to take much exercise. Therefore, those who can only afford to bring up a goose or two, should confine them in a crib or some such place about the beginning of July, and feed them upon the ingredients above recommended, with a daily supply of clean water for drink. If, on the contrary, from a dozen to twenty are kept, a large pen of from fifteen to twenty feet square must be made, and well covered with straw in the bottom, and a covered house in a corner for protection against the sun and rain when required, because exposure to either of these is not good. It will be observed that about noon, if geese are at liberty, they will seek some shady spot to avoid the influence of the sun; and when confined in small places, they have not sufficient room to flap their wings and dry themselves after being wetted; nor have they room to move about so as to keep themselves warm. There should be three troughs in the pen, one for dry oats, another for vegetables—which ought always to be cut down—and a third for clean water, of which they must always have a plentiful supply. It must be remembered that the riper the cabbages and lettuces which they are supplied with, the better. In the neighbourhood of large towns, the most profitable way of disposing of geese is in a dead state; as nearly the same sum can be obtained for them as if they were alive, and then you have the feathers, which are valuable, and may be sold to much advantage by themselves when you have collected a stone weight or more.

Geese are kept in vast quantities in the fens of Lincolnshire, several persons there having as many as a thousand breeders. They are bred for the sake of their quills and feathers, for which they are stripped while alive, once in the year for their quills, and no less than five times for their feathers. The first plucking commences about Ladyday, for both, and the other four are between that time and Michaelmas. It is said that in general the birds do not suffer very much from the operation, except when cold weather sets in, which then kills great numbers of them. The old geese submit quietly to the operation, but the young ones are very noisy and unruly. The possessors, except in this cruel practice, treat their birds with great kindness, lodging them very often in the same room with themselves.

These geese breed in general only once a-year, but, if well kept, they sometimes hatch twice in a season. The best method for promoting this is to feed them with corn, barley, malt, fresh grains, and, as a stimulant, they should get a mixture of pollard and ale. During their sitting, each bird has a space allotted to it, in rows of wicker pens placed one above another, and the gooseherd who has the care of them drives the whole flock to water thrice a-day, and, bringing them back to their habitation, places every bird (without missing one) in its own nest. One gander is generally put to five geese. The time of incubation varies from twenty-seven to thirty days. The goose begins to lay in March, but the time of the month depends upon the state of the atmosphere. When goslings are first allowed to go at large with their dam, every plant of hemlock which grows within the extent of their range should be pulled up, as they are very apt to eat it, which generally proves fatal to them. Nightshade is also equally pernicious to them, and they have been known to be poisoned by eating sprigs of yew-tree.

TURKEYS.

This is certainly one of the most valuable fowls which have been naturalised in this country, but it very difficult to rear. The turkey-hen lays from fifteen to twenty eggs, and then sits upon them. She will bring out two broods in a year. The eggs are of a pale yellowish-white colour, finely streaked and spotted with reddish-yellow. They are a most delicious food, much more delicate in their flavour than those of the common hen. In England or Scotland, however, the eggs are seldom to be met with for sale, being deemed too valuable to be used as food. In Ireland they are to be got in the markets in great abundance, especially in the midland counties, where we have bought them at ninepence per dozen. In that country, when the turkey-hen has laid about half a dozen eggs, they afterwards take away one daily, by which means the hens are induced to produce a greater number of eggs than otherwise. This they assist by means of stimulating food, such as hemp-seed and buck-wheat. There is an interval of a day between the laying of each egg. It is said that the first two eggs which she lays are unfruitful. A turkey-hen can seldom hatch more than from sixteen to eighteen eggs. The time of incubation varies from twenty-seven to twenty-eight days, at which time the young begin to pierce their shelly prison, and emerge from it. When they first come forth, they are extremely weak, and much assiduous care is necessary to rear them. The first thing to be attended to, is to remove them to a situation where they are not exposed to the sun's rays, which at first are too powerful for them. A woody place is the most suitable to their natural habits. Nothing is so destructive to them as rain, from which they must be protected.

When young turkeys accidentally get wet, they should be brought into a house, carefully dried by applying soft towels to them, and then placed near a fire, and fed upon bread which has been mixed with a small proportion of ground pepper or ginger. It should be made up in the form of small peas. If the bread is too dry for this purpose, it may be moistened with a little sweet milk. Should the turkey-pouts refuse to eat it, a few of these pellets may be forced down their throats. Even heavy dews prove destructive to them, and frost is no less injurious in its effects. These must therefore be most carefully guarded against, when the hens incubate in March or early in April. Dry and sandy situations are most congenial for breeding turkeys, and especially elevated situations where large woods are contiguous. A single male turkey is sufficient for twelve or sixteen females, although the former number is probably the safest, to prevent sterility in the eggs, which is frequently the case with those of turkeys. Eggs should never be entrusted to the care of a female until she is at least two years of age, and they may be kept for the purpose of incubation till they reach their fifth year. The largest and strongest hens should always be kept for this purpose. During the time the hen is sitting, it becomes necessary to place food near her, as otherwise, from her assiduity, she may be starved to death, as turkey-hens seldom move from their nest during the whole time of incubation.

Where farmers rear turkeys in great numbers, they do not indulge the hen by allowing her to sit as soon as she has done laying, but keep them from her until all the other hens have ceased to lay, as it is of consequence that they should all be hatched about one time. When hens are unhappy during this interval, they may be indulged with hens' eggs. When all the females have ceased to lay, each of them is provided with a nest ranged close to the wall, in a barn or other convenient place, and each female is supplied with from sixteen to twenty of her own eggs. The windows and doors are then closed, and only opened once in the twenty-four hours for the admission of air, and for the purpose of feeding the hens. They are taken off their nests, fed and replaced, and again shut up. On the twenty-sixth day, the person who is entrusted with the management of the birds, examines all the eggs, and removes those that are addled; feeds the hens, and does not again disturb them till the pouts have emerged from their shells, and have become perfectly dry, from the heat of the parent bird, as to be subjected to cold at this time would certainly kill them. When the young birds are thoroughly dried, two of the broods are joined together, and the care of them entrusted to a single hen; and those which have been deprived of their offspring are again placed on hens' or ducks' eggs, and subjected a second time to the tedious operation of incubation, in which case it is not unusual for them to bring out thirty eggs. We cannot recommend this practice, in point of humanity; for the poor hens, when they have accomplished their second sitting, are literally reduced to skin and bone, and frequently so weak as hardly to be able to walk.

As before hinted at, great care should be taken of the young turkey-pouts; besides warmth, proper food, and shade, the nearer they are to a pure running stream, the better, as they drink a great deal, and nothing is of greater importance to their being successfully reared as fresh drink. They must be also carefully protected from strong gusts of wind, and on the slightest appearance of a thunder-storm, should be immediately taken into a house. They should get no food for twenty-four hours after they leave the egg. Their first food should be hard-boiled eggs finely chopped and mixed with crumbs of bread. Curds is also an excellent food for them. When they are about a week old, boiled peas and minced scallions are given to them. If eggs are continued, the shells should be minced down with their food, to assist digestion, or some very coarse sand, or minute pebbles. They should be fed thrice a-day; and as they get older, a mixture of lettuce-milk will be found beneficial, together with minced nettles. Barley boiled in milk is another excellent food at this period, and then oats boiled in milk. In short, the constitution of young turkeys requires at all ages every kind of stimulating food. When about three weeks old, their meat should consist of a mixture of minced lettuce, nettles, abelmoschus, curdled milk of burdocks, bran, and dried camomile; but when all these cannot be readily obtained, part of them must be used. Fennel and wild endive, with all plants which are of a tonic character, may be safely given to them. Too much lettuce, however, has been found to be injurious to them; and it is a curious fact, that both cultivated and wild vetches are a poison to young turkeys; the great blue-flowered digitalis, cicuta, and henbane, are also fatal to them; so that, wherever turkeys are kept, these should be carefully rooted out. When pouts are about a month old, they should be turned out, along with the parent bird, into the fields or plantations, where they will find sufficient food for themselves. Grass, worms, all kinds of insects and snails, are their favourite food, and nature dictates to them such vegetables as are conducive to their general health. As their feet are at first very tender, and subject to inflammation from the pricking of nettles and thistles, they ought to be rubbed with spirits, which has the effect of hardening the skin, and fortifying them against these plants.

The glandulous fleshy parts and barbles of their heads begin to develope when they are from six weeks to two months old. This is a critical period with the pouts, and unusual care must be bestowed on them, as they now become weak and often sickly. A little brine mixed with their food will be found very beneficial, or spirits much diluted with water. A paste made of fennel, pepper, hempseed, and parsley, has been found an excellent remedy when afflicted with an inflammation in the wattles, to which they are liable when growing. They are very subject to this if the weather happens to be broken and changeable at the time these tubercles are growing. These parts swell and grow very red, which frequently proves fatal to them. If, therefore, such be the state of the weather at this critical period, the paste above recommended should be given even although they are perfectly healthy, which will be found an excellent preventive. When the inflammation becomes very great, recourse is often had to bleeding in the axillary vein, which frequently recovers them.

Soon after the turkey-pouts have acquired their first feathers, they are liable to a disease which is very fatal to them, if not attended to. This distemper produces great debility, and the birds appear languid and drooping, and almost totally neglect their food. Their tail and wing-feathers assume a whitish appearance, and their plumage has a bristled aspect. This is occasioned by a disease in two or three of the rump-feathers. On examination, the tubes of these will be found filled with blood. The only remedy for this disease is to pluck them out, when the bird will speedily acquire its wonted health and spirits.

In fattening turkeys for the table, various methods are resorted to. Some feed them on barleymeal mixed with skim-milk, and confine them to a coop during this time; others merely confine them to a house; while a third class allow them to run quite at liberty; which latter practice, from the experience of those on whose judgment we can most rely, is by far the best method. Care should, however, be taken to feed them abundantly before they are allowed to range about in the morning, and a meal should also be prepared for them at mid-day, to which they will generally repair homewards of their own accord; they should be fed at night, before roosting, with oatmeal and skim-milk; and a day or two previous to their being killed, they should get oats exclusively. We ourselves have found from experience, that when turkeys are purchased for the table, and cooped up, they will never increase in bulk, however plentifully they may be supplied with food and fresh water, but, on the contrary, are very liable to lose flesh. When feeding them for use, a change of food will also be found beneficial. Boiled carrots and Swedish turnips, or potatoes mixed with a little barley or oat meal, will be greedily taken by them. A cruel method is practised by some to render turkeys very fat, which is termed cramming. This is done by forming a paste of crumbs of bread, flour, minced suet, and sweet milk, or even cream, into small balls the size of a marble, and, after the bird has made a meal in the ordinary way, these are forced down its throat.

DUCKS.

Ducks are a kind of fowl easily kept, particularly near ponds or streams of water. In keeping them in a domestic state, one drake is usually put to five ducks. The ducks begin to lay in February; their time of laying being either at night or early in the morning. They are extremely apt to deposit their eggs in some sequestered spot, and to conceal them with leaves or straw. From eleven to fifteen eggs is the number which a duck can properly cover. The time of incubation is about twenty-eight days. The place where they incubate should be as quiet and retired as possible; and if they have liberty, they will give no trouble whatever in feeding, as the duck, when she feels the call of hunger, covers her eggs carefully up, and seeks food for herself, either by going to the streams or ditches in her neighbourhood, or, if no such are at hand, she will come to the cottage and intimate her wants by her squalling. When the young are hatched, they should be left to the care of the duck, who will lead them forth in due time; and when she does so, prepare a coop for them, which should be placed on short grass, if the weather is mild; and if cold or stormy, they should be kept under cover. The future strength of the brood will depend much upon the care that is taken of them for the first three or four weeks after they have emerged from the shell. Ducklings will begin to wash themselves the first day after they are hatched, if they find water at hand. Therefore, a flat dish filled with that element should be always within their reach. Many persons are in the practice of clipping the tail, and the down from beneath it, in ducklings, if the weather is wet during the first weeks of their existence. This is to prevent them from draggling themselves, which has a tendency to produce intestinal diseases. From a fortnight to three weeks is all that is necessary to confine them to the coop.

The first thing on which ducklings are fed is a mixture of barley, peas, or oat meal, and water. They may afterwards be fed upon a mixture of buck-wheat and any of the above-named meals. The greatest attention must be paid to keeping their bed warm and dry, and with young ducks a frequent change of straw is absolutely necessary, as their beds soon get dirty and wet. It is a common practice to set ducks' eggs under a hen; but where water is at hand, and the ducklings are permitted to enjoy this element, so natural to them, the practice of giving them an adopted mother is not to be recommended.

In feeding ducks for use, peas and oat meal are to be preferred. It is said that barleymeal renders their flesh soft and insipid. Bruised oats should be given to them freely for some weeks before they are killed, which renders their flesh solid and well tasted; and the same general principles recommended in the feeding of geese should be kept in view. It has been found that the offals of butchers' shops feed ducks quickly, and that this does not impair the flavour of their flesh.

Those who have paid much attention to the management of domestic poultry assert that geese and ducks should be kept apart from other fowls. The former should have their houses ranged along the banks of a piece of water with a fence, and sufficiently extensive for walks in front, with doors for their access to the water, which can be closed at pleasure; for, as we have already observed, too much exercise on water is not conducive to their feeding quickly.

PIGEONS.

Pigeons are also very easily kept about a cottage, and occupy a space in the roof which is fit for no other purpose. They require little or no care; and as for food, they will generally seek that for themselves, although it will be necessary occasionally to give them a little. Care must be taken that the dovecot is not approachable by cats or vermin. When they are first begun to be kept, a pair or two ought to be got which have not flown, otherwise it is ten to one but they will leave their new domicile. They should be kept shut up in the place appropriated for keeping them, and well fed during this time. Of the domestic pigeon there are not fewer than twenty varieties, such as carriers, croppers, powters, fantails, tumblers, &c. Their principal food is grain; they drink much, and not at intervals like other birds, but by a continued draught like quadrupeds. The house-dove or common pigeon, as is well known, breeds every month. During breeding time, they associate in pairs, and pay court to each other with their bills; the female lays two eggs, and the young ones that are produced are for the most part a male and a female. When the eggs are laid, the female, in the space of fifteen days, not including the three days during which she is employed in laying, continues to hatch, relieved at intervals by the male. From three or four o'clock in the evening till nine the next day, the female continues to sit; she is then relieved by the male, who takes his place from ten till three, while his mate is feeding abroad. In this manner they sit alternately till the young come out. The cottager who keeps a few pigeons and rabbits can never be at a loss for a little palatable and nourishing food, and that consisting of two kinds.

BREWING ALE AND BEER.

Many cottagers have no accommodation or possess no means to brew their own beer; but others have both, and to these the following practical observations will be found useful:—One of the first and most essential things to be attended to in brewing is a proper knowledge of the quality of malt to be used for that purpose. When malt is good, it is full of flour, or, more properly speaking, that substance from which flour is made. If the skin of the grains is thin, and yields easily and freely when bitten asunder, it is a sure proof of the malt being of a good quality; but, on the other hand, if the skin is thick, hard, and brittle, it is sure to be bad. Besides the smaller quantity of nutritious matter in this last kind, it will be found not to malt so well as grain of a good quality; that is, it will be longer of shooting out the roots and exhibiting signs of vegetation, and even some of the roots will not appear at all; so that all that does not shoot is lost, as it remains simply barley; and thus that portion of it has not benefited the beer in any degree. When malt is not home-made, but purchased from a maltster, it is sometimes found to be adulterated with barley. To detect this, take a cupful of the unground malt, and put it into a basin of cold water; mix it with the water so that all the grains have been fairly wet; all that are malted will swim, and the barley which has been added, or that which is but imperfectly malted, will sink to the bottom.

The specific gravity or weight of barley is much greater than that of malt, and the better the quality of the barley, the heavier it is; consequently the heavier the malt is, when opposed to light malt, the better it is also, as not only producing stronger but better beer. Some persons are in the practice of mixing barley with the malt in making beer, but experience has most satisfactorily proved that the beer is neither so good nor so strong, neither is it so wholesome; so that the best, though dearest at first, is cheaper in the end.

Hops.—There is also considerable variety in the quality of hops, which can only be detected by experience. So different indeed are they, that they vary in price from one to five shillings a pound. The use of hops in making beer is to preserve it. The coarser kind, at one shilling per pound, may have as much of the bitter principle as the finer qualities, and, consequently, is as effectual a preservative; but then they will be coarse, and harsh in the flavour, imparting a disagreeable taste to the beer. Hops are the seed-pods or husks of a species of vine called the hop-vine. These are subject to great variety, depending on soil, cultivation, and other circumstances. Good hops have a pleasant and fresh smell, and will keep for any length of time. Indeed, they have been known to be perfectly fresh after the lapse of twenty years. The quantity of hops used in beer will depend upon their quality and the length of time which the beer is intended to be kept—if they are good, a pound to the bushel of malt, providing the beer is made in the cool season of the year, and not to be too long kept; but if the weather is warm, and the beer wished to be preserved for a length of time, then it will be necessary to use one pound two ounces to a pound and a quarter of hops.

Water.—The more pure the water used for brewing, the better, and hard water is at all times to be avoided, as, from the great quantity of mineral salts and other substances which it contains, the beer which is made from it is generally flat and ill tasted. The best water is rain water, and next is that from a pure spring, and, last of all, river water.

Utensils.—The size of the utensils will of course depend upon the quantity required. We shall suppose that a family will brew at one time eighteen gallons of ale and thirty-six of small beer. It will be easy, from the dimensions which we point out for these quantities, to calculate what sizes of utensils will be requisite for larger or smaller quantities. 1. A copper boiler capable of containing forty-two gallons. 2. A mashing-tub of such dimensions as will contain sixty gallons, to be broader at top than bottom, its depth and width being nearly equal. In the centre of the bottom there is a hole for draining off the wort. Into this perforation is fitted a stick tapered at the point for the space of six inches, so as to answer the purpose of a cock for stopping the hole above mentioned. This stick must be a foot or eighteen inches longer than the depth of the mashing-tub. 3. An underbuck or shallow tub, which is placed under the mash-tub for the purpose of catching the wort which runs from the grains. 4. A tun-tub capable of containing thirty gallons. 5. Two coolers. These are shallow tubs about a foot or fourteen inches deep. Some use from three to four, so as to cool the liquor more quickly. A simple substitute for these are the heads of wine-butts or pipes.

Process to be pursued.—The copper boiler must be filled with water, and brought to the boiling point. An adequate quantity of water is added to the malt in the mashing-tub, so as to let it be freely stirred and separated; the water must be heated to one hundred and seventy degrees by the thermometer; but when the cottager has not this instrument in his possession, let the malt be added as soon as, by looking into the tub, the face can be distinctly seen as in a mirror. Let it be well stirred with a broomstick for a quarter of an hour; fill the copper, and bring it to the boiling point; about forty gallons of water must be added, as the grains will absorb about ten gallons. The mashing-tub should be covered over with sacks, and allowed to stand for two hours; the wort is then drawn off; in this operation the tub should be raised on two stools, so that the underbuck may be placed beneath it for the reception of the wort, which ought to be run off very slowly, to prevent the sediment from following. It is then removed to the tun-tub. Empty the copper, and put the wort into it, with a pound and a half of hops, which ought to be previously well rubbed and separated. Bring it to the boiling point, and allow it to boil briskly, with the lid off, for an hour at least. The liquor is now taken off the fire, and put through a strainer to keep back the hops; wickerwork baskets will answer this purpose. The liquor must be put into various coolers, and distributed into such quantities that they will all be cool about one time. The liquor which has been set to cool is now brought to the heat of seventy degrees, when it is put into the tun-tub, and half a pint of yeast added to it. A gallon of the liquor should first be taken out, and the yeast well mixed with it, together with a handful of wheat or rye flour, and poured into the tun-tub. The whole liquor is then agitated till completely mixed. The tun-tub should be in a situation where it will neither become too warm nor too cold, but of the temperature of fifty-five degrees. Should the working of the beer be in cold weather, the tub ought to be covered with sacks, to prevent the air from destroying the fermentation. To work effectually, it will require to stand forty-eight or fifty hours; but this will depend upon the state of the air. The first yeast which rises on the top must be removed in twenty-four hours, and the second quantity in twelve hours more, and continue this at intervals until it has done working, and no more yeast rises to the top. It is now ready for casking, but must first be perfectly cold, otherwise the liquor will be spoiled. From one to two bushels of malt may be used in making the above quantity, and this will depend on the strength which it is wished to be. From the sediment and grains of the ale which have been left, small beer can be made. Take the hops which were used before, with an additional pound of fresh hops, and these must be placed in the boiler, with thirty-six to forty gallons of water. When it has boiled an hour, it must be taken off, and proceeded with in the same manner as the ale; and to it must be added a pint and a half of yeast. When put into the cask, however, it must not be quite cold, as it requires to work in the barrel, and not in the tub, as in the case of ale. It should be bottled when a fortnight old, as it will be too weak to keep without souring, unless drunk quickly.

COTTAGE GARDENS.

The cottage which has not a garden attached is destitute of not only a great conveniency, but without one of its greatest ornaments. Every cottager ought to possess a garden, however small. Its cultivation occupies many hours which would otherwise be spent in frivolous pursuits. The labourer who occupies a tolerably good-sized garden, and takes a pride and pleasure in its improvement, is seldom found in ale-houses, or among disorderly company of any sort. His happiness is centered in his home, and he sets a good example for his children to follow, in his industrious domesticated habits. The principal object in keeping a cottage garden should be to produce vegetables for the kitchen, which can be accomplished at extremely little expense or trouble; and besides having nearly always some kind of fresh pot-herbs, there will generally be a quantity of refuse, which may be given to a cow or pig. Profit may also sometimes be derived from fruit, and in favourable situations bees may be kept with advantage. A cottage garden ought to be managed on a simple plan, while at the same time some variety of productions is desirable. Much must depend on the occupant being supplied with good seeds; for five shillings per annum, laid out in the purchase of seeds, properly selected, and sown in due season, would render his garden doubly valuable. The fittest articles for cultivation in a cottage garden are summer cabbage, winter kail or savoys, potatoes, carrots, peas, beans, leeks, and onions. French beans are recommended as being very productive and profitable. Useful herbs, such as balm, mint, camomile, and rhubarb, should not be neglected. We need hardly say how useful are a few gooseberry bushes. Strawberries require a great deal of care. The produce of the garden must greatly depend on the care taken of it, and the careful collection of every thing that can be converted into manure. To the mine of dung of the pigsty, if there be one, add the leaves of the vegetables, the soot and ashes from the chimney and fire, and every other article which will make manure; and this kind of compost will form an excellent enricher of the soil of the garden, or small potato patch. Cottagers are often so ignorant as to allow the fluid which runs from their cowhouse and piggery to go to utter waste in stagnant puddles. This fluid is the best of all manures; it abounds in those gases from which vegetation derives its chief subsistence, and ought to be carefully managed and directed to the irrigation of gardens and fields. In some parts of England, the gardens of labourers, and the entrance to their cottages, are adorned by flowering creepers, shrubs, and plants, which, though not attended with any profit, yet indicate a greater attention to neatness, and an enjoyment of more comfort, than the occupiers of the miserable unadorned huts in other countries can possess. The sight of such *superfluities* is a gratifying voucher that *necessaries* are not wanting.

The following are the seasons usually appropriated to the sowing and planting of vegetables in the cottage or kitchen garden:—In January, delve up the soil to meliorate with the weather. About the middle of February, sow the principal crops of early peas, beans, and radishes, and make plantations of strawberry, gooseberry, and currant plants; continue also to delve and clear the garden of winter refuse. In March and April, sow yellow turnips, the larger sorts of peas to succeed those sown last month; also full crops of onions, leeks, and carrots; and plant early cabbages, greens, &c. In May, sow cabbages and cauliflowers for a late crop; also all kinds of flower seeds. In June, clear the garden, water those plants requiring such attention; sow red beet for pickling, transplant leeks, &c., and stake the peas and beans. In July, sow spinach, turnips, small salading, lettuce. In August, sow onions, cabbage, lettuces; also cauliflower to stand the winter. September is a good month for transplanting all kinds of greens. In October and the three following months, dig and trench all vacant ground. This rough outline will suggest the course of general culture in the garden; and we may add, that as the weather and climate change, so must much be left to the good sense of the cottager in arranging the periods of sowing, planting, and trenching his garden. It is of the utmost consequence to have the fences of gardens secure and complete, and this matter alone ought at all times to meet with due attention.

HINTS ABOUT BEES.

It is not every cottage garden that lies so commodiously to the sun, or is in so secluded a situation, as to render it available for bees; but where such is the case, and where the labourer has a little leisure, it is extremely advantageous in many instances to keep one or two hives. Often has the poor but industrious cottager been relieved from embarrassed circumstances by the toil of a swarm of bees. Nature having supplied this useful insect with food, it puts its owner to little or no expense for that article. That which it chiefly requires is a comfortable and quiet abode. There have been many improvements of late in bee-hives, or *skeps*, as they are called in the north; but the good old-fashioned rustic straw hive is still reckoned among the best. It should be situated in a nice sunny sheltered spot at the end of the garden, and will be all the better for having flowers and shrubs in its immediate vicinity, on which the bees may at times settle. It ought to be placed upon a roundish board, supported on three or more feet which cannot be climbed up by vermin. The best time for establishing a hive is just before the taking-up season, which is generally about the end of August. In examining a hive for purchase, turn it gently up some cool evening, and observe if the combs are crowded with bees, and the combs worked down to the floor. If white or of a light yellow colour, it denotes their being of the present year's produce, and fit for the purpose; but if they are of a deep yellow or brown, they are of the last season, and not so proper. If the cottager has to protect his hive from wet, he may place a coping of straw upon it; but this thatch ought to be removed as soon as it begins to rot, for insects will lodge in it, and the effects of its rank smell will endanger the health of the bees. There is as great danger of hives proving too hot in summer as cold in winter, and both must if possible be prevented by proper shades and protectives.

The most difficult part in the economy of these insects is the management of them during swarming. Their swarming consists in a portion of the bees in the hive flying off to seek new quarters in consequence of the growing want of room in the hive for the young bees. When the swarm flies off, it will light on a bush or any likely place for clustering, in which case, if the cottager be clever, he may secure this new colony by holding over them an empty hive. The bees may be shaken from the bush into a linen cloth, and the skep then held above them. All swarms, if the weather be fair, will begin to work almost as soon as hived. Swarms at the latter end of May or beginning of June are said to prosper better than those which remove earlier. Hitherto, in order to get at the combs of honey, it has been a general practice to fumigate hives with brimstone. But this cruel mode, which kills the bees, may be avoided by following a new plan, which has been found available, and consists in stupifying the bees with the fumes of a narcotic. After subjecting them to this process, they recover, and again take up their quarters in the hive, provided honey be left for their subsistence during the winter. This narcotic is the *Fungus maximus*, or large mushroom. After being gathered, it is squeezed in a piece of paper, and baked in an oven till it be dry. A piece of this being cut off, is fixed on the end of a wire or stick, and set fire to under a hive. On the fumes rising, they stupify the bees, which drop into the vessel held beneath, and remain dormant till their hive is robbed. The smoke must be prevented from escaping by the aid of a cloth. This narcotic may be purchased in London, at Butler's Herbalist, Covent Garden. Cottagers entirely ignorant of the habits of bees ought to procure a manual for their direction. Among other books of this kind, we recommend a recent publication, entitled "The Management of Bees, by Samuel Bagster, junior."

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ARCHITECTURE.

HISTORY OF ARCHITECTURE.

ARCHITECTURE appears to have been among the earliest inventions, and its works have been commonly regulated by some principle of hereditary imitation. Whatever rude structure the climate and materials of any country have obliged its early inhabitants to adopt for their temporary shelter, the same structure, with all its prominent features, has been afterwards kept up by their refined and opulent posterity. Thus, the Egyptian style of building has its origin in the cavern and mound; the Chinese architecture is moulded from the tent; the Grecian is derived from the wooden cabin; and the Gothic from the bower of trees. The first habitations of men were such as nature afforded, with but little labour on the part of the occupant, and sufficient to supply his simple wants—huts, grottoes, and tents. But as soon as men rose above the state of nature, and became acquainted with some of the arts, they began to build more durable and more commodious habitations. After they had learned to build houses, they commenced the erection of temples to their gods, and these they made still more splendid than private dwellings. Thus, architecture became a fine art, which was first displayed on the temples, afterwards on the habitations of princes, and public buildings, and at last became an universal want in society.

Traces of these eras of advancement in the art of erecting buildings, are found in various quarters of the globe, especially in eastern countries, where the remains of edifices are discovered, of which fable and poetry can alone give any account. The most remarkable of these vestiges of a primitive architecture, are certain pieces of masonry in the island of Sicily, as well as in some other places, called the works of the Cyclops, an ancient and fabulous race of giants, mentioned by Homer in his Odyssey. The walls they erected were composed of huge stones, laid in this manner:—

According to Vitruvius, a celebrated Roman writer of the first century, mankind at first erected forked stakes for walls, and disposed twigs between the interstices, covering the whole with loam; others, he says, piled up dry clods of clay, binding them together with wood; and to avoid rain and heat, they made a covering with reeds and boughs; but finding that this roof could not resist the winter rains, they made it sloping and pointed at the top, plastering it over with clay, and by that means discharged the rain water. That this was the original mode of erecting dwellings, may be concluded from observing that to this day some nations construct their habitations of the same kind of materials. The erection of houses chiefly of timber, and thatching the same with straw, is still a common practice in the country parts of England and Normandy; and we need not travel beyond Ireland and the rude parts of Scotland to see dwelling-houses or huts formed principally of mud and turf. Not a few instances could be produced, however, wherein these humble and frail "clay biggings" have been the birthplaces of men of as great genius as ever first drew breath in the dwellings of princes.

The originally rude style of house architecture was first improved in Italy, from whence a superior taste spread over Europe; yet even till a comparatively recent era, the chief towns of England and Scotland were erected in an exceedingly mean style. We find that in the twelfth century the style of domestic building which obtained in the better order of Scottish burghs was just one advance beyond the primitive cottages which gave shelter to the peasantry. From a specimen in the town of Perth, which was only destroyed in the last age, and which is known to have been erected in the thirteenth century, it would appear that a good house, such as might be occupied by one of the better order of merchants, consisted of one strongly built ground-flat, with a more flimsy superstructure of wood, having an open gallery or balcony in front. Specimens of such buildings exist to this day in the meaner parts of Edinburgh, with apparently little alteration from their original condition, except what consists in the substitution of slate for thatch. The following is a sketch of one of the most ancient of these structures, situated between houses of modern erection.

The repeated occurrence of fires, and the progress of a better taste, as well as the great diffusion of wealth by means of trade, have at length concurred to establish all over Britain a prodigiously improved system of city architecture, whether of brick or stone; and in the present day we find the dwellings of persons not only in the higher, but the inferior ranks, inhabiting mansions, which, in architectural decoration, emulate the most splendid temples and palaces of ancient times. When we consider what these magnificent edifices were more than a thousand years ago, it seems marvellous how such a length of time should elapse before a good style of architecture was applied to domestic erections; but a satisfactory reason is given for this in the circumstance of the exceedingly slow advancement of a middle class in society, and the ages of superstition and barbarous warfare, which for many hundreds of years interrupted the cultivation of the human intellect, and, consequently, the establishment of comfortable usages. Architecture has been so little considered as a science affecting domestic structures, that its history refers almost exclusively to the erection of temples; and as it is mainly from this species of buildings that all modern architectural decoration has sprung, it will be necessary to go back with our account to the times when these temples were erected.

The most ancient nations known to us, among whom architecture had made some progress, were the Babylonians, whose most celebrated buildings were the temple of Belus, the palace and the hanging gardens of Semiramis; the Assyrians, whose capital, Nineveh, was rich in splendid buildings; the Phœnicians, whose cities, Sidon, Tyre, Aradus, and Sarepta, were adorned with equal magnificence; the Israelites, whose temple was considered as a wonder of architecture; the Syrians and the Philistines. No architectural monument of these nations has, however, been transmitted to us; but we find subterraneous temples of the Hindus, hewn out of the solid rock, upon the islands Elephanta and Salsetta. Of the Persian architecture, the ruins of Persepolis still remain; of the Egyptian obelisks, pyramids, temples, palaces, sepulchres; of the Etruscan, some sepulchres and portions of city-walls. The character of this elder architecture was immoveable firmness, gigantic height, prodigal splendour, which excited admiration and astonishment, but comparatively little pleasure. The Greeks were the first who passed from the rough and gigantic to a noble simplicity and dignity. The Doric order of columns characterises this first period. The greatest masters, Phidias, Ictinus, Callicrates, and others, encouraged and supported by Pericles, emulated each other, as soon as peace at home and abroad was restored. The beautiful temple of Minerva was erected upon the Acropolis of Athens, also the Propylæum, the Odeum, and other splendid buildings. An equal taste for the arts arose in the Peloponnesus and in Asia Minor. A high degree of simplicity was united with majestic grandeur and elegance of form. The beauties of architecture were displayed not only in temples, but also in theatres, odeums, colonnades, market-places, and gymnasia. The Ionic and Corinthian columns were added to the Doric. At the end of the Peloponnesian war, the perfection of architecture was gone. A noble simplicity had given place to excess of ornament. This was the character of the art at the time of Alexander, who founded a number of new cities. But a strict regularity hitherto prevailed in the midst of this overcharged decoration. After the death of Alexander, 323 B. C., the increasing love of gaudy splendour hastened the decline of the art more and more. In Greece, it was afterwards but little cultivated, and, in the edifices of the Seleucidæ in Asia, and of the Ptolemies in Egypt, an impure taste prevailed. The Romans had no temples, or similar public edifices, equal to the Grecian masterpieces, although they had early applied their industry to other objects of architecture, viz., to aqueducts and sewers. The capitol and the temple of the capitoline Jupiter were erected by Etruscan architects. But soon after the second Punic war, 200 B. C., they became acquainted with the Greeks.

Sylla was the first who introduced the Grecian architecture to Rome; and he, as also Marius and Cæsar, erected large temples in this and in other cities. But under Augustus the art first rose to the perfection of which it was capable at that time. He encouraged the Greek artists, who had exchanged their country for Rome, and erected, partly from policy, many splendid works of architecture. Agrippa built temples (the Pantheon), aqueducts, and theatres. Private habitations were adorned with columns and marble. Splendid villas were built, of which the rich Romans often possessed several. The interior was adorned with works of art obtained from Greece. The walls were covered with thin marble plates, or were painted, and divided into panes, in the middle of which were represented mythological or historical subjects. They were also surrounded with the most elegant borders. These borders were what we call grotesques. Almost all the successors of Augustus embellished the city more or less, erected splendid palaces and temples, and adorned, like Adrian, even the conquered countries with them. Constantine the Great transferred the imperial residence from Rome to Constantinople, so that nothing more was done for the embellishment of Rome.

But at the time when the Romans received the art from the Greeks, it had already lost, among the latter, its perfection and purity. In Rome, it rose indeed in a short time to its former height, but soon degenerated, with the continually increasing magnificence of the emperors, into extravagance of ornament. About this time, the Roman or Composite column originated, which was employed in temples and splendid buildings. In the time of Nero, whose golden palace is celebrated, the exterior and interior of the buildings were profusely adorned. Adrian, who encouraged artists as much as possible, was not able to restore a noble and simple taste in architecture. Instead of imitating the beautiful models already existing, the endeavour, in his time, was to invent new styles, and to embellish the beautiful more and more. Now originated the many curved and twisted ornaments, the high pedestal under the columns, the numerous bas-reliefs on the exterior of buildings, the flutings of the columns, the reduction of the same according to a curved line, the coupled columns, the reduced pilasters behind the columns, the small columns between larger ones, the round and cut pediments, and the concave friezes.

Thus the art was practised from the time of Vespasian to the reign of the Antonines. Works were produced in this period which may still be considered as masterpieces, but which want the great and noble style of the Greeks. In the provinces taste became still more corrupt. Architecture declined continually after the Antonines; more ornaments were continually added, which is proved particularly by the Arch of the Goldsmiths, so called in Rome. Alexander Severus, indeed, himself a connoisseur, did something for its improvement; but it rapidly declined under his successors. The buildings of this time are either overcharged with mean and trifling ornaments, as those of Palmyra, erected about 260 A.D., or they border on the rude, like those of Rome, erected under Constantine. Little was done under the following emperors for the embellishment of the cities, on account of the continually disturbed state of the empire. Justinian, however, built much. His principal edifice was the church of St Sophia, at Constantinople. The beautiful works of ancient architecture were almost entirely destroyed by the Goths, Vandals, and other barbarians, in Italy, Spain, Greece, Asia, and Africa; and whatever escaped destruction remained in neglect. Theodoric, king of the Ostrogoths, a friend of the arts, endeavoured to preserve and restore the ancient buildings, and even erected several new ones, the ruins of which are still to be seen in Ravenna and Verona.

We may consider this period as the era of the origin of modern art. We see a new style taking place of the ancient classical architecture, and eventually extending as far as the conquests of the Goths, through Italy, France, Spain, Portugal, a part of Germany, and even to England, whither, however, the Goths did not penetrate. Whether this modern architecture, which is called Gothic, originated from the Germans, is not decided. We find, in the buildings erected under Theodoric, nothing attempted but simplicity, strength, and the display of national taste in their exterior (the interior is unknown to us). But the buildings erected during the Lombard dominion in Italy (from 568), and all the monastic architecture of that time, have been erroneously called Gothic. Since the error was perceived, it has been distinguished by the name of the old Gothic, from the proper Gothic, which is called the modern Gothic.

The Lombards entertained no respect for antiquities, and neither spared nor preserved them. Whatever they built was tasteless and faulty. On the exterior of their churches they placed small semicircular columns, and small pillars in a row along the cornice of the pediments; in the interior, coarse pillars united by semicircular arches; the small windows and doors were finished with semicircles; the columns, capitals, and arches, were often overlaid with incongruous sculpture; the roofs of the naves covered with beams and boards, which were afterwards changed into arches, and on this account often required arched buttresses on the outside. This Lombard style in architecture clearly proves the decline of science and art. It was employed in the seventeenth century in Pavia, the chief city of the Lombard kingdom, in the erection of the churches of St John and St Michael; at Parma, in the church of St John; at Bergamo, in the church of St Julia; in the chapel of Altenötting, in Bavaria; in the castle of Nuremberg; in the Scottish church at Ratisbon, &c.

The architects driven from Constantinople (Byzantium) were the first who combined with it the use of the Ionic pedestals and columns, provided with capitals formed according to their own taste, among which were twisted ones. In this Lombard-Byzantine style were erected the cathedrals of Bamberg, Worms, and Mentz; also the church Miniato al Monte, near Florence, and the most ancient part of the minster of Strasburg. Cupolas were afterwards added, as used in the East; and these, as well as the tasteless capitals, and the many slender pillars and minarets, of which we often see two rows, one on another, indicate the proper Byzantine or Oriental style of architecture. In this style were erected, besides the church of St Sophia in Constantinople and others, the church of St Mark, in Venice, the Baptisterium and the cathedral of Pisa, and the church of St Vitalis, in Ravenna.

The Normans who had settled in Sicily built the cathedral of Messina upon the foundation of an old temple—a huge but tasteless edifice, in which, by means of the changes made in different centuries, we may observe, at the same time, the rise and fall of the art. The Vandals, Alans, Suevi, and Visigoths, had penetrated into Spain and Portugal; the Arabs and Moors expelled them in the eighth century, and destroyed the kingdom of the Goths. The Mussulman conquerors had at that time almost exclusive possession of the arts and sciences. Saracen architects rose in Greece, Italy, Sicily, and other countries; after some time, many Christians, particularly Greeks, joined them, and formed together a fraternity, who kept secret the rules of their art, and whose members recognised one another by particular signs.

At this period, three different styles of architecture prevailed—the Arabian, a peculiar style, formed after Greek models; the Moorish, which originated in Spain out of the remains of Roman edifices; and the modern Gothic, which originated in the kingdom of the Visigoths, in Spain, through the mixture of the Arabian and Moorish architecture, and flourished from the eleventh until the fifteenth century. The two first styles differ but little from each other: the Moorish style is principally distinguished from the Arabian by arches in the form of a horse-shoe. But the Gothic, or old German, is very different. Swinburne mentions the following marks of distinction:—The Gothic arches are pointed; the Arabian circular; the Gothic churches have pointed and straight towers; the mosques terminate in globes, and have here and there minarets, covered with a ball or a cone: the Arabian walls are adorned with Mosaic and stucco, which we find in no ancient church in the Gothic style.

The entrance of a Gothic church is a deep arch, diminishing towards the interior of the building, and adorned on the side walls with statues, columns, niches, and other ornaments; but those of the mosques, and of other Arabian and even Moorish buildings, are shallow, and made in the same manner as doors are at present. Besides, Swinburne observes, that, among the different Arabian capitals which he saw, he found none resembling, in design and arrangement, those which we find in the Gothic churches of England and France.

The Moorish architecture appears in all its splendour in the ancient palace of the Mahommedan monarchs at Granada, which is called the Alhambra, or Red-house, and which resembles more a fairy palace than a work of human hands. The character of the Arabian architecture was lightness and splendour. Rich ornaments and lightness in the single parts render it agreeable to the eye. The modern Gothic architecture, which originated in the attempts of Byzantine artists to cover the coarseness and heaviness of the old Gothic by an appearance of lightness, excites the imagination by its richly adorned arches, its distant perspective, and its religious dimness, produced by its painted windows. It retained, from the old Gothic architecture, the high bold arches, the firm and strong walls; but it disguised them under volutes, flowers, niches, little pierced towers, so that the stairs appear hanging in the air; they gave to the windows an extraordinary height, and adorned the building itself with statues. This style, in which many churches, convents, and abbeys, were erected, was formed in Spain, and thence extended over France, England, and Germany.

The Germans were unacquainted with architecture until the time of Charlemagne. He introduced from Italy to Germany the Byzantine style, then common. Afterwards the Arabian architecture had some influence upon that of the western nations; for the German art shows its characteristics in the pointed arches and the buttresses, &c. This was united with the Byzantine style, to which in general they still adhered, and thus originated a mixed style, which maintained itself until the middle of the thirteenth century. Then began the modern Gothic or German style, which we may also call the romantic, since it was formed by the romantic spirit of the middle ages. Growing up in Germany, it obtained its perfection in the towers of the minster of Strasburg, in the cathedral of Cologne, in the church of St Stephen in Vienna, the cathedral of Erfurt, the church of St Sebaldus in Nuremberg, the church of St Elizabeth in Marburg, &c., and extended itself from thence to France, England, Spain, and Italy. The German architecture shows also the influences of climate and religion, particularly in the churches. The slender columns, always united in groups, rise to a lofty height, resembling the giants of the grove, in whose dark shade the ancient Teuton used to build his altar. In the *chiaro oscuro* of the dome, the soul, divested of earthly thoughts, must collect itself, and rise like the dome to its Maker. The decorations of the ancient Christian churches are by no means an accidental ornament. They speak a figurative religious language; and at the tabernacle, or ciborium, over the altar, where the pyx is kept, the whole temple is presented in miniature to the view of the beholder. In these edifices, every one must admire the accurate proportions, the bold yet regular construction, the unwearied industry, the grandeur of the bold masses on the exterior, and the severe dignity in the interior, which excites feelings of devotion in every spectator. We must therefore ascribe to the German architecture more symbolical than hieroglyphic eloquence and dignity.

The Italians disengaged themselves by little and little from the Byzantine taste. Even in the eleventh century, Byzantine architects built the cathedral of Pisa and the church of St Mark in Venice. But in the twelfth century, a German architect, named William (Guglielmo), and, in the thirteenth, Jacob, with the surname Capo, who died in 1262, and his pupil or son Arnolf, are mentioned as having built churches and convents in Florence. The modern Gothic style passed from the churches and abbeys to the castles, palaces, bridges, and city gates, many of which were built in this manner; for instance, in Milan, sixteen city gates of marble, and several new palaces; in Padua, seven bridges and three new palaces; in Genoa, two docks and a splendid aqueduct; and the town of Asti, in 1280, almost entirely. Architecture was continually improving in Italy, particularly in the fourteenth century. Galeazzo Visconti finished the great bridge at Pavia, and built a palace which had not then its equal. About the same time, the famous cathedral of Milan was erected. The Marquises of Este erected handsome edifices at Ferrara, and Albert the splendid palace at Belsiore. In Bologna, the great church of St Petronius was begun, and in Florence the famous tower of the cathedral. The fifteenth century, in which the study of ancient architecture was revived, was greatly distinguished. The Dukes of Ferrara, Borso, and Ercole of Este, were active patrons of architecture. Duke Francesco embellished Milan with the ducal palace, the castle Porta di Giove, the hospital, and other edifices. Ludovico Sforza erected the buildings of the university at Pavia and the hospital of Milan. The Popes adorned Rome, and Lorenzo de Medici, Florence, with splendid buildings. The artists returned to the monuments of antiquity, and studied their beautiful forms and just proportions.

The most illustrious architects of this time were Filippo Brunelleschi, who built at Florence the dome of the cathedral, the church S. Spirito, and the palace Pitti, besides many edifices at Milan, Pisa, Pesaro, and Mantua; Battista Alberti, who wrote at the same time, on architecture; Michelozzi Bramante, who commenced the building of St Peter's; Michael Angelo Buonarotti, who erected its magnificent dome; and Giocondo, who built much in France, and afterwards directed, with Raphael, the building of the church of St Peter's. These were followed by others, who proceeded in their spirit—Palladio, Scamozzi, Serlio, Barozzio, known by the name of Vignola. They are the founders of the existing taste in architecture. That, however, they studied their art in those works of antiquity which had already deviated from the early purity and elevated grandeur, is evident in their buildings, from the many curved and twisted ornaments, the circular, irregular, and cut pediments, the coupled columns, high pedestals, and other things, which were unknown to architecture at the time of Pericles. Thus a new period in architecture had begun in Italy. Italian masters, and young artists sent to Italy, introduced the Roman taste into foreign countries, which gradually supplanted the Gothic. Since that time, architecture has experienced different destinies in different countries. It has risen and declined at different periods; yet laudable attempts have been made in recent times to advance it to its true perfection, though we cannot affirm that they have succeeded every where.

ELEMENTARY PARTS OF BUILDINGS.

The essential elementary parts of a building are those which contribute to its support, enclosure, and covering. Of these, the most important are the foundation, the column, the wall, the lintel, the arch, the vault, the dome, and the roof. In laying the foundation of any building, it is necessary to dig to a certain depth in the earth, to secure a solid basis, below the reach of frost and common accidents. The most solid basis is rock, or gravel which has not been moved. Next to these are clay and sand, provided no other excavations have been made in the immediate neighbourhood. From this basis a stone wall is carried up to the surface of the ground, and constitutes the foundation. Where it is intended that the superstructure shall press unequally, as at its piers, chimney, or columns, it is sometimes of use to occupy the space between the points of pressure by an inverted arch. This distributes the pressure equally, and prevents the foundation from springing between the different points. In loose or muddy situations, it is always unsafe to build, unless we can reach the solid bottom below. In salt marshes and flats, this is done by depositing timbers, or driving wooden piles into the earth, and raising walls upon them. The preservative quality of the salt will keep these timbers unimpaired for a great length of time, and makes the foundation equally secure with one of brick or stone.

The simplest member in any building, though by no means an essential one to all, is the column or pillar. This is a perpendicular part, commonly of equal breadth and thickness, not intended for the purpose of enclosure, but simply for the support of some part of the superstructure. The principal force which a column has to resist is that of perpendicular pressure. In its shape, the shaft of a column should not be exactly cylindrical, but, since the lower part must support the weight of the superior part, in addition to the weight which presses equally on the whole column, the thickness should gradually decrease from bottom to top. The outline of columns should be a little curved, so as to represent a portion of a very long spheroid, or paraboloid, rather than of a cone. This figure is the joint result of two calculations, independent of beauty of appearance. One of these is, that the form best adapted for stability of base is that of a cone; the other is, that the figure, which would be of equal strength throughout for supporting a superincumbent weight, would be generated by the revolution of two parabolas round the axis of the column, the vertices of the curves being at its extremities.

The swell of the shafts of columns was called the entasis by the ancients. It has been lately found that the columns of the Parthenon at Athens, which have been commonly supposed straight, deviate about an inch from a straight line, and that their greatest swell is at about one-third of their height. Columns in the antique orders are usually made to diminish one-sixth or one-seventh of their diameter, and sometimes even one fourth. The Gothic pillar is commonly of equal thickness throughout.

The wall, another elementary part of a building, may be considered as the lateral continuation of a column, answering the purpose both of enclosure and support. A wall must diminish as it rises, for the same reasons, and in the same proportion as the column. It must diminish still more rapidly if it extends through several stories, supporting weights at different heights. A wall, to possess the greatest strength, must also consist of pieces, the upper and lower surfaces of which are horizontal and regular, not rounded nor oblique. The walls of most of the ancient structures which have stood to the present time, are constructed in this manner, and frequently have their stones bound together with bolts and cramps of iron. The same method is adopted in such modern structures as are intended to possess great strength and durability, and in some cases the stones are even dovetailed together, as in the lighthouses at Eddystone and Bell Rock. But many of our modern stone walls, for the sake of cheapness, have only one face of the stones squared, the inner half of the wall being completed with brick, so that they can in reality be considered only as brick walls faced with stone. Such walls are said to be liable to become convex outwardly, from the difference in the shrinking of the cement. Rubble walls are made of rough irregular stones laid in mortar. The stones should be broken, if possible, so as to produce horizontal surfaces. The coffer walls of the ancient Romans were made by enclosing successive portions of the intended wall in a box, and filling it with stones, sand, and mortar, promiscuously. This kind of structure must have been extremely insecure. The Pantheon, and various other Roman buildings, are surrounded with a double brick wall, having its vacancy filled up with loose bricks and cement. The whole has gradually consolidated into a mass of great firmness. The reticulated walls of the Romans, having bricks with oblique surfaces, would at the present day be thought highly unphilosophical. Indeed, they could not long have stood, had it not been for the great strength of their cement. Modern brick walls are laid with great precision, and depend for firmness more upon their position than upon the strength of their cement. The bricks being laid in horizontal courses, and continually overlaying each other, or breaking joints, the whole mass is strongly interwoven and bound together. Wooden walls, composed of timbers covered with boards, are a common but more perishable kind. They require to be constantly covered with a coating of a foreign substance, as paint or plaster, to preserve them from spontaneous decomposition. In some parts of France and elsewhere, a kind of wall is made of earth, rendered compact by ramming it in moulds or cases. This method is called building in *pisé*, and is much more durable than the nature of the material would lead us to suppose. Walls of all kinds are greatly strengthened by angles and curves, also by projections, such as pilasters, chimneys, and buttresses. These projections serve to increase the breadth of the foundation, and are always to be made use of in large buildings, and in walls of considerable length.

The lintel, or beam, extends in a right line over a vacant space, from one column or wall to another. The strength of the lintel will be greater in proportion as its transverse vertical diameter exceeds the horizontal, the strength being always as the square of the depth. The floor is the lateral continuation or connection of beams by means of a covering of boards.

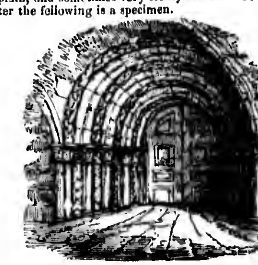
Arches.

The arch is a transverse member of a building, answering the same purpose as the lintel, but vastly exceeding it in strength. The arch, unlike the lintel, may consist of any number of constituent pieces, without impairing its strength. It is, however, necessary that all the pieces should possess a uniform shape—the shape of a portion of a wedge—and that the joints formed by the contact of their surfaces should point towards a common centre. In this case, no one portion of the arch can be displaced or forced inward; and the arch cannot be broken by any force which is not sufficient to crush the materials of which it is made. In arches made of common bricks, the sides of which are parallel, any one of the bricks might be forced inward, were it not for the adhesion of the cement. Any two of the bricks, however, constitute a wedge by the disposition of their mortar, and cannot collectively be forced inward. An arch of the proper form, when complete, is rendered stronger, instead of weaker, by the pressure of a considerable weight, provided this pressure be uniform. While building, however, it requires to be supported by a centring of the shape of its internal surface, until it is complete. The upper stone of an arch is called the keystone, but is not more essential than any other. In regard to the shape of the arch, its most simple form is that of the semicircle. It is, however, very frequently, a smaller arc of a circle, and, still more frequently, a portion of an ellipse.

The simplest theory of an arch supporting itself only, is that of Dr Hooke. The arch, when it has only its own weight to bear, may be considered as the inversion of a chain, suspended at each end. The chain hangs in such a form that the weight of each link or portion is held in equilibrium by the result of two forces acting at its extremities; and these forces, or tensions, are produced, the one by the weight of the portion of the chain below the link, the other by the same weight increased by that of the link itself, both of them acting originally in a vertical direction. Now, supposing the chain inverted, so as to constitute an arch of the same form and weight, the relative situations of the forces will be the same, only they will act in contrary directions, so that they are compounded in a similar manner, and balance each other on the same conditions. The arch thus formed is denominated a catenary arch. In common cases, it differs but little from a circular arch of the extent of about one-third of a whole circle, and rising from the abutments with an obliquity of about thirty degrees from a perpendicular. But though the catenary arch is the best form for supporting its own weight, and also all additional weight which presses in a vertical direction, it is not the best form to resist lateral pressure, or pressure like that of fluids, acting equally in all directions. Thus the arches of bridges and similar structures, when covered with loose stones and earth, are pressed sideways, as well as vertically, in the same manner as if they supported a weight of fluid. In this case it is necessary that the arch should arise more perpendicularly from the abutment, and that its general figure should be that of the longitudinal segment of an ellipse. In small arches, in common buildings, where the disturbing force is not great, it is of little consequence what is the shape of the curve. The outlines may even be perfectly straight, as in the tier of bricks which we frequently see over a window. This is, strictly speaking, a real arch, provided the surfaces of the bricks tend towards a common centre. It is the weakest kind of arch, and a part of it is necessarily superfluous, since no greater portion can act in supporting a weight above it, than can be included between two curved or arched lines.

Besides the arches already mentioned, various others are in use. The acute or lancet arch, much used in Gothic architecture, is described usually from two centres outside the arch. It is a strong arch for supporting vertical pressure. The rampant arch is one in which the two ends spring from unequal heights.

About the eighth century, the Anglo-Saxons in England began to erect churches on plans partly borrowed from the remains of Roman edifices in this country. They in particular introduced the circular or rounded arch; and a few very beautiful examples of this kind of building still remain in different parts of the country. It is called Saxon or Norman, from its having prevailed during the reign of the Saxon and Norman kings in England. It commenced at the establishment of Christianity among the Saxons, in the sixth century, and continued till about the year 1135, in the reign of King Stephen. The entrance to the Temple Church, London; the Abbey Gate, Bristol; and the Church of Romsey in Hampshire, are in this style of architecture. The doors in this style are sometimes quite plain, and sometimes very richly carved. Of the latter the following is a specimen.



Between the reign of Stephen and that of Henry III., the circular arch began to disappear, and before the death of the latter monarch, gave way to the pointed arch. At first the two arches were intermixed, and the style was then called semi or half Norman. Some suppose that the pointed arch was introduced from the Saracens by the Crusaders to the Holy Land, and from this circumstance they call it the Saracenic arch; but the greater number of persons imagine it to have arisen from the accidental intersection of several rounded arches with each other. That this will produce pointed arches of different widths and heights, according to the points of intersection, may easily be shown by placing two hoops or rings across each other, allowing one point of the hoops or rings to rest upon a floor or table. The crossings of the boughs of trees in an avenue also afford a familiar illustration of the same fact. In the Temple Church the two arches may be found united, and other specimens may be seen in the Church of St Cross near Winchester; the ruins of Buildwas Abbey, Shropshire; Fountains Abbey, Rievaulx Abbey, and Roche Abbey, in Yorkshire.

When the circular arch totally disappeared in 1220, the early English style commenced. The windows of this style were at first very narrow in comparison with their height; they were called lancet-shaped, and were considered very elegant; two or three were frequently seen together, connected by dripstones. In a short time, however, the windows became wider, and divisions and ornaments were introduced. Sometimes the same window was divided into several lights, and frequently finished at the top by a light in the form of a lozenge, circle, trefoil, or other ornament. A specimen of this kind may be seen in the beautiful church of St Saviour's, Southwark, which has lately been thrown open to view by the improvements connected with the erection of the New London Bridge, and another and a very beautiful example in the "Lady Chapel," near London Bridge, on the Surrey side of the Thames. With reference to the formation of this arch, it is curious to examine the extreme accuracy with which the masonry is connected at the springing of the arch. It is in this respect much superior to that of a later period. The door of St Mary's, Lincoln, is also in this style, of which we subjoin an example.

About the year 1300, the architecture became more ornamental, and from this circumstance received the name of the decorated English style, which is considered the most beautiful for ecclesiastical buildings. The windows of this style are very easily distinguished; they are large and wide, and are divided into several lights by mullions, which are upright or perpendicular narrow columns, branching out at the top into tracery of various forms, such as trefoils, circles, and other figures. York Cathedral affords a fine specimen of this sort of architecture, and there is a beautiful window of the same style in the south transept of Chichester Cathedral. The west front of that of Exeter is another specimen, and the doorway of Lincoln Cathedral is in the same style.

The transition from the decorated to the florid or perpendicular style was very gradual. Ornament after ornament was added, till simplicity disappeared beneath the extravagant additions; and about the year 1380, the architecture became so overloaded and profuse, that it obtained the title of florid, which by some persons is called the perpendicular, because the lines of division run in upright or perpendicular lines from top to bottom, which is not the case in any other style. King's College Chapel, Cambridge, begun in the reign of Henry VI., though not finished till some time after; Gloucester Cathedral; Henry VII.'s Chapel at Westminster; St George's Chapel at Windsor; Wrexham Church, Denbighshire; and the Chapel on the Bridge at Wakefield, Yorkshire, are all of this character. Many small country churches are built in this style; and their size not admitting of much ornament, they are distinguished from structures of a later date by mouldings running round their arches, and generally by a square head over the obtuse-pointed arch of the door. A peculiar ornament of this style is a flower of four leaves, called from the family reigning at that period the Tudor flower.

In describing arches, the upper surface is denominated the extrados, and the inner surface the intrados. The springing lines are those where the intrados meets the abutments or supporting walls. The span is the distance from one springing line to the other. The wedge-shaped stones which form an arch are sometimes called voussoirs, the uppermost being the keystone. The part of a pier from which an arch springs is called the impost, and the curve formed by the upper side of the voussoirs the archivolt. It is necessary that the walls, abutments, and piers, on which arches are supported, should be so firm as to resist the lateral thrust as well as vertical pressure of the arch. It will at once be seen that the lateral or sideway pressure of an arch is very considerable, when we recollect that every stone or portion of the arch is a wedge, a part of whose force acts to separate the abutments. For want of attention to this circumstance, important mistakes have been committed, the strength of buildings materially impaired, and their ruin accelerated. In some cases, the want of lateral firmness in the walls is compensated by a bar of iron stretched across the span of the arch, and connecting the abutments, like the tie-beam of a roof. This is the case in the cathedral of Milan, and some other Gothic buildings.

Arcades.

In an arcade, or continuation of arches, it is only necessary that the outer supports of the terminal arches should be strong enough to resist horizontal pressure. In the intermediate arches, the lateral force of each arch is counteracted by the opposing lateral force of the one contiguous to it. In bridges, however, where individual arches are liable to be destroyed by accident, it is desirable that each of the piers should possess sufficient horizontal strength to resist the lateral pressure of the adjoining arches. The vault is the lateral continuation of an arch, serving to cover an area or passage, and bearing the same relation to the arch that the wall does to the column. A simple vault is constructed on the principles of the arch, and distributes its pressure equally along the walls or abutments. A complex or groined vault is made by two vaults intersecting each other, in which case the pressure is thrown upon springing points, and is greatly increased at those points. The groined vault is common in Gothic architecture.

Domes.

The dome, sometimes called cupola, is a concave covering to a building, or part of it, and may be either a segment of a sphere, of a spheroid, or of any similar figure. When built of stone, it is a very strong kind of structure, even more so than the arch, since the tendency of each part to fall is counteracted, not only by those above and below it, but also by those on each side. It is only necessary that the constituent pieces should have a common form, and that this form should be somewhat like the frustum of a pyramid, so that, when placed in its situation, its four angles may point towards the centre or axis of the dome. During the erection of a dome, it is not necessary that it should be supported by a centring until complete, as is done in the arch. Each circle of stones when laid is capable of supporting itself without aid from those above it. It follows that the dome may be left open at top without a keystone, and yet be perfectly secure in this respect, being the reverse of the arch. The dome of the Pantheon at Rome has been always open at top, and yet has stood unimpaired for nearly two thousand years. The upper circle of stones, though apparently the weakest, is nevertheless often made to support the additional weight of a lantern or tower above it. In several of the largest cathedrals there are two domes, one within the other, which contribute their joint support to the lantern, which rests upon the top. In these buildings, the dome rests upon a circular wall, which is supported in its turn by arches upon massive pillars or piers. This construction is called building upon pendentives, and gives open space and room for passage beneath the dome. The remarks which have been made in regard to the abutments of the arch apply equally to the walls immediately supporting a dome. They must be of sufficient thickness and solidity to resist the lateral pressure of the dome, which is very great. The walls of the Roman Pantheon are of great depth and solidity. In order that a dome in itself should be perfectly secure, its lower parts must not be too nearly vertical, since in this case they partake of the nature of perpendicular walls, and are acted upon by the spreading force of the parts above them. The dome of St Paul's Church in London, and some others of similar construction, are bound with chains or hoops of iron, to prevent them from spreading at bottom. Domes which are made of wood depend in part for their strength on their internal carpentry. The Halle du Bled, in Paris, had originally a wooden dome more than two hundred feet in diameter, and only one foot in thickness. This has since been replaced by a dome of iron.

Roofs.

The roof is the most common and cheap method of covering buildings, to protect them from rain and other effects of the weather. It is sometimes flat, but more frequently oblique, in its shape. The flat or platform-roof is the least advantageous for shedding rain, and is seldom used in northern countries. The pent roof, consisting of two oblique sides meeting at top, is the most common form. These roofs are made steepest in cold climates, where they are liable to be loaded with snow. Where the four sides of the roof are all oblique, it is denominated a hipped roof, and where there are two portions to the roof of different obliquity, it is a curb or mansard roof. In modern times, roofs are made almost exclusively of wood, though frequently covered with incombustible materials. The internal structure or carpentry of roofs is a subject of considerable mechanical contrivance. The roof is supported by rafters, which abut on the walls on each side, like the extremities of an arch. If no other timbers existed except the rafters, they would exert a strong lateral pressure on the walls, tending to separate and overthrow them. To counteract this lateral force, a tie-beam, as it is called, extends across, receiving the ends of the rafters, and protecting the wall from their horizontal thrust. To prevent the tie-beam from sagging, or bending downward with its own weight, a king-post is erected from this beam to the upper angle of the rafters, serving to connect the whole, and to suspend the weight of the beam. This is called trussing. Queen-posts are sometimes added, parallel to the king-post, in large roofs; also various other connecting timbers. In Gothic buildings, where the vaults do not admit of the use of a tie-beam, the rafters are prevented from spreading, as in an arch, by the strength of the buttresses. In comparing the lateral pressure of a high roof with that of a low one, the length of the tie-beam being the same, it will be seen that a high roof, from its containing most materials, may produce the greatest pressure, as far as weight is concerned. On the other hand, if the weight of both be equal, then the low roof will exert the greater pressure; and this will increase in proportion to the distance of the point at which perpendiculars drawn from the end of each rafter would meet. In roofs, as well as in wooden domes and bridges, the materials are subjected to an internal strain, to resist which, the cohesive strength of the material is relied on. On this account beams should, when possible, be of one piece. Where this cannot be effected, two or more beams are connected together by splicing. Spliced beams are never so strong as whole ones, yet they may be made to approach the same strength by affixing lateral pieces, or by making the ends overlay each other, and connecting them with bolts and straps of iron. The tendency to separate is also resisted, by letting the two pieces into each other, by the process called scarfing. Mortises intended to truss or suspend one piece by another, should be formed upon similar principles.

STYLES OF BUILDING.

The architecture of different countries has been generally characterised by peculiarities in external form, and in modes of construction. These peculiarities among ancient nations were so distinct, that their structures may be identified even in the state of ruins, and the origin and era of each may be conjectured with tolerable accuracy. Before we proceed to describe architectural objects, it is necessary to explain certain terms which are used to denote their different constituent portions. The architectural orders will be spoken of under the head of the Grecian and Roman styles, but their component parts ought previously to be understood.

The front or façade of a building, made after the ancient models, or any portion of it, may present three parts, occupying different heights:—The pedestal is the lower part, usually supporting a column; the single pedestal is wanting in most antique structures, and its place supplied by a stylobate; the stylobate is either a platform with steps, or a continuous pedestal, supporting a row of columns. The lower part of a finished pedestal is called the plinth; the middle part is the die, and the upper part the cornice of the pedestal, or surbase. The column is the middle part, situated upon the pedestal or stylobate. It is commonly detached from the wall, but is sometimes buried in it for half its diameter, and is then said to be engaged. Pilasters are square or flat columns attached to walls. The lower part of a column, when distinct, is called the base; the middle, or longest part, is the shaft; and the upper, or ornamented part, is the capital. The height of columns is measured in diameters of the column itself, taken always at the base. The entablature is the horizontal continuous portion which rests upon the top of a row of columns. The lower part of the entablature is called the architrave, or epistylium. The middle part is the frieze, which, from its usually containing sculpture, was called zophorus by the ancients. The upper or projecting part is the cornice. A pediment is the triangular face produced by the extremity of a roof. The middle or flat portion enclosed by the cornice of the pediment is called the tympanum. Pedestals for statues, erected on the summit and extremities of a pediment are called acroteria. An attic is an upper part of a building, terminated at top by a horizontal line instead of a pediment. The different mouldings in architecture are described from their sections, or from the profile which they present when cut across. Of these, the torus is a convex moulding, the section of which is a semicircle, or nearly so; the astragal is like the torus, but smaller; the ovolo is convex, but its outline is only the quarter of a circle; the echinus resembles the ovolo, but its outline is spiral, not circular; the scotia is a deep concave moulding; the cavetto is also a concave, and occupying but a quarter of a circle; the cymatium is an undulated moulding, of which the upper part is concave and the lower convex; the ogee or talon is an inverted cymatium; the fillet is a small square or flat moulding. In architectural measurement, a diameter means the width of a column at the base. A module is half a diameter. A minute is a sixtieth part of a diameter. In representing edifices by drawings, architects make use of the plan, elevation, section, and perspective. The plan is a map or design of a horizontal surface, showing the ichnographic projection, or groundwork, with the relative position of walls, columns, doors, &c. The elevation is the orthographic projection of a front, or vertical surface; this being represented, not as it is actually seen in perspective, but as it would appear if seen from an infinite distance. The section shows the interior of a building, supposing the part in front of an intersecting plane to be removed. The perspective shows the building as it actually appears to the eye, subject to the laws of scenographic perspective. The three former are used by architects for purposes of admeasurement; the latter is used also by painters, and is capable of bringing more than one side into the same view, as the eye actually perceives them. As the most approved features in modern architecture are derived from buildings which are more or less ancient, and as many of these buildings are now in too dilapidated a state to be easily copied, recourse is had to such imitative restorations, in drawings and models, as can be made out from the fragments and ruins which remain. In consequence of the known simplicity and regularity of most antique edifices, the task of restoration is less difficult than might be supposed. The groundwork, which is commonly extant, shows the length and breadth of the building, with the position of its walls, doors, and columns. A single column, whether standing or fallen, and a fragment of the entablature, furnish data from which the remainder of the colonnade, and the height of the main body, can be made out. A single stone from the cornice of the pediment is often sufficient to give the angle of inclination, and, consequently, the height of the roof. In this way, beautiful restorations are obtained of structures, when in so ruinous a state as scarcely to have left one stone upon another. We come now to the different styles of architecture.

Egyptian style.—In ancient Egypt, a style of building prevailed, more massive and substantial than any which has succeeded it. The elementary features of Egyptian architecture were chiefly as follow:—1. Their walls were of great thickness, and sloping on the outside. This feature is supposed to have been derived from the mud walls, mounds, and caverns of their ancestors. 2. The roofs and covered ways were flat, or without pediments, and composed of blocks of stone, reaching from one wall or column to another. The principle of the arch, although known to them, was seldom if ever employed by them. 3. Their columns were numerous, close, short, and very large, being sometimes ten or twelve feet in diameter. They were generally without bases, and had a great variety of capitals, from a simple square block, ornamented with hieroglyphics or faces, to an elaborate composition of palm-leaves, not unlike the Corinthian capital. 4. They used a sort of concave entablature, or cornice, composed of vertical flutings, or leaves, and a winged globe in the centre. 5. Pyramids, well known for their prodigious size, and obelisks, composed of a single stone, often exceeding seventy feet in height, are structures peculiarly Egyptian. 6. Statues of enormous size, sphinxes carved in stone, and sculptures in outline of fabulous deities and animals, with innumerable hieroglyphics, are the decorative objects which belong to this style of architecture. The architecture of the ancient Hindoos appears to have been derived from the same original ideas as the Egyptian. The most remarkable relics of this people are their subterraneous temples, of vast size and elaborate workmanship, carved out of the solid rock, at Elephanta, Ellora, and Salsette.

The Chinese style.—The ancient Tartars and wandering shepherds of Asia appear to have lived from time immemorial in tents, a kind of habitation adapted to their erratic life. The Chinese have made the tent the elementary feature of their architecture; and of their style any one may form an idea, by inspecting the figures which are depicted upon common China ware. Chinese roofs are concave on the upper side, as if made of canvass, instead of wood. A Chinese portico is not unlike the awnings spread over shop windows in summer time. The verandah, sometimes copied in dwelling-houses, is a structure of this sort. The Chinese towers and pagodas have concave roofs, like awnings, projecting over their several stories. The lightness of the style used by the Chinese leads them to build with wood, sometimes with brick, and seldom with stone.

The Grecian style.—Grecian architecture, from which have been derived the most splendid structures of later ages, had its origin in the wooden hut or cabin, formed of posts set in the earth, and covered with transverse poles and rafters. Its beginnings were very simple, being little more than imitations in stone of the original posts and beams. By degrees, these were modified and decorated, so as to give rise to the distinction of what are now called the orders of architecture.

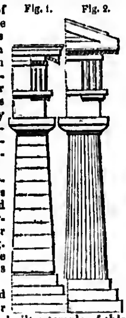
By the architectural orders are understood certain modes of proportioning and decorating the column and its entablature. They were in use during the best days of Greece and Rome, for a period of six or seven centuries. They were lost sight of in the dark ages, and again revived by the Italians, at the time of the restoration of letters. The Greeks had three orders, called the Doric, Ionic, and Corinthian. These were adopted and modified by the Romans, who also added two others, called the Tuscan and Composite.

The *Tuscan order*, as an antique, exists only in the works of Vitruvius, the description in which, being very obscure, has left a wide field for the ingenuity of modern architects. Among these, Palladio composed two profiles; one from the description of the ancient master, and the other, according to his own idea of a simplification of the Doric. That of Vignola, however, has been most generally approved and adopted.

The base of this order consists of a simple torus, with its fillet; it is, as are in general all the Roman orders, accompanied by a plinth. The proportions, from Sir W. Chambers, are as follow: The column, fourteen modules; the entablature, three modules fifteen minutes. Of the former, the base occupies one module; the shaft (including the astragal, which divides it from the capital), twelve modules, and the capital one. Of the latter, the architrave (including the fillet), thirty-one minutes and a half; the frieze, the same; and the cornice, forty-two minutes.

The intercolumniations, in all the orders except the Doric, are the same; viz. the eustyle, which is most common and beautiful, four modules twenty minutes; the diastyle, six modules; and the aræostyle, seven modules.

Fig. 1. Fig. 2.



The Tuscan order admits of no ornaments, nor flutes in the columns; but rustic cinctures are sometimes represented on the shaft, an example of which occurs in the accompanying illustration, fig. 1. This order may be employed in most cases where strength and simplicity are required, rather than magnificence; such as prisons, market-places, arsenals, and the inferior parts of large buildings.

We now come to the *Doric order*, of which numerous ancient examples exist, and which will in consequence furnish us with more materials for description than the preceding. It is represented at fig. 2. The origin of the Doric order is thus described by Vitruvius:—

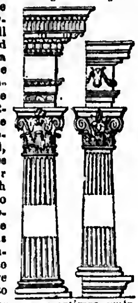
"Dorus, son of Hellen and the nymph Orises, reigned over Achaia and Peloponnesus. He built a temple of this order, on a spot sacred to Juno, at Argos, an ancient city. Many temples similar to it were afterwards raised in the other parts of Achaia, though at that time its proportions were not precisely established." This account, as well as those of the orders which we shall presently examine, is very incredible, and is now generally rejected.

The Doric is the earliest and most massive order of the Greeks. It is known by its large columns with plain capitals; its triglyphs resembling the ends of beams, and its mutules corresponding to those of rafters. The column, in the examples at Athens, is about six diameters in height. In the older examples, as those at Pæstum, it is but four or five. The shaft had no base, but stood directly on the stylobate. It had twenty flutings, which were superficial, and separated by angular edges. The perpendicular outline was nearly straight. The Doric capital was plain, being formed of a few annulets or rings, a large echinus, and a flat stone at top called the abacus. The architrave was plain; the frieze was intersected by oblong projections called triglyphs, divided into three parts by vertical furrows, and ornamented beneath by guttæ, or drops. The spaces between the triglyphs were called metopes, and commonly contained sculptures. The sculptures representing Centaurs and Lapithæ, carried by Lord Elgin to London, were metopes of the Parthenon, or temple of Minerva at Athens. The cornice of the Doric order consisted of a few large mouldings, having on their under side a series of square sloping projections, resembling the ends of rafters, and called mutules. These were placed over both triglyphs and metopes, and were ornamented, on their under side, with circular guttæ. The best specimens of the Doric order are found in the Parthenon, Propylæa, and the temple of Theseus, at Athens.

The *Ionic* is a lighter order than the Doric, its column being eight or nine diameters in height. It had a base often composed of a torus, a scotia and a second torus, with intervening fillets. This is called the Attic base. Others were used in different parts of Greece. The shaft had twenty-four or more flutings, which were narrow, as deep as a semicircle, and separated by a fillet or square edge. The capital of this order consisted of two parallel double scrolls, called volutes, occupying opposite sides, and supporting an abacus, which was nearly square, but moulded at its edges. These volutes have been considered as copied from ringlets of hair, or perhaps from the horns of Jupiter Ammon. When a column made the angle of an edifice, its volutes were placed, not upon opposite, but on contiguous sides, each fronting outwards. In this case the volutes interfered with each other at the corner, and were obliged to assume a diagonal direction. The Ionic entablature consisted of an architrave and frieze, which were continuous or unbroken, and a cornice of various successive mouldings, at the lower part of which was often a row of dentels, or square teeth. The examples at Athens, of the Ionic order, are the temple of Erectheus, and the temple on the Ilissus, which was standing in Stuart's time, seventy years since, but is now extinct.

The *Corinthian* was the lightest and most decorated of the Grecian orders. Its base resembled that of the Ionic, but was more complicated. The shaft was often ten diameters in height, and was fluted like the Ionic. The capital was shaped like an inverted bell, and covered on the outside with two rows of leaves of the plant acanthus, above which were eight pairs of small volutes. Its abacus was moulded and concave on its sides, and truncated at the corners, with a flower on the centre of each side. The entablature of the Corinthian order resembled that of the Ionic, but was more complicated and ornamented, and had, under the cornice, a row of large oblong projections, bearing a leaf or scroll on their under side, and called modillions. No vestiges of this order are now found in the remains of Corinth, and the most legitimate example at Athens is in the choragic monument of Lysicrates. The Corinthian order was much employed in the subsequent structures of Rome and its colonies. The finest Roman example of this order is that of three columns in the Campo Vaccino at Rome, which are commonly considered as the remains of the temple of Jupiter Stator. This example has received the commendation of all modern artists, yet has seldom been executed in its original form. This is probably owing to the excessive richness and delicacy of it, which renders its adoption very expensive, and perhaps the modification of it by Vignola is preferable to the original, possessing a sufficient enrichment without the excessive refinement of the other. In this order (which has been adopted by Sir William Chambers) the base is one module in height; the shaft, sixteen modules twenty minutes; and the capital, two modules ten minutes; thus giving ten diameters to the whole column. The architrave and frieze are each one module fifteen minutes in height, and the cornice, two modules. The cornice is distinguished by modillions interposing between the head-mouldings and corona;

Fig. 1. Fig. 2.



the latter is formed by a square member surmounted by a cymatium, supported by a small ogee: the former is composed of dentils, supported by a cyma reversa, and covered by the ovolo. When the order is enriched, which is usually the case, these mouldings, excepting the cymatium and square of the corona, are all sculptured: the column is also fluted, and the channels are sometimes filled to about a third of their height with cablings, which are cylindrical pieces let into the channels. When the column is large, and near the eye, these are recommended as strengthening them, and rendering the fillets less liable to fracture; but when they are not approached, it is better to leave the flutes plain. They are sometimes sculptured, but this should be only in highly enriched orders. An example is given in fig. 1.

The flutes are twenty-four in number, and commonly semicircular in their plan. The Corinthian base is similar to that of the Composite order, excepting that two astragals are employed between the scotiæ instead of one; but the Attic is usually employed for the reasons before assigned.

"The Corinthian order," says Sir William Chambers, "is proper for all buildings where elegance, gaiety, and magnificence, are required. The ancients employed it in temples dedicated to Venus, to Flora, Proserpine, and the nymphs of fountains, because the flowers, foliage, and volutes with which it is adorned, seemed well adapted to the delicacy and elegance of such deities. Being the most splendid of all the orders, it is extremely proper for the decoration of palaces, public squares, or galleries and arcades surrounding them; for churches dedicated to the Virgin Mary, or to other virgin saints, and on account of its rich, gay, and graceful appearance, it may with propriety be used in theatres, in ball or banquetting rooms, and in all places consecrated to festive mirth or convivial recreation."

Caryatides.—The Greeks sometimes departed so far from the strict use of the orders, as to introduce statues, in the place of columns, to support the entablature. Statues of slaves, heroes, and gods, appear to have been employed, occasionally, for this purpose. The principal specimen of this kind of architecture which remains, is in a portico called Pandroseum, attached to the temple of Erectheus at Athens, in which statues of Carian females, called Caryatides, are substituted for columns. One of these statues has been carried to London.

Grecian temple.—The most remarkable public edifices of the Greeks were their temples. These being intended as places of resort for the priests, rather than for the convening of assemblies within, were in general obscurely lighted. Their form was commonly that of an oblong square, having a colonnade without, and a walled cell within. The cell was usually without windows, receiving its light only from a door at the end, and sometimes from an opening in the roof. The part of the colonnade which formed the front portico was called the pronaos, and that which formed the back part, the posticus. The colonnade was subject to great variety in the number and disposition of its columns, from which Vitruvius has described seven different species of temples. These were, 1. The temple with antæ. In this the front was composed of pilasters, called antæ, on the sides, and two columns in the middle. 2. The prostyle. This had a row of columns at one end only. 3. The amphiprostyle, having a row of columns at each end. 4. The peripteral temple. This was surrounded by a single row of columns, having six in front and in rear, and eleven, counting the angular columns, on each side. 5. The dipteral, with a double row of columns all round the cell, the front consisting of eight. 6. The pseudo-dipteral differs from the dipteral, in having a single row of columns on the sides, at the same distance from the cell as if the temple had been dipteral. 7. The hypæthral temple had the centre of its roof open to the sky. It was colonnaded without, like the dipteral, but had ten columns in front. It had also an internal colonnade, called peristyle, on both sides of the open space, and composed of two stories or colonnades, one above the other. Temples, especially small ones, were sometimes made of a circular form. When these were wholly open, or without a cell, they were called monopteral temples. When there was a circular cell within the colonnade, they were called peripteral.

The theatre of the Greeks, which was afterwards copied by the Romans, was built in the form of a horse-shoe, being semicircular on one side, and square on the other. The semicircular part, which contained the audience, was filled with concentric seats, ascending from the centre to the outside. In the middle, or bottom, was a semicircular floor, called the orchestra. The opposite, or square part, contained the actors. Within this was erected, in front of the audience, a wall, ornamented with columns and sculpture, called the scene. The stage or floor between this part and the orchestra was called the proscenium. Upon this floor was often erected a moveable wooden stage, called by the Romans pulpitum. The ancient theatre was open to the sky, but a temporary awning was erected to shelter the audience from the sun and rain.

Grecian architecture is considered to have been in its greatest perfection in the age of Pericles and Phidias. The sculpture of this period is admitted to have been superior to that of any other age; and although architecture is a more arbitrary art than sculpture, yet it is natural to conclude that the state of things which gave birth to excellence in the one, must have produced a corresponding power of conceiving sublimity and beauty in the other. Grecian architecture was in general distinguished by simplicity of structure, fewness of parts, absence of arches, lowness of pediments and roofs, and by decorative curves, the outline of which was a spiral line or conic section, and not a circular arc, as afterwards adopted by the Romans.

Roman style.—Roman architecture had its origin in copies of the Greek models. All the Grecian orders were introduced into Rome, and variously modified. Their number was augmented by the addition of two new orders—the Tuscan and the Composite. The order derived from the ancient Etruscans is not unlike the Doric deprived of its triglyphs and mutules. It had a simple base, containing one torus. Its column was seven diameters in height, with an astragal below the capital. Its entablature, somewhat like the Ionic, consisted of plain running surfaces. There is no vestige of this order among ancient ruins, and the modern examples of it are taken from the descriptions of Vitruvius.

The Romans modified the Doric order by increasing the height of its column to eight diameters. Instead of the echinus, which formed the Grecian capital, they employed the ovolo, with an astragal and neck below it. They placed triglyphs over the centre of columns, not at the corners, and used horizontal mutules, or introduced foreign ornaments in their stead. The theatre of Marcellus has examples of the Roman Doric. The Romans diminished the size of the volutes in the Ionic order. They also introduced a kind of Ionic capital, in which there were four pairs of diagonal volutes, instead of two pairs of parallel ones. This they usually added to parts of some other capital; but at the present day it is often used alone, under the name of modern Ionic. The Composite order was made by the Romans out of the Corinthian, simply by combining its capital with that of the diagonal, or modern Ionic. Its best example is found in the arch of Titus. The favourite order, however, in Rome and its colonies, was the Corinthian, and it is this order which prevails among the ruins, not only of Rome, but of Nismes, Pola, Palmyra, and Balbec.

The temples of the Romans sometimes resembled those of the Greeks, but often differed from them. The Pantheon, which is the most perfectly preserved temple of the Augustan age, is a circular building, lighted only from an aperture in the dome, and having a Corinthian portico in front. The amphitheatre differed from the theatre, in being a completely circular or rather elliptical building, filled on all sides with ascending seats for spectators, and leaving only the central space, called the arena, for the combatants and public shows. The Coliseum is a stupendous structure of this kind. The aqueducts were stone canals, supported on massive arcades, and conveying large streams of water for the supply of cities. The triumphal arches were commonly solid oblong structures, ornamented with sculptures, and open with lofty arches for passengers below. The basilica of the Romans was a hall of justice, used also as an exchange or place of meeting for merchants. It was lined on the inside with colonnades of two stories, or with two tiers of columns, one over the other. The earliest Christian churches at Rome were sometimes called basilicæ, from their possessing an internal colonnade. The monumental pillars were towers in the shape of a column on a pedestal, bearing a statue on the summit, which was approached by a spiral staircase within. Sometimes, however, the column was solid. The thermæ, or baths, were vast structures, in which multitudes of people could bathe at once. They were supplied with warm and cold water, and fitted up with numerous rooms for purposes of exercise and recreation. In several particulars, the Roman copies differed from the Greek models on which they were founded. The stylobate or substructure, among the Greeks, was usually a plain succession of platforms, constituting an equal access of steps to all sides of the building. Among the Romans it became an elevated structure, like a continued pedestal, accessible by steps only at one end. The spiral curve of the Greeks was exchanged for the geometrical circular arc, as exemplified in the substitution of the ovolo for the echinus in the Doric capital. The changes in the orders have been already mentioned. After the period of Adrian, Roman architecture is considered to have been on the decline. Among the marks of a deteriorated style, introduced in the later periods, were columns with pedestals, columns supporting arches, convex friezes, entablatures squared so as to represent the continuation of the columns, pedestals for statues projecting from the sides of columns, niches covered with little pediments, &c.

Greco-Gothic style.—After the dismemberment of the Roman empire, the arts degenerated so far, that a custom became prevalent of erecting new buildings with the fragments of old ones, which were dilapidated and torn down for the purpose. This gave rise to an irregular style of building, which continued to be imitated, especially in Italy, during the dark ages. It consisted of Grecian and Roman details, combined under new forms, and piled up into structures wholly unlike the antique originals. Hence the names Greco-Gothic and Romanesque architecture have been given to it. It frequently contained arches upon columns, forming successive arcades, which were accumulated above each other to a great height. The effect was sometimes imposing. The cathedral and leaning tower at Pisa, and the church of St Mark at Venice, are cited as the best specimens of this style. The Saxon architecture, used anciently in England, has some things in common with this style.

MODERN TASTE.

So much for the varieties of the Greek and Roman styles of building, which have properly enough formed models for the erection of public edifices in every nation of modern times. But, as we have already hinted, the adoption of these models has not been always successful. It would seem as if the architects of ancient times had exhausted human ingenuity, and left nothing to be invented in the construction of ornamental and tasteful edifices; at least the architects of modern ages have not had the hardihood to attempt, or the genius to be successful in, original composition. They have copied Greek temples, porches, pillars, pediments, and cornices, without regard either to climate or situation, and also without bearing in mind that they lack the marble, and cannot afford the expensive sculpture which lent so much beauty and grace to the forms of Athenian architecture. Magnificent temples which crowned the summits of rising grounds in Greece, we find imitated in hollows; and the eye of the spectator, instead of taking in a bold and lofty outline of pillars relieved against the clear blue sky, is offended by looking down upon clusters of chimney pots. Thus innumerable public buildings in England and Scotland, possessing intrinsically good architecture, are completely lost by the want of taste in those who have placed them in unseemly awkward situations. It appears to us, likewise, that far too little attention is usually paid by architects to the nature of our climate. We cannot recal to remembrance one public edifice in the Grecian style in this country which does not possess a dingy damp look. At every projecting point, and particularly over the pediments, pillars, and flat cornices of doorways, there is generally an ugly spot covered with moisture, and exhibiting the early rudiments of vegetation on the walls. All this offends the eye of the spectator, and excites universal notice, except among those who can see nothing but beauty in Grecian architecture, however clumsy it may be, and however much out of place.

Transcendant as were the efforts of the Grecian architects, one cannot believe that they exhausted their art. Grecian literature has not prevented the rise of a literature in England suitable to its genius, so neither ought the existence of a Grecian style of architecture to be for ever an obstacle to the rise and progress of a pure modern style of building. Hitherto there has been too great a disposition to cavil at the efforts of modern artists, as if it were beyond the bounds of possibility to discover and establish new and really beautiful styles in painting, sculpture, or architecture. We are most anxious, for our national credit, to see an end put to this severity of criticism. We hope that our young architects, while studying the chaste models of antiquity, will persevere in endeavouring to elaborate something *still better*, at least some species of architecture which will be in better accordance with our climate, as well as the national genius and habits. As powerfully tending to produce so beneficial a result, we hail the appearance of such works as the ARCHITECTURAL MAGAZINE, conducted by Mr Loudon, which is designed to improve the national taste in architecture, building, furnishing, and the various trades connected therewith; and which, from its cheapness, may become popular among all those classes of artisans whose genius it is intended to cultivate. We cannot but deem it a matter of astonishment that so little has, up till a very recent period, been done to improve the style of housebuilding. It is certain that bad taste is not necessarily cheap. Under proper management, a tastefully constructed domicile is not more expensive than one the reverse—most likely it is less expensive; and there can be no question as to its superiority, and the greater degree of pleasure it yields to those who contemplate its aspect. Utility may thus be found associated with the beautiful and the economical to an extent which many will imagine to be hardly possible.

OLD ENGLISH STYLE OF ARCHITECTURE.

The style of architecture used in the erection of gentleman's country residences is at present undergoing a most wonderful improvement all over Britain. The clumsy square domiciles, oftener resembling cotton mills than gentlemen's seats, and which were brought into fashion in the reigns of George the Second and Third, are giving way to more tasteful erections in alliance with the character of rural scenery amidst which they are placed. The square chest-like houses are in the course of alteration into edifices constructed in the styles which prevailed in the days of Elizabeth and James, technically called the old English style of architecture. The origin and nature of this ornamental style are thus described by a writer in the Quarterly Review for July 1831:—

"Every country has an architecture more or less peculiarly its own, formed, like the character and language of its inhabitants, by the blending of various foreign ingredients which have at different periods introduced and naturalised themselves, but which have been also in turn modified by the original stocks, as well as by the local peculiarities of climate, soil, social condition, and political history. The national character attaches itself far more to domestic architecture than to that which is displayed in public buildings, ecclesiastical or civil. In the erection of these, the architect, often himself a stranger, or taught abroad, has sometimes wholly copied a foreign model, and merely transferred the entire cathedral or palace from the banks of the Rhine or the Po, to those of the Thames and Isis. But in designing the residences of the opulent classes of any country, it became necessary to consult the manners, habits, and wants of the future occupants, the character of the climate, and the nature of the ordinary materials within reach. And in whatever degree the architect has neglected to adapt his design to the type required by these local circumstances, to that extent has he sinned against taste and propriety, and failed in producing that harmony of ideas, that association of ornament and purpose, which, as an essential element in the quality of beauty, it is the object of his art to create.

In the erection of a country residence where the choice of a style is not fettered by the proximity of other buildings, associations of a general and imaginative nature come into play, and dictate the adoption of the national and indigenous architecture. In this country, which is still rich in the possession of numerous specimens of buildings, both ecclesiastical and domestic, belonging to the earlier ages of its history, the old English style, in some of its varieties, is that which we consider specially appropriate to a country residence. The natural scenery around presents congenial images in the venerable grove, and the ancient oaks spreading their broad arms over the lawns and glades of the park. The local annals of the estate, of the site itself, or of the proprietor's family, combine to call for the employment of a style which is connected with so many of the most pleasing recollections of our national history. The irregularity of outline which it admits, and, indeed, almost requires, allows of an arrangement of the apartments which comfort or fancy may suggest, and accommodates it to all the varied wants of modern life. However, it is equally appropriate to every rank of habitation, from the princely palace down to the snug parsonage or humble cottage. To us the Grecian temple is completely out of place in an English landscape, as would a cloistered abbey or feudal castle in the prairies of Kentucky or the Illinois.

Our Saxon ancestors reared few places of strength. Their habits were peaceful and agricultural, rather than warlike; and they lived in low and mean houses, having no pretensions either to splendour or strength. It was indeed the defenceless condition of the island which rendered it so easy a prey to the Norman conqueror; and it was to remedy this defect, and secure his newly acquired dominions, as well against invasions from without as rebellions within, that William lost no time in erecting strong castles in all the principal towns of his kingdom. His followers, among whom he had parcelled out the lands of the English, had likewise to protect themselves against the resentment of those they had despoiled, and imitated their masters' example, by building castles on their estates. 'The whole kingdom,' says the author of the Saxon Chronicle, 'was covered with them, and the poor people worn out with the forced labour of their erection.' Many of the castles of this age were of great size, and possessed a certain rude grandeur of design. After the age of Edward III., who both ameliorated the institutions of the country, and introduced into it a certain degree of elegance and refinement, we find a considerable improvement in the character of the habitations which remain to us. By degrees, it was found possible to associate much convenience and magnificence with the strength requisite for defence; and the confined plan of the close fortress expanded into a mixture of the castle and the mansion. At a later period, a still farther change took place. The reign of law had gradually succeeded to that of the strong hand. The peaceable were able to trust to the executive for the defence of their persons and property, rather than to the strength of their own walls, and roof-trees, or the falchions and iron mails of their friends and retainers. The residences of the nobility and rich landed proprietors again assumed, though by degrees, and with the exception of some districts like the borders of England and Scotland, a civil, in place of a military appearance. Beauty and ornament were consulted by the builders instead of strength, and the convenient accommodation of the ordinary indwellers, in lieu of the means for disposing of a crowded garrison, and its necessary provision in time of siege. The mansions erected under these circumstances partook but slightly of the castellated character. They usually retained the moat and battlemented gateway, and one or two strong turrets, to build which a royal licence was necessary; but their defensive strength could only have availed against a sudden and momentary attack. They were generally quadrangular in form; the larger class enclosing two open courts, of which one contained the stables, offices, and lodgings of the household; the second, the principal or state chambers, with the hall and chapel. Such buildings differed but little from the monastic residences of the same, or of an earlier date. Of the minor country residences of that and the earlier reigns, many interesting examples remain scattered through the island, sometimes fulfilling their original destination, but far more frequently employed only as farm-houses, and going fast to decay.

In a few of the houses built during the reign of Henry the Eighth, we may observe some slight traces of the Italian architecture, which in the next reign was more liberally introduced, and mixed up with the original Tudor, or early English, into an irregular, certainly, but in most instances an exceedingly rich and effective composition. Whilst in England, and the north of Europe generally, the debased Roman architecture of the lower empire, which forms the foundation of the Saxon, Norman, or Lombard style, had been successively improved into those several beautiful modifications which are now classed indiscriminately under the term Gothic, the architects of Italy had never stepped out of their ancient track. With the seat of empire, the arts had migrated to Constantinople; and when the towns of Venice and Pisa were desirous of exhibiting their newly-born opulence in the erection of splendid cathedrals, it was in Constantinople, the capital of the lower empire, where St Sophia had already risen to astonish the eastern world, that they were compelled to seek a fitting artist. But on the revival of learning, the ancient Roman edifices were disinterred, and admired, and measured; and the eastern, or, as it is called in Italy, Lombard architecture, was in turn corrected, by reference to its classical original. The architects of Italy soon rose to eminence, and their fame was a subject of deep interest in this country, where the rage for building was no less strong and general than in Italy. In the brilliant reign of Elizabeth, the English nobles and princely proprietors vied more than ever with each other in the magnificence of their mansions. It might have been supposed that the noble Tudor houses, with their panelled walls, buttresses, and battlements, traceried windows, sculptured dripstones, florid pinnacles, and embossed chimney-shafts, were sufficiently rich and gorgeous to satisfy the prevailing taste for splendour; but in their anxiety to strike and surprise the admiration of their countrymen, many deserted the native styles, and sought for designs, and even artists, from abroad. Italian architecture became, by degrees, the mode; and even where the indigenous style was adhered to in the general design, many of the enrichments and ornamental features were borrowed from the Italian. First of all, the porch or gateway, as the most conspicuous points on which to exhibit these exotic novelties, were decorated on either side the entrance, and, perhaps, a second and third story above with pilasters, belonging to the different Greek orders; the doorway itself exchanged the low-pointed or Tudor, for the circular arch; the deep, elegant, and sweeping Gothic mouldings, for the Vitruvian architecture, cut across by the awkward projecting imposts. Next was introduced the cupola, whose invention in Italy had made so much noise, that it appears our country squires were anxious to have miniature specimens of it at home. It was applied as a covering to the high turrets, round, square, or polygonal, which flanked the entrance or terminated the angles of the building, and, surmounted with gilded vanes, certainly produced a rich and imposing effect. Then followed the removal of the panelled battlements, and the substitution of a parapet, carved into fantastic notches or scrolls, or perforated with oval openings and ornamented with obelisks, balls, busts, statues, and other singular decorations. These ran up the gables, which were often twisted into strange shapes, and sometimes wholly replaced by the level balustrade. And thus the most characteristic features of the old style, its numerous steep gables and spiry pinnacles, were succeeded by the uniform horizontal straight lines of the new. At length the whole building was surrounded by columns or pilasters, rising, tier above tier, to the exhaustion sometimes of the five orders; open arcades took the place of the entrance porch, and nothing remained of the Tudor style but the mullioned window, which, however, was of itself sufficient to give a peculiarly picturesque and old-fashioned aspect to the whole building.

To us it has always appeared that this architecture of the Elizabethan age constitutes a style of its own—a compound of two extremely different modes, the Italian and the Tudor Gothic. It is evident that the Italian design was always greatly altered to suit the climate and the taste of England. Indeed, were we not afraid the comparison might be considered profane, we should say there is something in the rich irregularity of the Elizabethan architecture, its imposing dignity, gorgeous magnificence, and quaint and occasionally fantastic decoration, reminding us of the glorious visions that flitted across the imagination of Shakspeare, the immortal bard of the same age. He, like the architects of his day, borrowed largely from the foreigner, but made his importations appear exclusively his own. The architectural garden, which always accompanied this style of mansion, is not the least pleasing part of it. We delight in its wide and level terraces, decorated with rich stone balustrades, and these again with vases and statues, and connected by broad flights of stone steps—its clipped evergreen hedges—its embowered alleys—its formal yet intricate parterres, full of curious knots of flowers—its lively and musical fountains—its steep slopes of velvet turf—its trim bowling-green—and the labyrinth and wildness which form its appropriate termination, and connect it with the ruder scenary without. This kind of ornamental garden came from Italy, with the change we have been discussing, in domestic architecture.

The quadrangular embattled mansion of the last Henries affords scope for the display of much grandeur and magnificence, and adapts itself more conveniently to the plan of a modern house. The carved oriel, and deep many-lighted bay window, often projecting in a multitude of capricious angles and curves, besides the regular octagon, the panelled angle-turrets, with richly embossed finials, and the wreathed chimney-shafts, are characteristic beauties of this class of building. The gabled manor-house, together with these ornamental features, admits at the same time of a much greater irregularity of form and outline, so as to accommodate itself to every variety of disposition, and to buildings of every size, from the baronial residence to the parsonage and grange. All the forms which particularly mark the Elizabethan style may be wrought in the cheapest materials with comparatively little labour; and a small portion of ornamental work, tastefully disposed, is capable of producing very considerable effect. Lastly, the Elizabethan house is distinguished by the number and size of its rectangular and many-mullioned windows, which gave a peculiar lightness and elegance to its several parts. The roof-line may be either horizontal or broken with gables, turrets, and cupolas. In either case, it is enriched with perforated parapets, balustrades, or other architectural devices, while similar embellishments ornament the entrance, and the terraces which connect the building with the garden."

Fortunately, as we have said, this light and elegant style of domestic architecture is gradually superseding the clumsy style of the eighteenth century. A better taste is evidently extending itself, particularly as regards the erection of villas, cottages, hunting-seats, gate-lodges, and other rural residences. To these the old English style is peculiarly well adapted. The leading feature of this style applied to cottages is the doing away with unbroken lines. The house is composed of different parts projecting at right angles from each other, with also a projecting porch, and the outshot octagonal windows commanding views in three different points. It also sometimes possesses an open rustic arcade along a portion of the front or back, which will be found useful and agreeable both in sultry and cold broken weather. A usual plan with a cottage of this kind is to have on the ground-floor two parlours, communicating by folding doors, fourt[illegible] feet by twelve each, and ten feet in height; a kitchen and scullery, with a porch seven feet by five feet six inches, opening to a staircase seventeen feet six inches by eight feet, with three rooms above. The gables are enriched with pendants and ornamental dressings to the doorways and windows, and handsome octagonal chimney-stacks. In erecting ornamental cottages of this kind, there ought to be a lightness in the pointing of the upper projecting windows, with a sharp angularity in the roof; and the chimney-stacks ought to stand well out, in order to create effect in different points of view. When the little gardens adjacent are well trimmed and blooming, and the woodbine and ivy trained round the porch or mullioned window, the prospect exhibited is such as it would be impossible to surpass in rural elegance. We have not here room to enlarge on this interesting topic, and we can only conclude by recommending, that, in applying cottage architecture to a residence, much care ought to be taken to preserve the simplicity of the component parts, or the idea of the cottage will be lost in the magnitude of the dwelling. London's Encyclopædia of Architecture should certainly be consulted by gentlemen and others in the country before fixing on the style or mode of construction of their residences—that is to say, when skilful architects are not employed.

While the architectural character of gentlemen's seats and other rural residences is at present improving in its tone, so also is there now a better kind of taste exerted in the erection of ecclesiastical structures, particularly in the northern part of the United Kingdom. Throughout the greater part of last century and part of the present, the style of church architecture which prevailed in Scotland was what is now called the *barn order*, from the buildings resembling barns, and seldom possessing any kind of ornament or work to distinguish them as ecclesiastical structures, except a tall pointed steeple at one of the extremities. Within the last twenty years, however, this grovelling and unsightly style of architecture has merged in favour of a very superior taste. A class of architects or planners has arisen (chiefly in Edinburgh), who, by the encouragement given them by the heritors, or those on whom is imposed the burden of building parish churches, have erected a considerable number of ecclesiastical structures in a neat and simple Gothic style, charming to the eye in the midst of rural scenery, and strikingly picturesque when viewed in connection with the grey hills and ruined baronial castles which usually characterise Scottish landscapes. In general, these handsome Gothic churches are calculated to accommodate from a thousand to twelve or fourteen hundred sitters, are neatly fitted up with pews and galleries, and cost from three to four thousand pounds. It is but justice to the heritors to say that they rarely grudge the erection of these edifices, and to them will Scotland stand indebted for the possession of many tastefully erected country churches, highly decorative of its romantic scenery.

CITY ARCHITECTURE.

The style of architecture in cities differs very materially in different countries. The houses of Paris, London, and Edinburgh, are respectively constructed and ornamented in a style conformable to the genius of the French, English, and Scotch. Architecture is susceptible of far greater improvement in Paris than in the other two cities mentioned. The stone which is used is a whitish sandstone, not very fine in the grain, but able to preserve a purity of colour from the absence of coal smoke. Marble likewise preserves its clear white appearance in Paris, and is never seen loaded with that encrustation of culm or black dust which disfigures every public edifice and piece of ornamental sculpture in London. The French, besides, possess a much more refined architectural taste than the English. They spare no trouble or cost in the erection of splendid public structures, which, when at length erected, are not so liable to be defaced as in this country. The Parisian architects, or those who employ them, are at the same time more careful than we are in choosing good situations for their public buildings. They do not seem to grudge room, in order that a building may have a striking effect. This will be observable by all strangers in Paris. In London, space is so exceedingly valuable, that few of the public buildings are allowed a proper proportion of room around them for purposes of effect. A bad choice of situation, and the want of space around, form the prevailing characteristics of public edifices in all the large towns in Britain. In Edinburgh, which abounds in fine commanding rising grounds, some of the most splendid public buildings are erected in hollows, where they are seen to great disadvantage. From a pretty close examination, we consider that the modern French Grecian style of architecture is a great deal lighter, as regards the fabric, and more pleasing in outline, than that at work in Britain. The Bourse, or Exchange, at Paris, surrounded on all sides with Corinthian pillars, and exalted above the street line, so as to meet the eye of the spectator in a proper point of view, has not, as far as we know, an equal in Britain.

The domestic architecture of these cities, to which we would here confine our remarks, is, as above noticed, different in the different places. The Parisian, however, bears a resemblance to that of the Scottish metropolis. The houses in Paris are very lofty, and contain a number of families, living on separate floors, and entering by one common stair. The houses in London, as in mostly every other English town, are built of brick, and of a size sufficient to contain only one family each. Little or no ornament is displayed in English domestic architecture, the comfort of the interior compensating the want of external decoration. The houses of Edinburgh are of two kinds—those of the Old Town, which are generally six and seven stories in height, and those of the New Town, which are commonly three, or at most four stories high, and built on a regular uniform plan. All the modern portion of the town is constructed of sandstone, similar to that employed in Paris. In the more newly erected streets, ornaments in the Grecian style, such as well-formed pillars, pediments, and cornices, at the doorways, are common, but serve to enhance greatly the cost of erection, and, consequently, to raise the rents of the householders. In nearly all parts of the town, the division of houses into separate dwellings on the different floors is too common, and proves a source of endless disquietude to families. The style of house-building in Edinburgh seems to be yearly improving, so far as external appearance is concerned; and the extent of work done of this kind for a number of years has tended, among other circumstances, to cultivate the science of architecture and the practice of stone-masonry.

The peculiarities of taste of the English and Scotch in the erection of their domestic dwellings, form certainly a fair subject for remark in the present sketch. The English build their houses of brick, and the Scotch of stone. This decided peculiarity of taste and habit is so strongly associated with the character of the two nations, that it may be frequently observed wherever the English and Scotch are planted, especially in foreign countries. When a Scotchman crosses the Border, at almost any point, he wonders how the people come to have such a predominating taste for brick. Every house he sees seems to be built with no other material, and all the towns and villages he travels through seem but piles of so many brick-kilns set in rows. As he proceeds, he gets accustomed to this, as it appears to him, very strange fancy; but he always feels a certain degree of pity for those who are doomed to inhabit houses with walls so very thin, and so little able to keep out the cold. When an Englishman, in the same manner, enters Scotland, he is apt to be as much surprised at finding that the houses are all reared of solid stone, like so many castles or public edifices; and he is led to imagine that the Scotch are really an extravagant people, in building their dwellings with a material so dear and difficult to be wrought.

Some persons might be led to suppose that these diversities of taste in the architecture of dwelling-houses are the result of necessity; but they are by no means entirely so. In many parts of England which are covered with brick houses, the district abounds in excellent stone; while in Scotland, in places where clay is plentiful and stone is scarce, the latter material is transported by land carriage, at a heavy charge, in preference to brick, which could be easily and cheaply made. In erecting a brick house, the Englishman makes a point of consulting his own comfort and that of his family. He rears his dwelling with every imaginable convenience; sections it off into neat snug apartments, almost calculating where his own easy chair is to stand by the fireside; surrounds the house with a pretty kitchen and flower garden; encloses the whole with a smart green railing; and finishes his goodly work by attaching to the wicket a clear-burnished fanciful brass knocker. Now, the Scotchman's taste runs in an entirely different channel. He sets about his work by going through certain toilsome preliminaries, which are considered of paramount importance. His first object of search is a quarry whence he may have his stones dug, and transported to the spot where they are to be used; his second point of inquiry is for a place to which he may convey the rubbish excavated from the foundation. When he has satisfied himself in these particulars, he commences operations on a scale of wonderful magnitude, generally contriving to commence his labours with the first appearance of fine weather at the close of winter, so as to make sure of having the roof on and the walls plastered before Christmas. The Englishman erects his house for the comfort of those who are immediately to inhabit it; but the Scotchman invariably calculates on its uses to his posterity, or how "the property" will serve as a legacy to his descendants. He appears to take a delight in building for future ages; and in order to make up a good rent-roll for his grandson, or that he may enjoy the dignity of being a *laird*, he will put himself to great inconvenience.

These different processes of house-building are partly the result of the English and Scotch modes of letting land for long periods. In England it is the common practice to take leases of ground for building for a period of ninety-nine years, or perhaps less, and for this piece of ground a certain rent is charged annually, with the arrangement that the houses on the property shall fall into the hands of the lord of the manor at the expiry of the lease; and hence, in a great measure, the plan of building houses which will not last in good repair for more than a hundred years. The Scotch, being in every respect a more calculating people, despise the prospect of only a hundred years' possession—"what! some day to be turned out of our own house!" They therefore take leases of ground which shall endure till the end of the world, and think themselves very badly off, indeed, when they are restricted to the brief period of nine hundred and ninety-nine years! These perpetual leases they term *feus*, an expression importing that the lessee becomes *feudal* vassal of the ground landlord. "*Ground to Feu*" is therefore to be found on hundreds of sign-boards north of the Tweed, and to English visitants appears quite an incomprehensible announcement. In Edinburgh and its vicinity, the annual feu-duty is enormous, amounting sometimes to a charge of a guinea for every foot of ground in front; and this has to be paid as a chief rent for ever, under the penalty of loss of the property.

One good results from this peculiar conduct on the part of the Scotch; it tends, as already mentioned, to encourage a superior kind of architectural taste, and greatly improves the general aspect of the country. There can be no proper comparison of the beauty of stone and brick, and the Scotch act very wisely in building stone houses, if they can afford the cost; but the general exercise of this refined taste has an injurious effect on society, and is spoiling the large towns in the north. It limits the proprietary to a mere unit; raises up a body of large capitalists over the people, who are reduced to the character of yearly tenants; and prolongs the very absurd custom of dividing houses into separate dwellings on the different floors. For example, there are few merchants, tradesmen, or shopkeepers in the large towns in Scotland, who live in what are termed self-contained houses; for the simple reason, that they cannot afford to build, or even rent a complete stone mansion. Yet they can frequently purchase a *flat*; that is, a house up two, three, or four stairs; whereas, for the sum they thus expend for a confined lodging, they could erect a sufficient brick house from top to bottom, calculated to last during the whole period of their own lives, and those of their immediate descendants. But the prejudices of society would seem to forbid that any such course should be pursued.

MONUMENTAL COLUMNS.

The erection of triumphal or monumental columns was a favourite idea of the Romans. Augustus erected a column of white marble near the temple of Saturn, in the forum at Rome, as a centre whence the account of the miles began in the calculation of distances from the city. This celebrated column, which is still in existence, is however not of great altitude. Among the principal triumphal columns of antiquity now remaining, is what is called the column of Pompey, constructed of red granite, and situated on a rock, about a mile without the walls of Alexandria in Egypt. The total height of this column is variously mentioned as being ninety-two feet and one hundred and fourteen feet. The spectator can never be tired with admiring the beauty of its Corinthian capital, the length of the shaft, nor the extraordinary simplicity of the pedestal. To whom this famous pillar was erected is now unknown. It acquired the name of Pompey's pillar so late as the fifteenth century. The following cut will convey a correct idea of its outlines.

The Trajan column, which falls next to be mentioned, is one of the most celebrated monuments of antiquity. Its height, including the pedestal and statue, is one hundred and thirty-two feet. This monumental column was erected in the centre of the forum Trajani, and dedicated to the Emperor Trajan for his decisive victory over the Dacians, as is testified by the inscription on the pedestal. It is of the Doric order, and its shaft is constructed of thirty-four pieces of Greek marble, joined with cramps of bronze. For elegance of proportion, beauty of style, and for simplicity and dexterity of sculpture, it is the finest in the world. The figures on the pedestal are masterpieces of Roman art. It was formerly surmounted by a statue of Trajan, which has been succeeded by a statue of St Peter.

There are other columnar erections in Rome. The column of the Emperor Phocas is near the temple of Concord. It is of Greek marble, fluted, and of the Corinthian order, four feet diameter, and fifty-four feet high, including the pedestal. The Antonine column was erected by the Roman senate to the glory of Marcus Aurelius, for his victories over the Marcomanni, in the reign of Commodus. Aurelius afterwards dedicated it to his father-in-law, Antoninus Pius. According to a rigid admeasurement, made by M. de la Condamine, this column is one hundred and sixteen French feet in height, and eleven in diameter. It is built entirely of marble, and encircled with bas-reliefs, which form twenty spirals around its shaft. It has been well illustrated by engravings and descriptions by Pietro Santi Bartoli. It is in every respect inferior to that of Trajan as a work of art, particularly in the style and execution of the sculptures. There is also in Rome another column bearing the same name, situated on the Monte Cittorio. Its shaft is of a single piece of Egyptian granite, forty-five feet in height, and five feet eight inches in diameter. Its pedestal is ornamented with bas-reliefs, representing the apotheosis of Antoninus and Faustina, and other events relating to the history of Rome.

The column which ornaments the British metropolis, better known as the Monument, was designed by Sir Christopher Wren, and erected by order of parliament, in memory of the burning of the city of London, anno 1666, in the very place where the fire began. This pillar was begun in 1671, and finished in 1677. It is of the Doric order, fluted, 202 feet high from the ground, and fifteen feet in diameter, of solid Portland stone, with a staircase in the middle, of black marble, containing three hundred and eighty-five steps. The lowest part of the pedestal is twenty-eight feet square, and its altitude forty feet; the front being enriched with curious bas-reliefs. It has a balcony within thirty-two feet of the top, on which is placed a blazing urn of gilt brass.

The column in Phœnix Park, Dublin, differs from any other work of this description. It was erected in 1745. It stands in the centre of an area where four great avenues meet, and from which there are entrances to the vice-regal lodge, and that of the chief secretary. The trees which shade the avenues form vistas, through which the perspective view of the column forms a picturesque object. The pillar is formed of Portland stone, and is of the Corinthian order, fluted, and highly ornamented—the base and pedestal five feet in height, the shaft and capital twenty, and the phœnix which surmounts the column five feet, so that the whole presents an object thirty feet high.

The Napoleon column has justly been considered as the greatest ornament of the Parisian capital. It stands in the Place Vendome, and was erected to commemorate the successful result of Bonaparte's arms in the German campaign of 1805. Its total elevation is one hundred and thirty-five feet, and the diameter of its shaft is twelve feet. It is in imitation of the pillar of Trajan at Rome, and is built of stone, covered with bas-reliefs (representing the various victories of the French army), composed of twelve hundred pieces of cannon taken from the Russian and Austrian armies. The bronze employed in this monument was about three hundred and sixty thousand pounds weight. The column is of the Doric order. The bas-reliefs of the pedestal represent the uniforms and weapons of the conquered legions. Above the pedestal are festoons of oak, supported at the four angles by eagles, in bronze, each weighing five hundred pounds. The bas-reliefs of the shaft pursue a spiral direction from the base to the capital, and display in chronological order the principal actions of the campaign, from the departure of the troops from Boulogne to the battle of Austerlitz. The figures are three feet high; their number is said to be two thousand, and the length of the spiral band eight hundred and forty feet. Above the capital is a gallery, which is approached by a winding staircase within, of one hundred and seventy-six steps. The capital of the column is surmounted by an acroterium, upon which stands the statue of Napoleon, measuring eleven feet in height, and weighing five thousand and twelve pounds. The total expense of this sumptuous monument was 1,500,000 livres.

There are also several smaller columns, but of beautiful proportions, in various parts of England, in imitation of the above, but mostly of the Grecian or pure Doric order, as the Anglesea column, erected in commemoration of the battle of Waterloo, and the noble earl of that name, in the island of Anglesea; the column at Shrewsbury, erected in commemoration of the same event, and of another noble general, Lord Hill; the Nelson columns, at Yarmouth and in Dublin; the Wellington column, at Trim, in the county of Meath, Ireland; the monument commemorative of Lord Melville, at Edinburgh; and a similar one at St James's Park, of the Duke of York, &c. A very common error is committed in the erection of monumental columns, by loading their summit with a clumsy mass of masonry, on which the statue is placed, and technically called an acroterium. The Melville monument at Edinburgh presents the most notable instance of this kind of defect. If there must be an acroterium, it cannot be too modest in its proportions, or too little seen by the spectator.

To the above list we may add the Washington monument, at Baltimore, on which a colossal statue of Washington has been placed. The pillar is of the Grecian Doric order, and of very massive proportions. It stands on a grand base or zocle, and is surmounted by a circular pedestal, on which the statue rests. This base or zocle of the monument is 50 feet square, and 25 feet high; the column is 20 feet in diameter, and with its sub-base, 130 feet high; the capital is 20 feet square. The statue is 15 feet high, and the whole height of the monument, from the pavement, including the statue, will be 176 feet. As it stands on a hill 100 feet high, this structure rises 276 feet above tide. It is constructed of white marble, which is slightly variegated, and is a very conspicuous object to every one approaching the city, whether by land or water. The statue greatly increases its effect, and gives finish and beauty to the whole structure. The attitude given to the statue represents the great man to whom the monument is dedicated in the act of resigning his commission, and the authority with which he had been invested by his country, again into the hands of the people, having accomplished the great object of his appointment—the freedom and independence of the union. The statue is the work of Mr Causici.

BRIDGES.

The art of bridge-building is traced to the Romans. In the brightest days of the Grecians, when their fine style of architecture was complete, when their porticoes were crowded with paintings, and their streets with statues, the people of Athens waded or ferried over the Cephisus for want of a bridge. The Greeks do not seem to have valued the construction of the arch sufficiently to excel in bridge-building. No people of the ancient world carried the power of rearing the stupendous arch and the magnificent dome to such an extent as the Romans. After the construction of their great sewers, the aqueducts, and the cupola over the Pantheon of M. Agrippa, a bridge over the Tiber was of easy execution; and the invention of the architecture of stone bridges, as practised in its best and most effectual manner, must be conceded to this great and indefatigable people. The most celebrated bridges of ancient Rome were not distinguished by the extraordinary size of their arches, nor the peculiar lightness of their piers, but, like the rest of the magnificent works of this city, as far as construction is concerned, they are worthy of study from their excellence and durability. The span or chord of their arches seldom exceeded seventy or eighty feet, and the versed sine or height was nearly half of the chord, so that they were mostly semicircular, or constituted a segment nearly of that form.

Among the most celebrated bridges in modern times, or those built subsequently to the destruction of the Roman empire, are those of the Moors in Spain, who imitated and rivalled the best constructions of the Romans. In Great Britain, the art of building bridges appears to have been diligently studied from early times. The most ancient bridge in England is the Gothic triangular bridge at Croyland, in Lincolnshire, said to have been built in 860. The ascent is so steep that none but foot passengers can go over it, a common peculiarity of old bridges.

The greatest improvement effected in modern times upon bridge-building consists in constructing them with so level a surface or roadway above, that they are easy of access. The most splendid work of art of this kind is Waterloo Bridge, across the Thames. Its length is 1250 feet. It consists of nine elliptical arches, each of 120 feet span, and 32 feet in height. Westminster Bridge was commenced in 1740, and completed in 1750. It is 1220 feet long, and 44 feet between the parapets, has 13 large and 2 small arches, all semicircular. The middle arch is 76 feet in span. The newly-erected London Bridge is also an elegant structure, and, excepting Waterloo Bridge, is perhaps the finest bridge in the world. At Paris there are some remarkably good stone bridges across the Seine, also an excellent suspension bridge. One of the most curious provincial bridges in Great Britain is that at Taff, in Glamorganshire. It is of one arch, and its space is rather more than 140 feet. The architect of this bridge was a poor uneducated man, and the persevering courage with which he pursued his object till the completion of the edifice, is worthy of record. His first attempts failed in consequence of the enormous pressure of the haunches or sides of the bridge, which forced up the key-stone; and to obviate this, he pierced the stonework with cylindrical apertures, which remedied the defect. Prior to the erection of this bridge, that of the Rialto had the largest span of any in existence.

Metal bridges are the invention of British artists. The true elements of their construction are as yet but imperfectly understood. The Southwark Bridge over the Thames is at present the finest iron bridge in the world. It consists of three arches. The chord of the middle arch is 240 feet long, and its height 24 feet. There are several other fine bridges of this kind in England, in particular one at Sunderland, in the county of Durham.

The art of making suspension bridges is not new, but it is only in recent times that it has been brought to perfection. In this kind of erection the flooring or main body of the bridge is supported on strong iron chains or rods, hanging in the form of an inverted arch, from one point of support to another. The points of support are the tops of strong pillars or small towers, erected for the purpose. Over these pillars the chain passes, and is attached at each extremity of the bridge to rocks, or massive frames of iron firmly secured under ground. The great advantage of suspension bridges consists in their stability of equilibrium; in consequence of which, a smaller amount of materials is necessary for their construction than for that of any other bridge. If a suspension bridge be shaken, or thrown out of equilibrium, it returns by its weight to its proper place, whereas the reverse happens in bridges which are built above the level of their supporters.

The most remarkable suspension bridge in existence is that constructed by Mr Telford over the Menai Strait, between the Isle of Anglesea and Caernarvonshire in North Wales. It was finished in 1825. The roadway was 100 feet above the surface of the water at high tide. The opening between the points of suspension is 560 feet. The platform is about 30 feet in breadth. The whole is suspended from four lines of strong cables, by perpendicular iron rods, five feet apart. The cables pass over rollers on the tops of pillars, and are fixed to iron frames under ground, which are kept down by masonry. The weight of the whole bridge between the points of suspension is 489 tons. There is but one circumstance which appears at all to affect the stability of its equilibrium, and that is, the heavy and measured tread of a long line of military. The whole weight of a number of men, whose feet drop at the same instant of time, would affect any suspension bridge. The striking grandeur of this wonderful work of art cannot be described. The bridge must be visited in order to fully appreciate its beauty, its sublimity, and its other merits.

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CHEMISTRY APPLIED TO THE ARTS.

THERE is not an art or manufacture in which the principles of chemistry are not in one way or another employed, and practically illustrated. The applications of chemistry in the arts, manufactures, &c. are indeed so numerous, that we can scarcely do more in this paper than give a short account of the most important of them. In order to render our descriptions as intelligible as possible, we shall in the first place present a brief view of a chemical laboratory, with its various apparatus.

THE CHEMIST'S LABORATORY.

A laboratory is a chemist's workshop. It is the place where he performs his experiments, and is of course provided with all the utensils necessary for doing so. The size of an apartment of this kind necessarily varies with the purpose for which it is constructed. If it is attached to a public institution, it should be large; if for private experimentation, in a very moderately sized room the most important processes of chemical manipulation may be easily performed. It should, if possible, be upon the ground floor, and well lighted and ventilated; a skylight throws a very agreeable and convenient illumination over such an apartment. Shelving should run round the walls for the reception of vessels. The chimney should be high enough to admit of a person standing under it, and as broad as possible. Here the general working furnace, as well as others, both portable and fixed, together with an oven and a sand-bath, may be conveniently placed. It should also be provided with a pair of bellows. The other most essential fixtures are a large table in the centre of the room, on which experiments with the lamp may be performed, mixtures made, and so on. A sink having an abundant supply of water is a very important appendage; for water is continually wanted in chemical operations, both in the performance of experiments and in the cleansing of vessels. It should be placed in a corner of the room, to be out of the way. Cupboards, drawers, small portable tables or stands, blocks of wood, and boxes, are also very useful. The other small moveables, or utensils of a laboratory, are hand-mortars, of iron, glass, agate, and Wedgewood's ware, together with their pestles; earthen, stone, metal, and glass vessels of different kinds; funnels, measures, &c. These we shall describe in course. Filters and troughs are very important, and charcoal is an essential article in the replenishing of a laboratory.

BALANCES AND MEASURES.

Correct weighing is indispensable to every chemical experiment, and therefore an exact and very delicate balance is an essential requisite. There should be at least two balances; one for weighing heavy matters, and another for very minute quantities. The last instrument should be sufficiently delicate to weigh from 600 to 1000 grains, and downwards, indicating, distinctly and certainly, differences equal to the 1-50,000th or 1-60,000th part of the weight in the scale. These small weights are sometimes as low as the hundredths of a grain, and are usually made of platina, because air and moisture do not act upon that metal. As it is by carefully weighing substances, both before and after being experimented upon, that the exact constituent parts of bodies are determined, and the most important chemical truths ascertained, the balance and weights should be carefully examined at intervals, and their accuracy ascertained. The methods of determining the specific gravity of bodies by immersion in water, will be found described in our article upon Hydrostatics.

Measures are necessary for ascertaining the bulk of liquids or gases, and two integers are sufficient, the pint and the cubic inch. Measures should be made of glass, and have a graduated scale marked on both sides. They are commonly of a cylindrical shape, like a phial bottle, and possess a small spout at the orifice. The graduations on these instruments are sometimes very minute, and indicate exceedingly small quantities of matter put into them. The measures should be verified by weighing into them successively portions of mercury and water. A cubic inch of the former, at a temperature of 62°, weighs 3425.35 grains, and the same quantity of the latter at the same temperature weighs 252.458 grains. Water answers well enough for estimation down to the cubic inch, but for the tenths and the hundredths of an inch, mercury is both more exact and more expeditious.

FURNACES, LAMPS, AND BLOWPIPES.

Heat is one of the most powerful and extensively useful agents employed by the chemist for ascertaining the properties of bodies, and the methods of its production become of great moment to him. The most simple way of producing heat is by means of a common fire. Furnaces are more scientifically and elaborately constructed than our common fireplaces and stoves, and a more intense heat is accordingly generated by them. The forms of furnaces are almost innumerable, every month or even week giving birth to some new improvement upon them; but one general principle is kept in view in their construction; that is, the production of the greatest amount of heat by means of the smallest expenditure of fuel. Mr Faraday describes a very cheap and useful furnace which he is in the habit of using, made of clay and plumbago, or black lead, mixed. It is simply a vessel shaped like a common flower-pot, and having holes perforated in its sides for the admission of air. As it is liable to crack after being used, it is bound with iron or copper hoops, or wire. A small portable cast-iron grate is made to fit into it, and repose about two-thirds downwards from the top to the bottom. Charcoal, the fuel employed, is placed upon this grate, and there reposes the crucible with the substance to be experimented on. A funnel pipe may be made to fit upon this furnace, by which means the draught, and consequently the heat, is greatly augmented. This is a very simple form of such apparatus, and can be obtained for a mere trifle. Furnaces upon a larger scale are constructed in various ways of fire-brick, which resists fusion, at least until the temperature is very high. The main object is to produce an immense amount of heat, and this can be accomplished either by propelling air upon the combustible matter by means of bellows, in which case the furnace is called a *blast-furnace*, or by forming long flues and raising a high chimney, so as to produce a strong draught of air; this is termed a *wind-furnace*. The best construction of furnaces has scarcely been ascertained, certain kinds of them being best adapted for certain purposes. Upon the top of the furnace, and even upon the flues, vessels containing sand, and hence called sand-baths, are placed. In these, bodies can be raised to a high degree of temperature. Charcoal is the substance most commonly used in furnaces. It produces an intense heat without smoke, but very soon consumes. Coke or charred coal produces a strong and lasting heat.

A lamp may be considered a species of small furnace, and is a cheap and convenient source of heat. Spirit-lamps, which are trimmed with cotton-wick in the ordinary way, and fed with alcohol, or spirit of wine, are the most useful. The flame of alcohol, which is pale, produces no smoke or fuliginous matter, and the heat which it generates is very intense. Common oil-lamps, and also gaslight, are used, but the heat of such apparatus is not so great. By means of a very simple instrument, the blowpipe, all the effects of the most violent heat of furnaces can be produced. A common blowpipe is merely a glass pipe, about one-eighth of an inch in diameter at one end. The hole gradually lessens until it terminates at the opposite extremity in a very small orifice. Two or three inches of the narrow end are bent nearly at right angles to the longer part of the tube. By placing the thick end of the instrument in the mouth, and urging a stream of air upon the flame of a lamp or candle, an intense degree of heat is produced, which may be brought to bear upon any substance placed in a small spoon of pure gold or platina. If the body to be fused be not of such a nature as to sink into the pores of charcoal, that substance is commonly used. A great many important and beautiful experiments may be performed by this cheap and convenient instrument, but the proper way of blowing it requires practice. If the two gases, oxygen and hydrogen, be mixed together in the proportions which form water, and compressed to the amount of many atmospheres in a metallic box provided with a small tube, what is called an oxy-hydrogen blowpipe is formed. By this apparatus an almost incredible degree of heat can be produced, but accidents often occur in using it.

TRITURATION, FUSION, SOLUTION, DISTILLATION, &c.

As a general principle, having, however, certain limitations, it may be stated, that the more minutely matter is divided, the more rapid will be the chemical action exerted between the particles. This division of matter is effected in various ways. First, by trituration, or the reduction of substances to a state of powder, which is a mechanical action not affecting the physical state of the body, and only relating to solids. In accomplishing this, the pestle and mortar are generally used. Externally, mortars are usually shaped like a flower-pot, the inside, at the bottom, being curved like the thick end of an egg. They are made of various materials, such as metal, porphyry, agate, and so on, according to the purposes to which they are applied. The pestle is generally of the same material as the mortar, and is a solid rod having a rounded bulb at one end for pulverising the substance in the mortar. Trituration answers very well the purpose of promoting chemical action in a number of experiments, but by fusion and solution it is rendered more complete.

Bodies are said to be in a state of fusion, when, heat being applied to them, they assume the liquid form, a state in which all the particles of a substance move easily amongst themselves. When a solid body, such as a piece of sugar, is put into water, it is gradually dissolved; and when the lump of saccharine matter has disappeared, and become mixed with the water, and remain so, it is said to be held in solution by it. Heat greatly promotes the rapidity of solution; and glass vessels having a rounded bottom, such as a Florence flask, and placed upon a spirit-lamp, are very commonly employed. In processes connected with the subdivision of matter, those in which hot water is merely poured upon the substance, the process is called *infusion*; when heat is applied for some time, it is called *decoction*; and when it consists of pouring hot or cold water on the substance, and allowing it to stand for some time, it is termed *maceration*. There is a process of solution called *lixivation*, which consists in the separation of a soluble body from an insoluble one by means of washing.

Distillation and sublimation mean nearly the same thing; both consist in the conversion of a body into vapour, its transference in that state and consequent separation from other substances, and its ultimate condensation. The difference generally consists in the state assumed by the vapours when condensed; if the product be solid, the process is called sublimation; if liquid, distillation. The substance is raised to such a temperature as causes it to assume the gaseous state, in which state it is conducted into a vessel containing water of a low temperature, where it is condensed into a fluid or solid state. A common still consists of a metal boiler for containing the substance to be distilled; a head terminating in a peak is adapted to it; the latter is made to fit into the commencement of a spiral tube, called a worm, fixed in a tub; the whole of this part of the apparatus being called the refrigerator. The substance is raised into vapour in the still, and being condensed in the worm, runs out at its lower extremity. Distillations are usually effected in the laboratory by means of glass retorts and flasks; for substances, however, which require a greater degree of temperature to effect their distillation, metallic retorts are employed. Bodies which are very volatile are distilled or sublimed in an alembic, which consists of a globular bottom and conical-shaped head, whence a nose or beak passes off in a downward direction into a receiver.

FILTRATION, EVAPORATION, &c.

Filtration consists in putting mixed substances into vessels which are porous enough to admit of the passage of one substance through them, but close enough to retain another. Unsized paper, cloth, flannel, tow, sponge, sand, pulverised glass, flints, porous stones, earthenware, and many other substances, are used on different occasions; but the first is almost exclusively used in the laboratory, a few of the others now and then being resorted to only on particular occasions. Evaporation is a process so simple as scarcely to require description; it is merely the assumption of the gaseous form by bodies either at ordinary temperatures, or when heat is applied to them. In this general characteristic it resembles distillation and sublimation, but it differs from these processes in this respect, that the substance evaporated is generally allowed to pass off uncollected by a refrigerator, not being that part of the mixture which is required.

Professor Leslie invented a very ingenious method of evaporation. He placed the substance to be evaporated, along with a vessel containing sulphuric acid, under the receiver of an air-pump. When the air was withdrawn, evaporation went rapidly on; and the sulphuric acid having a strong attraction for water, absorbed the vapour as fast as it was given off, and ice was very soon formed.

The drying of substances, or *desiccation*, as it is usually called in scientific works, may be carried on without exhaustion by means of what is called desiccators or dryers. This is better effected in close vessels than in the open air, unless a current be taken advantage of. In these processes, sulphuric acid, chloride of calcium, carbonate of potash, quicklime, and similar absorbents, may be used. A basin of common quicklime, with a moist precipitate placed above it, the whole being covered with a jar or receiver, will soon dry the precipitate.

CRUCIBLES, RETORTS, TROUGHS.

Crucibles are open vessels which resist very high temperatures. They are made of various shapes, triangular or circular, and of different kinds of materials, but by far the greater number are formed of earthenware. To promote chemical action, what are called *fluxes* (which will be afterwards described) are employed. Now, it is important that the crucible be made of a substance which is not rendered more fusible by a flux. Wedgewood's crucibles are made of a close white ware; and although thin, they are not easily dissolved; and they retain fluxes at moderate temperatures longer than other crucibles. Those made of a mixture of coarse plumbago and clay are also excellent in these respects. But the most valuable in the laboratory are the Hessian and Cornish crucibles. Charcoal and metallic ones are likewise used; those formed of platina being the most generally useful, although they are at first very expensive.

Retorts are vessels employed for many distillations, and most frequently for those which require a degree of heat superior to that of boiling water. This vessel is a species of bottle with a long neck, so bent that it makes with the globular belly of the retort an angle of about sixty degrees. The most capacious part of the retort is called its belly, its upper part the arch or roof, and the bent part the neck. They are composed of different kinds of materials, those of glass being by far the most common. They answer for all operations conducted at temperatures less than that at which glass softens; and from their transparency, they admit of constant observation of the materials within: they are, besides, acted upon or injured by few substances, and may be easily cleaned. To the bent neck of the retort various tubes can be fitted, and the evaporated substance conducted into a refrigerator. For distillations or sublimations requiring great degrees of temperature, metallic retorts are had recourse to. Those made of platina are the most expensive, but by far the most valuable and useful.

A pneumatic trough is a vessel constructed so as to retain water, and large enough to admit of jars being filled in it. Shelves and supports are fixed in it beneath the surface of the water; on these, vessels may be firmly placed. If now a large open-mouthed glass jar be filled with water, inverted beneath the surface of the water in the trough, and put upon one of these stands, a tube from a retort or other distilling vessel, introduced into the inverted mouth of the jar, will bring over the vapoury matter, which displacing the water occupying the jar, can thus easily be collected in it. In this manner gases are obtained. If the jar be provided with a stopcock, they can easily be withdrawn into vessels fitted to retain them. Instead of water, mercury, which is fluid at ordinary temperatures, is used in experiments where water would absorb the gases, or where exceeding nicety is required.

A great variety of other apparatus than those enumerated are either necessary or useful in a laboratory. Electrifying machines, galvanic batteries, air-pumps, syringes, tubes bent into various forms and of different sizes for fitting into the necks of retorts, &c., dishes for holding both solids and fluids, as well as other materials which it is unnecessary to name, are frequently required; but a very convenient small laboratory, where a vast number of remarkable experiments can be performed, may be furnished at very little expense.

TESTS, FLUXES, LUTES, CEMENTS, &c.

Acids and alkalis in a free state possess the power, even in very small quantities, of effecting certain general and regular changes in the tints of some vegetable colours. Accordingly, colours of this description are used for ascertaining the presence of these bodies when in excess or uncombined, and are called *tests*. Litmus and turmeric papers are most generally used. They are prepared by dipping unsized and bibulous paper in solutions of these substances. The litmus imparts a fine blue tinge to the paper, the turmeric a yellow one. In using these test-papers with a fluid suspected to contain free acid or alkali, or knowing that one of these substances is predominant, in order to ascertain which is so, all that is necessary is to moisten the papers with the liquid, and observe the change which is effected; if the fluid be acid, the blue colour of the litmus will immediately become red; if alkaline, the yellow colour of the turmeric will be changed to brown.

A *flux* is a substance made use of to assist the fusion and union of minerals or metals. It acts by protecting the substance from the air, by dissolving impurities which would otherwise be infusible, and by conveying active agents, such as charcoal and reducing matter, into contact with the substance operated upon. Upon a large scale, limestone and fusible spar are used as fluxes; those employed in philosophical experiments are alkaline, and they render the earthy mixtures fusible by converting them into glass. What is called crude flux, is a mixture of nitre and cream of tartar, put into the vessel along with the substance to be fused. White flux consists of the same ingredients, in equal quantities, but they are first deflagrated in an earthen crucible heated red-hot at the bottom. Black flux has the same constituents as the preceding, but the weight of the tartar is double that of the nitre.

Lutes are soft adhesive mixtures, principally earthy, used either for closing apertures existing at the junction of different pieces of apparatus, or for coating the exterior of vessels which have to be subjected to very high temperatures. The lutes employed for junctions pass into the nature of cements, which are substances used for uniting or joining together things of the same or different kinds, so as to form a whole. The best lute used for coating a vessel is made of Stourbridge clay. It is formed into a paste, which should be beaten until it becomes perfectly ductile and uniform, flattened into a cake, and then applied to the vessel which it is wished to coat. The same substance also answers for joining different parts of apparatus together; but there are various other lutes and cements employed for the same purpose. What is called *fat lute* is prepared by beating dried and finely pulverised clay (pipe-clay or Cornish clay) with drying linseed oil, until the mixture be soft and ductile. Caustic lime, when mixed with various mineral and vegetable substances in solution, affords numerous cements and lutes, which become hard when dry, and are impervious to vapours. One of the best is that obtained by using white of egg diluted with its bulk of water. The fluids are to be beaten together until the mixture pours with perfect liquidity. The substance is then to be treated with dry slaked lime in powder, until the mixture assumes the consistency of thin paste. A solution of glue or the serum of blood is sometimes substituted for the white of egg. White lead ground with oil also makes a very useful lute or cement. Soft cement consists of yellow wax (which alone is sometimes used as a cement) melted with its weight of turpentine, and a little Venetian red to give it a colour. When cold, it is hard like soap; but when pressed by the hand, the warmth of the latter renders it pliant.

With these preliminary observations, we shall now proceed to give a brief outline of the principal arts and manufactures in which chemistry has been applied. We shall not treat of these in the order of their relative importance; indeed it would be a difficult matter to determine which is the most important, or most largely contributes to human comfort. But there are a few, the names of which are more familiar to us than the rest, and with these we shall commence.

BLEACHING.

Bleaching is the art by which various articles used for clothing are deprived of the dark colour which they naturally possess, and are rendered white. Bleaching, especially in Egypt, where white linen or cotton was a common article of clothing, must have been early practised by mankind. Pliny informs us that different plants, and the ashes of plants, were used in this art; and Mr Parkes says that lime was employed by the ancients; but according to Dr Thomson,* there is no foundation for this assertion. Until about eighty years ago, the art of bleaching was very little known or practised in Britain, it being customary to send goods to Holland to be purified. About the year 1750, however, a bleaching establishment was set up in the north of Scotland. The process was then long and tedious; but an important change in the method of bleaching took place in 1787, for which we are indebted to the celebrated chemist Berthollet. This was simply the employing of the substance now called chlorine, which possesses a wonderful power of destroying vegetable colours. In the old process of bleaching, the cloth was merely steeped in a potash ley, washed with water, and afterwards with sour milk; then spread out upon the grass, and exposed for months to the action of the solar rays during summer. Without adverting to the various improvements which from time to time were made upon the idea suggested and practically acted upon by Berthollet, we shall describe the process of bleaching as it is now almost universally practised. The bleaching-powder, or chloride of lime, as it is usually called, is manufactured by exposing slaked lime to the action of chlorine gas, till as much of the latter is absorbed as the lime is capable of combining with under these circumstances. Mr Tennant of Glasgow, who discovered the process, prepares it by covering the floor of a stone chamber with a layer of slaked lime, to the height of a few inches. The floor is coated with a cement which is impervious to the chlorine. Above there is an aperture by which the common air can make its escape, the door of the apartment being air-tight and closed. A mixture of native black oxide of manganese, ground to a fine powder of common salt, and of vitriol diluted with water, is put into a large leaden vessel, nearly spherical, and provided at the top with a lid, which fits so as to be air-tight. From this top a leaden pipe passes into the lime chamber, where by this means the chlorine gas is conveyed as it is formed. The leaden vessel is cased in an iron one, a space being left between the two for the purpose of introducing steam to heat the materials after the process has continued for some time. At the beginning this is not required, because the chemical action goes on rapidly; but after the process has continued for some time, in order to decompose the whole of the salt, and disengage the whole of the chlorine gas, it is at last found necessary. Before the bleaching powder is applied to the cloth, it is dissolved in water; and the quantity employed for the first process consists of a solution of twenty-four pounds of the powder to sixty gallons of water. The specific gravity of the solution is 1.02, and the quantity necessary for 700lbs. of cloth is 071 gallons.

In cotton bleaching, the cloth is first boiled in lime-water, one pound of lime being necessary for thirty-five pounds of cloth. After being thus treated, it is carefully washed to remove the lime, and then subjected to the action of the bleaching powder. It is left in this cold solution about six hours, and then taken out and washed with water. The next part of the process is called *souring*, which is immersing the cloth in a solution of sulphuric acid, so diluted that it does not injure the texture of the goods, whilst it improves their colour. The sulphuric acid dissolves and removes the oxide of iron with which the cloth is always contaminated; it also removes the lime which may have attached itself to the cloth during its previous treatment with that substance. It is again washed, boiled in an alkaline ley, and once more carefully washed in cold water. Another solution of bleaching powder, two-thirds the strength of the former, is then prepared, in which the cloth is immersed, and left for five or six hours; it finally undergoes another process of souring, by which means it is rendered perfectly white. The acid is carefully removed by washing; and after each piece of cloth has been stretched to its full length, it undergoes a process of mangling, by being passed successively between cylinders forced towards each other by levers, to which a considerable weight is attached. The cloth being thus stretched, smoothed, and wound upon a roller, is rendered fit for *starching*. The starch is that of flour, deprived of its gluten by remaining for twenty-four hours in water, and then passed through a sieve, which retains the bran, and allows the starch to pass. A little indigo is mixed with it, and sometimes porcelain clay. The starch is applied in the state of a pretty thick paste whilst the cloth is passing between a pair of rollers. The goods are then dried, and passed through a calender for the purpose of giving them a gloss and texture.

Such is the process of bleaching as practised by the great bleaching establishments. The number of processes which the cloth undergoes amounts to about twenty-five, but some of the earlier ones are occasionally omitted. The expense of bleaching and finishing a yard of cotton cloth is about one halfpenny; and with respect to the time required, we state the following circumstance on the authority of Dr Thomson:—A bleacher in Lancashire received fourteen hundred pieces of grey muslin on a Tuesday, which on the Thursday following were returned bleached to the manufacturers, at the distance of sixteen miles, and on the same day they were packed up and sent to a foreign market.

The bleaching of linen is similar to the bleaching of cotton, but more difficult; hence the boiling in an alkaline ley, and the steeping in the solution of chloride of lime, must be repeated three or four times. In general, the linen is exposed to the sun's rays for some weeks, but this part of the process is not essentially necessary. The loss of weight which linen sustains during bleaching amounts to about one-third part of the whole goods; cotton scarcely loses one-tenth—a fact which proves the difference in the difficulty between bleaching the two kinds of cloth.

In the bleaching of wool, as that substance contains an oily matter, the first process is to cleanse it of that grease, by washing the cloth in an ammoniacal ley, which operation is called *scouring*. The ley is made by mixing five parts of soft water with one part of stale purified urine, which contains a considerable quantity of ammonia. This mixture is boiled for a short time, and allowed to cool to about 56°, when the wool is immersed in it. After being stirred for some

* Article *Bleaching* in the Encyclopædia Britannica.

time, it is taken out and rinsed, by exposure in baskets to a stream of running water. After this, the wool is sometimes carried to the fulling-mill, where it acquires an additional degree of whiteness. The above is chiefly employed for the coarser wools, and wool that has yet to be carded for the making of broadcloth; but for the finer kind, it is preferable to use a bath in which soap has been dissolved. The wool is separated into small parcels, immersed in the bath, washed, and dried; it is then deprived of all its natural oily matter by another scouring, after which it is combed before it gets quite dry. After combing, the wool sometimes undergoes several other washings, when the goods are wanted of a very delicate white. For the sake of economy, fullers have long been known to use a clayey matter, well known under the name of *fullers' earth*, which combines with the greasy matter, and renders it more soluble in water. But notwithstanding all this scouring and washing, before the wool can be brought to that brilliant state of whiteness which is frequently required, it undergoes a process called sulphuring, which is simply the exposing of the goods to the fumes of burning sulphur in a close chamber. The sulphureous acid destroys any colouring matter which remains, and the vapour itself is removed by washing. Properly scoured wool has its filaments smooth, long, and slender, white, perfectly free from foreign substances, and without having lost their natural tenacity. Dutch wool is generally considered the purest; the English is next in quality, but it is foulder and harsher than the former; the German is still more so, and the French is inferior to them all.

BLEACHING OF SILK.

Silk is bleached in two ways. By the first method, it is deprived of the yellow varnish which adheres to it in a raw state. By the second, this is retained, in order to give it that stiffness which is required for gauzes, blondes, &c. In the first process, the silk undergoes a scouring similar to that described as necessary for cleansing wool. For every hundred pounds of silk, thirty pounds of soap are dissolved in water, and boiled; but before the silk is put in, the solution must be cooled down to about 90°, at which temperature it is kept during the process. The silks are suspended in the liquor by rods or frames; and after the gum is destroyed, they are taken out, wrung, put into bags containing about thirty pounds each, and again steeped in a fresh bath, and boiled for two or three hours. After this the silks are wrung as before, and washed with water. The blue tinge of silk is imparted to it by litmus and indigo dissolved in a bath at 90°. A tolerably clear white is imparted to silk by these processes; but it receives its highest degree of purity by the action of sulphureous acid, either in the state of vapour, as formerly described, or, as is usually practised, by immersion in the diluted liquid acid.

Rags for the paper-maker are bleached by means of the bleaching powder, after having been well washed in an engine for the purpose. Yellow wax is now bleached white by being subjected for an hour or two to the action of chlorine gas. Chlorine has also been applied to the whitening and cleaning of prints, maps, books, and other articles of paper. For this purpose, simple immersion in liquid chlorine, letting the article remain in it a longer or shorter period according to the strength of the liquor, will be sufficient to whiten an engraving. When bound books are required to be cleaned, the leaves must be carefully separated, so that the liquid may act upon both sides of the whole of them; and the boards may be easily made to rest upon the sides of the vessel, so that only the paper enters the liquor. The latter assumes a yellow tint, and the leaves of the book become white in proportion. In three or four hours the process of whitening is completed, and the book is then plunged in pure water, for the purpose of extracting the acid and destroying the disagreeable smell. Chaptal, a celebrated chemist, first suggested this method of cleaning books and papers, and by it several of the most valuable works of the French national library have been restored.

DYEING.

Dyeing, in the limited and more proper signification of the term, is the art of imparting colours to wool, silk, feathers, cotton, or flax, or the thread or cloth formed of any of these substances. This art was practised at a very early period, and probably originated in Egypt or in India. In the time of Moses dyeing had made great progress in the former country. At a very remote era it had arrived at a state of high perfection in Phœnicia, and the *purple* of Tyre passed into a proverb. The dye used was extracted from certain species of shell-fish. The fine colours given to cotton cloths in India are well known; the methods of doing so are not modern inventions, but were practised in that country when it was visited by Alexander the Great. That conqueror had, we are informed by Pliny, transplanted the art into Greece. But it would appear that neither amongst the Greeks nor the Romans was it carried to any great degree of perfection. Amongst the moderns, the first attempt at methodical arrangement of the different processes was made in a work published at Venice in the year 1429. The art was greatly advanced by the introduction of indigo and cochineal into Europe, although the importation of the former substance was at first prohibited in England and other countries. The reason of these restrictions was, that pastel and woad, which were European productions, being employed for dyeing blue, it was supposed that indigo would supersede their use, and destroy one branch of native industry. Under the administration of Colbert, dyeing was greatly encouraged in France; but the revocation of the edict of Nantes, in 1685, was a fatal blow to the pre-eminence of France in the arts and manufactures. The most skilful workmen were driven from the kingdom, and carried their knowledge into Britain and other countries. As chemistry began to be more generally studied, and to assume the character of a distinct science, dyeing gradually advanced towards that high state of perfection in which we now find it. Within the last thirty years, great improvements have taken place, and many new dye-stuffs have been introduced; but we can only in this place give a brief view of the best methods of dyeing the most important articles, without adverting to the period at which the discoveries of the various processes were made.

A remarkable circumstance connected with dyeing is the different degrees of facility with which animal and vegetable substances imbibe the colouring matter applied to them. Tissues composed of the former, as silk and wool, receive more brilliant colours than those composed of the latter, as cotton and linen. The cause of this is unknown; it is usually ascribed to the superior attractive power of animal bodies for tinging matter, but still the interrogatory, what is the *cause* of this, remains to be responded to.

MORDANTS.

Although in a great many cases it is easy to impart colour to various tissues, yet when these become exposed to moisture, the dye-stuff is removed. It has therefore been found necessary to employ certain chemical substances, which shall have the property of permanently fixing the colour upon the body which is dyed. These substances have obtained the name of mordants (from the Latin word *mordere*, to bite), because they were supposed at first, figuratively speaking, to bite the dye into the cloth. The same name has also been applied to those preparations which possess the property of altering the shade or of heightening the colour, as it is called. The latter, at the suggestion of Berthollet, are sometimes termed *alterants*. The principal mordants are alumina, employed universally, we believe, in the form of a salt, as that of alum; the oxides of tin, employed like the former in the shape of salts; they are prepared by dissolving tin in muriatic acid. Silk and woollen dyers, however, employ nitric acid or aqua-fortis for forming the salts of tin which they use. The salts of lead and copper are likewise had recourse to as mordants, and the nut-gall, which contains two very peculiar vegetable substances, tannin and gallic acid, is not only employed as a mordant, but also as a powerful dye-stuff.

By varying the mordant, a great variety of shades may be derived from the same colouring matter. Indeed, the mordant itself, in many instances, supplies a colour. For example, in dyeing with cochineal, when the aluminous mordant is employed, the colour produced is crimson; but when oxide of iron is substituted for the alumina, a black colour is the result. The whole phenomena are accounted for on the principle of chemical affinity or attraction. The mordant employed should have an attraction both for the stuff to be dyed and the colouring matter, and act as it were like a third party in reconciling two inimicals. The way in which it is used must depend entirely upon the degree of affinity exerted between the stuff and the colouring matter. Where that is slight, the former should be saturated with the mordant before the latter is communicated. A knowledge of the chemical affinities and habits of the substances used is necessary before mordants can be had recourse to as a medium of union in imparting colour to cloths or other stuffs which we wish to dye; for by an indiscriminate use of them, results the very opposite of those anticipated may take place. Practice, or a thorough knowledge of chemistry, is essential to success.

It were impossible in this place to present a perfect account of the various methods of dyeing different stuffs of different colours; all we can do is to mention some of the most useful and important of them.

TO DYE RED.

The principal colouring matters used in dyeing red are madder, cochineal, kermes, lac, archil, carthamus, Brazil wood, and logwood. Madder is the root of a plant; cochineal is the name given to a small insect, a native of Mexico; kermes and lac are also animal substances; the remaining four dye-stuffs belong to the vegetable kingdom.

Wool.—In the dyeing of woollen goods a mordant is necessary; that one is employed which will produce the peculiar tint required. Coarse stuffs are dyed with madder, after being boiled for two or three hours in a solution of alum and cream of tartar; five ounces of the former and one ounce of the latter to each pound of wool is recommended, but the proportions are varied according to the shade of colour wanted. The quantity of madder used varies very considerably. Some employ one-third of the weight of the wool; others use more or less, according to circumstances. In dyeing with madder, the bath should not be boiling. When it is at a temperature which the hand can bear, Hellot recommends the addition of half a pound of grape madder for every pound of wool to be dyed. It must be well stirred before the wool is introduced, and must remain an hour without boiling.

Scarlet is the finest and most splendid of all colours, and is communicated to woollen stuffs by means of cochineal. They are first boiled in the following manner:—For one hundred pounds of cloth, six pounds of pure tartar are added to the water, which is made pretty warm. After being stirred and heated a little more, half a pound of powdered cochineal is introduced, and the whole is then well mixed. As the bath begins to boil, the cloth is introduced, and boiled for two hours, when it is taken out, washed, and again put into the bath, which has in the meantime been emptied and replenished with five pounds and three quarters of cochineal. When a crust has formed upon the surface, after the stirring has ceased, a quantity of the solution of tin (some use twelve or fourteen pounds) is poured in. The cloth is boiled for an hour, then withdrawn and washed. A shorter process is, not to remove the cloth in the first instance, but merely to refresh the bath with a new supply of ingredients. To impart to scarlet a bright fiery red, a little turmeric may be added to the cochineal; to increase the brightness of the hue, a little common salt is used, and sometimes a small quantity of quercitron bark. Every shade of scarlet may be obtained by varying the proportions of the ingredients. To dye crimson by a single process, a solution of two and a half ounces of alum, and an ounce and a half of tartar, for every pound of stuff, is employed for the boiling; and the stuff is afterwards to be dyed by an ounce of cochineal. It is usual also to employ a solution of tin, but in smaller proportions than those required to produce scarlet. Archil and potash deepen the colour of crimson, but the bloom imparted is extremely fugacious. Different substances, such as the alkalis, alum, and earthy salts in general, convert the colour of scarlet to crimson, which is the natural colour of cochineal. For dyeing fine woollen cloth, the lac dye is commonly used. It contains less colouring matter, but it is a great deal cheaper than cochineal. The tin mordant used is made by dissolving two ounces of tin in thirty pounds of aqua-fortis, mixed with one pound of muriatic acid.

Dyeing of Silk.—Silk may be dyed red in the following manner:—Half a pound of alum is to be dissolved in each quart of hot water employed, and two ounces of potash are afterwards to be added. When the liquor has become clear, the silk is put in, and kept there for two hours; it is then taken out and put into a madder bath. By the following process, a fine crimson hue is imparted to silk:—The silk is cleaned by washing and beetling. The bath is prepared by filling a large boiler two-thirds with water, to which are added, when it boils, from half an ounce to two ounces of powdered white galls for every pound of silk. When it has boiled for a few seconds, from two to three ounces of powdered cochineal for every pound of silk are put in, and afterwards one ounce of tartar to every pound of cochineal. After the tartar is dissolved, one ounce of solution of tin is added for every ounce of tartar. For the solution of tin, Macquer (a great French chemist) recommends the following proportions:—For twelve ounces of water there should be one pound of nitric acid, two ounces of sal ammoniac, and six ounces of fine grain tin. When these ingredients are mixed together, the boiler is to be filled up with cold water; and the proportion of the bath for every pound of silk is about eight or ten quarts of water. In this the silk is immediately immersed, and turned on the winch till it appear to be of a uniform colour. The bath being kept boiling for two hours, the fire is then put out, and the silk removed to the dye-bath, where it remains a few hours longer; then it is taken out and washed. Various shades of red are produced by employing carthamus. A scarlet colour is obtained by soaking silk for two hours in a solution of murio-sulphate of tin, diluted with five times its weight of water. After being partially dried, it is immersed in a bath prepared with four parts of cochineal, and three of quercitron bark. If the latter dye-stuff is omitted, a rose-colour will be obtained.

Cotton and Linen.—The processes of dyeing these two vegetable products are the same. The brightest and most substantial red is that called Turkey red. The cloth, after having been steeped in a weak alkaline ley, is put into a liquor composed of the following ingredients:—One gallon of Gallipoli oil; one and a half gallons of soft sheep dung; four gallons of solution of carbonate of soda of the specific gravity 1.06; one gallon of solution of pearl-ash of the specific gravity 1.04; cold water being added so as to make twenty-two gallons. After the cloth is dried and steeped in a weak solution of pearl-ash, it is immersed in a ley somewhat similar to the preceding, which process is repeated thrice, then washed in a mixed ley of pearl-ash and soda. Galling is the next step. Let eighteen pounds of Aleppo galls be boiled in twenty-five gallons of water, till the whole is reduced to twenty gallons; this is sufficient to impregnate one hundred pounds of cloth; after this, it undergoes a process of aluming. To a solution of alum in water, of the specific gravity 1.04, as much pearl ash, soda, or chalk, is added as is sufficient to precipitate the alumina contained in the alum. Through this muddy liquor, which should have a temperature of from 100° to 120°, the cloth is steeped and pressed for twelve hours. By this means the cloth becomes readily impregnated with the alumina, after which it is stove-dried, and then put into the dyeing-bath. From one to three pounds of powdered madder for every pound of cloth is employed, the quantity being determined by the shade of colour wanted. The cloth is put into the boiler when cold, and boiled for two hours. For every twenty-five pounds of cloth dyed, one gallon of bullock's blood is indispensably requisite for obtaining a fine red colour. The cloth then undergoes a *clearing process*, as it is called, by being boiled for twelve hours or so in one of the saponaceous leys formerly employed. Lastly, it is boiled under a pressure of two atmospheres, in a solution consisting of six pounds of soap and about eighteen ounces of proto-chloride of tin. Such are the several processes by which this beautiful and permanent colour is fixed on cloth. The scarlet and crimson hues are imparted to cotton and linen by means of cochineal, but they are by no means permanent.

DYEING YELLOW.

The principal colouring matters used in dyeing yellow are weld, fustic, catechu, annotto, and quercitron. Weld is the dried leaves of a plant that grows wild in Britain, and different other European countries; fustic is the wood of a West India tree; catechu is obtained from certain East India plants; annotto is the product of an American berry; and quercitron is the bark of a large tree which grows spontaneously in North America.

To Dye Wool.—A pure and permanent yellow is obtained by dyeing woollen stuffs with weld, the mordants being alum and tartar. The boiling is to be conducted in the usual way, as already described under the head dyeing of red. According to Hellot, four ounces of alum [illegible] one ounce of tartar are to be employed. From [illegible] four pounds of weld may be allowed to every pound of stuff. The addition of common salt or sulphate of lime to the weld, communicates both a richer and deeper colour. By boiling the stuff two hours, with one-fourth of its weight of a solution of tin, and the same proportion of tartar, and then washing and boiling it with the same proportion of weld, a fine yellow is obtained. Different shades are produced either by the addition of other substances, or by varying the proportions of those above mentioned. Equal weights of quercitron bark and alum, boiled in a suitable proportion of water, form a cheap and excellent yellow dye. The colour may be heightened by passing the cloth through hot water impregnated with fine chalk. To obtain the most permanent colours, the stuff should be boiled for about an hour with one-seventh of its weight of alum dissolved in a proper proportion of water. The stuff is then to be immersed in the dyeing-bath, and turned through the boiling liquor until the proper colour is obtained. A little clean chalk added to the bath a short while before the operation is discontinued, will be found to improve the colour.

Orange yellow is produced in a short space of time, by making a bath of hot water, and putting in ten pounds of quercitron bark for every hundred pounds of stuff, and after a few minutes adding eight or ten pounds of murio-sulphate of tin. Golden yellow, and the various other shades of yellow, may be produced by varying the above-named substances; a greenish tinge may be imparted by the addition of a little tartar or verdigris, dissolved in vinegar. The colours produced by quercitron bark are very durable.

Dyeing Silk Yellow.—Weld was the only substance formerly employed to dye silk yellow; but Dr Bancroft informs us that all the shades of yellow may be imparted to it by means of quercitron bark. From one to two pounds of powdered bark for every twelve pounds of silk is put into the dyeing-vat while cold, and when heated to 100°, the silk, having previously undergone an aluming process, is to be immersed and dyed in the ordinary way. Pearl-ashes deepen the shade, and a little murio-sulphate of tin produces a more lively yellow. Silk is dyed of an orange shade by employing annotto; but the stuffs must be reddened with vinegar or alum. These colours, however, are not permanent.

Dyeing Cot[illegible]d Linen Yellow.—Amongst the various methods of dyeing cotton yellow, we can only afford the following one by Dr Bancroft, and it is one of the best:—One pound of sugar of lead is to be dissolved in a sufficient quantity of warm water. The cotton or linen, after being properly rinsed, is to be soaked in this mixture, heated to the temperature of 100°, for two hours. It is then taken out and moderately pressed over a vessel, to prevent the waste of the aluminous liquor. It is then dried by stove heat, and after being again soaked in the aluminous solution, it is wrung out and dried a second time. Without being rinsed, it is to be barely wetted with lime-water, and afterwards dried; and if a full, bright, and durable yellow is wanted, it may be necessary to soak the stuff in the diluted aluminous mordant, and after drying, to wet it a second time with lime-water. After it has been soaked for the last time, it should be well rinsed with clean water.

In the preparation of the dyeing-bath, from twelve to eighteen pounds of powdered quercitron bark are inclosed in a bag for every hundred pounds of the stuff, the proportions being varied according to the shade required. The bark is put into the water whilst it is cold; the stuff is then immersed, and the heat slowly increased till the bath boils, at which temperature the stuff must only remain for a few minutes. It is then taken out, rinsed, and dried.

In the East, a plan similar to that followed in dyeing Turkey red is practised. After the usual preliminary steps are taken, the cloth is dyed with quercitron bark. In this country, these processes can be superseded, and as beautiful and permanent a colour given to cotton by impregnating it with acetate or nitrate of lead, and then passing the cloth through a solution of bichromate of potash.

DYEING BLUE.

The grand dye-stuff used for imparting a blue colour to cloth is indigo, which is a vegetable product of India.

Wool.—Into a vat put four hundred pounds of pastel or woad (which, before the introduction of indigo, was the substance used in dyeing blue), and let thirty pounds of weld be boiled in a copper vessel for three hours, in a sufficient quantity of water to fill the vat. Add to the decoction twenty pounds of madder and a basketful of bran. Continue the boiling for half an hour longer, then cool the copper with water, take out the weld, and after the liquid has settled, pour it into the vat, which is stirred for half an hour, and then covered up in a hot state, and allowed to remain so for six hours. It is then uncovered, stirred again for thirty minutes, which process is repeated every three hours until blue streaks appear on the surface, when eight or nine pounds of quicklime are added, and from ten to thirty pounds of indigo, according to the intensity of the hue required. The vat stands several days, and great care must [illegible] taken to cover it closely up, and to put in a proper [illegible]antity of lime; if too much lime be added, the necessary fermentation is retarded; and if there be too little, the putrifactive process commences.

Into a dyeing solution prepared as above described, the stuff to be coloured is put after having been wetted with pure water a little heated; there it is moved about until the proper tinge required is imparted to it.

To produce a Saxon blue colour on woollen stuffs, they are prepared with alum and tartar, and in proportion to the shade required the quantity of solution of indigo put into the bath must be regulated.

Silk.—Silk is dyed blue with indigo alone, without any woad. It is first boiled with soap, and well cleaned with repeated beetlings in a stream of water. Only small portions should be immersed in the bath at a time, and the silk, when taken out, should be put upon a frame kept constantly in motion. To produce Turkey blue, a strong bath of archil or cochineal is prepared, and the cloth passed through it. A blue is given to silk by means of verdigris and logwood, but it possesses little durability.

Cotton and Linen.—Of the various processes of dyeing these stuffs, the following simple one is followed at Rouen in France. The vats, which are constructed of a kind of flint, are coated within and without with fine cement, and are arranged in one or more parallel lines. Each vat contains four hogsheads of water. The indigo, to the amount of eighteen or twenty pounds, being macerated for a week in a caustic ley strong enough to bear an egg, is ground in a mill; three hogsheads and a half of water are put into the vat, and afterwards twenty pounds of lime. The lime being thoroughly slaked, the vat is raked, and thirty-six pounds of copperas are added; and when the solution is complete, the ground indigo is poured in through a sieve. It is raked seven or eight times the same day; and after being left at rest for thirty-six hours, it is in a state fit for dyeing. The colour denominated English blue is produced by the solution of indigo in sulphuric acid. This compound, improperly called sulphate of indigo, has hitherto only been used in dyeing wool and silk, and cannot advantageously be applied to cotton or linen.

DYEING BLACK.

The principal substances which are employed to give a black colour are gall-nuts, which contain tan, and the red oxide of iron. Oak bark, which contains the same astringent principle, has been used, especially in dyeing hats. Logwood is employed to give a lustre to black colours. The black colour is produced by the combination of the astringent principle with the oxide of iron held in solution by an acid, and fixed on the stuff.

Wool.—English dyers use the following proportions of ingredients in dyeing wool black:—For every hundred pounds of cloth previously dyed a deep blue, about five pounds of sulphate of iron, five pounds of galls, and thirty of logwood, are necessary. The first step in the process is to boil the cloth in galls, after which it is passed through the decoction of logwood, to which the sulphate of iron has been added. It is then washed in a river, fulled, and dried.

Silk.—In dyeing silk black, it is first boiled with soap; then with three-fourths of its own weight of galls for three or four hours; after this the liquor remains at rest for two hours; the silk is then put into the bath, where it lies from twelve to thirty-six hours, and is then taken out and washed. To communicate what is called heavy black, silk is allowed to remain longer in the gall liquor. The bath should al[illegible]ays be kept below the boiling point; and the gum and solution of iron are added to it in proportions varying, according to the different processes. To remove the harshness which attaches to silk after it has been dyed, it is washed in a soapy solution. Velvet is dyed black in much the same manner.

Cotton and Linen.—After undergoing galling, these stuffs are put into a bath containing iron liquor, which is a solution of iron in acetic acid. Five quarts of this liquor for every pound of stuff is requisite. The cotton is wrought with the hand, pound by pound, for fifteen minutes, and then taken out, wrung, and aired. The operation is repeated, a fresh supply of liquor having been put in, after which the stuffs are taken out. In the next operation, a pound of alder bark for every pound of stuff is boiled in a sufficient quantity of water for an hour. One-half of the bath which was employed in the galling, and about one-half the quantity of sumach as of alder bark, are then added. The whole is boiled together for two hours, and strained through a sieve. When this liquid is cold, the stuffs are immersed, wrought pound by pound, and occasionally aired. They are afterwards put into the bath, and after remaining for twenty-four hours, are wrung out and dried. The above is a process, which, according to D'Apligny, is followed at Rouen for dyeing cotton and linen. The process followed at Manchester, though it differs from the above in some respects, is upon the whole so nearly similar to it that we need not detail it in this place.

DYEING BROWN.

A great number of vegetable substances are capable of producing a fawn or brown colour on different stuffs, but those mostly used are walnut peels and sumach. The peels constitute the green covering of the nut; they are internally of a white colour, which is converted into brown or black by exposure to the air. Sumach is a shrub produced naturally in several parts of Asia and Europe. Bark of birch, sandalwood, or soot, are likewise capable of producing a fawn or brown colour.

Berthollet made a number of experiments to ascertain the difference of colour obtained from the simple decoction of walnut peels and the addition of metallic oxides as mordants. The oxide of tin, he found, yielded a clearer and brighter fawn colour than that of the simple decoction. The oxide of zinc produced a still clearer colour, inclining to ash or grey. The colour from oxide of lead had an orange cast, while that from oxide of iron was of a greenish brown.

A fawn colour which has a shade of green is obtained from sumach alone; but to cotton stuffs which have been impregnated with printers' mordant or acetate of alumina, sumach communicates a good and durable yellow.

Such is a view of the most approved methods of dyeing the simple colours, and compound ones are formed by mixtures of them, and different shades are obtained by different proportions. Mixtures of blue and yellow form green; and to dye green, the stuff is first immersed in one of these colours, and then in the other. By the mixture of red and blue, there are obtained violet, purple, dove-colour, lilac, and a great variety of other shades. Yellow and red form orange, and by the mixture of black with other colours, brown, grey, hazel, puce colour, marone, and other dyes, are produced.

CALICO PRINTING.

Calico printing is the art of impressing different colours to particular parts of the surface of cloth, chiefly cotton and linen, whilst the rest of the fabric is allowed to retain its white colour, or any other colour which may have been communicated to it, as blue or yellow. There are two methods of doing this; first, by block printing; and, secondly, by cylinder printing. The former is a very ancient invention. The figure which we wish to communicate to the cloth is cut upon a block of sycamore; thus making in fact a large woodcut. For fine lines, pieces of copper are ingeniously indented in the block. The cylinder is a large circular copper plate, being a circular ruler several feet long, and several inches in diameter, upon which the different figures to be given to the cloth are engraved. A circular motion is given to it, by which means the whole of these figures are impressed upon the cloth as it moves under the cylinder. In every case the treatment of the goods is nearly the same.

In general, the printing process is applied to fixing mordants on the cloth, which is afterwards dyed in the usual way, those parts which have received the mordant only retaining the colour, the other remaining white. In some cases the colour is removed from certain portions of cloth already dyed, so that they may either remain white, or receive some new colour afterwards. Sometimes it is applied to cloth before it is dyed blue, in order to prevent the indigo from being fixed on those parts to which it is applied, that they may remain white, or receive other colours afterwards. Substances possessed of this property are called resist-pastes. Lastly, it is frequently employed to communicate mordants and colouring matter at once to cloth. As the mordants employed for different dye-stuffs, and the substances which are had recourse to for producing the different colours, have already been amply detailed under bleaching, it is unnecessary to recapitulate what has been already stated, or enter further into detail in this place.

SOAP-MAKING.

The well-known and useful article soap is a compound of certain principles in oils, fats, or resin, with a salifiable base. If this base be potash or soda, the compound is used as a detergent in washing clothes. When an alkaline earth, or oxide of a common metal, such as lead, which forms litharge, &c. is the base, the compound is insoluble in water. The insoluble compounds, however, are very little used, except in some few cases of surgery. Dr Ure thus writes of soaps and saponification:—

"Fats are compounds of a solid and a liquid substance, the former called *stearine*, the latter resembling vegetable oil, and therefore called *elain*. When fat is treated with a hot ley of potash or soda, the constituents react on one another, so as to generate the solid pearly matter, *margaric acid*, and the fluid matter, *oleic acid*, both of which enter into a species of saline combination with the alkali; while the third matter that is produced, the *sweet principle*, remains free. We must therefore regard our common soap as a mixture of an alkaline margarate and oleate, in proportions determined by the relative proportions of the two acids producible from the peculiar species of fat. It is probable, on the other hand, that the soap formed from vegetable oil is chiefly an oleate. No chemical researches have hitherto been made known on the compounds of resin with alkalis, though these constitute the brown soaps so extensively manufactured in this country. All oils or fats do not possess in an equal degree the property of saponification." In general, the only soaps employed in commerce are those of olive oil, tallow, lard, palm oil, and rosin.

Olive Oil Soap is thus manufactured:—To one hundred parts of olive oil, twenty parts of that of rape-seed are added. These require about fifty-four parts of the soda (barilla) of commerce, and three parts of barilla require one of quicklime. After bruising the soda and slaking the lime, they are mingled, and cold water is poured upon the mixture. This is run off at the end of twelve hours, and is called the first ley. Two other leys of a weaker description are successively obtained from it. After a sufficient quantity of ley is made, the soap-boiling commences. Large boilers are used, which have in all cases a pipe at the bottom, two inches and two-thirds in diameter, called the thorn (*epine*, French). Weak ley is first put into the boiler, then the oil is gradually added, and the mixture boiled. After the combination is effected, which is in a short while, the fire is tempered, and weak ley and oil successively added, taking care to keep the mass in a state of equal consistency throughout. When all the oil which we wish to saponify has been poured in, some strong ley is slowly added, which completes the saturation of the oil, converting the emulsion with an oily excess into a perfect soap, which separates from the ley and floats upon the surface. The ley is withdrawn by the pipe; fresh leys are added, and the fire rekindled, by which means the perfect saturation of the oil with alkali is effected. The soap is of a blue colour, and is converted into white, by mingling it gradually with dilute leys, and applying a gentle heat, allowing deposition to take place with a covered boiler. It is now taken out and run into wooden frames, where it hardens in cooling. From these it is finally removed and cut into bars. This soap is known in France under the name of soap in tables (*savon en table*), and, according to M. Thenard, it consists of soda 4.6 fat matter 50.2, water 45.2 in 100 parts.

Hard Soap is made in Scotland chiefly with kelp and tallow That crude alkali rarely contains more than from one to five per cent. of free soda, mixed with some sulphate and hydrosulphate, and nearly thirty-three per Cent of muriate of soda. To every ton of kelp broken into small fragments, about one-sixth of new-slaked lime is added. The whole after mixture is put into a large tub called a cave, having a perforation at the bottom, shut with a wooden plug. Upon the materials water is very slowly poured. The liquid, after digestion, is suffered to run slowly off into a reservoir sunk in the ground. The first portion, or ley No. 1, is of course the strongest, and is reserved for the last operation in soap-boiling. Six days are required to make one boiling of soap, in which two tons or upwards of tallow may be employed. The leys 2 and 3, mixed, are used at the beginning diluted with water, on account of the excess of sea-salt in the kelp. A quantity of ley, not well defined, is poured on the melted tallow, and the mixture is boiled, a workman agitating the materials to facilitate the combination. The fire being withdrawn, and the aqueous liquid having subsided, it is pumped off, and a new portion is thrown in. A second boil is given, and so on in succession. Two or three boils are performed every twelve hours, for six days, constituting twelve or eighteen operations in the whole. Towards the last, the stronger ley is brought into play. Whenever the workman perceives the saponification perfect, the process is stopped, and the soap is lifted out and poured into the moulds.

Soft Soaps.—The compounds of fats or oils with potash, remain soft, or at least of a pasty consistency. There are three kinds known in commerce—the soaps from rape-seed and other oleaginous seeds, called green soaps; those made with hogs' lard, called toilette soaps; and the common soft soaps made with fish oils. We can only afford space for an account of the method of manufacturing the latter, as practised by an eminent soap-boiler near Glasgow. Whale or cod oil to the amount of two hundred and seventy-three gallons is put into a boiler alongst with four hundred-weight of tallow, and two hundred and fifty-two gallons of potash ley. On heat being applied, the mixture froths up very much, but means are adopted to prevent its boiling over. There are then added at intervals fourteen measures of stronger ley, each measure holding twenty-one gallons. After suitable boiling without agitation, the soap is formed, amounting in all to one hundred firkins of sixty-four pounds each, from the above quantity of materials.

TANNING.

Tanning is the art by which the hides and skins of animals are converted into leather, by being macerated with lime and water, to promote the separation of the hair and wool, and of the fat and fleshy parts, and then saturated with certain astringent principles, particularly the bark of the oak-tree, which contains the vegetable principle called tannin. The process, though it may be shortly described, is long and laborious. The hide, which consists for the most part of gelatin, is deprived of its hair, fat, &c. by being soaked in water, handled and trodden, and then immersed in milk of lime. Some use an acescent infusion of barley or rye meal, or spent tan, instead of lime, and others recommend the application of sulphuric acid in a very dilute state. Similar acidulous waters are made use of to raise or swell the hide when this is required. The hides are then put into a cistern made in the ground, alongst with ground oak-bark, the whole being disposed in regular layers, covered with half a foot of tan, and well trodden down. A little water is found to accelerate the tanning. Sir H. Davy recommends the slow tanning of leather, and the application of weak infusions of bark. By this treatment it appears that the leather is softer and stronger than when it is tanned by strong infusions.

POTTERY.

Pottery is intimately connected with chemistry, not only on account of the nature and preparation of the materials of which vessels are formed, but also from the way in which they are fired and glazed, and colours and engravings applied to them. The art, as may be inferred from its close connection with the most common processes of domestic economy, is of the very highest antiquity; but instead of describing either the bricks of Babylon, or the exquisitely fashioned vases of Greece or Egypt, and tracing from age to age, and from clime to clime, the various steps of improvement by which it has arrived at its present state, we prefer giving a brief view of the methods of manufacture as now practised in Britain. The chief ingredients used in the composition of all kinds of pottery are alumina and silica, or clay and flint. The clay principally used in the potteries of Staffordshire, an English county famous for its manufactures of this description, is brought from Dorsetshire and Devonshire, the former being considered as the best for the potter's use. These clays are each of two kinds: that of Dorsetshire is distinguished into brown clay and blue clay; that of Devonshire into black clay and cracking clay. The good qualities of brown clay are, that it burns of an excellent white, and is not liable to crack during the process of burning. It is subject, however, to an imperfection, technically called crazing; that is, cracking of the glaze. Blue clay is incomparably the best of them all. It burns very white, forms a solid species of ware, and combines with the greatest quantity of siliceous earth, for upon this depends the whiteness of the ware; the limit to the use of flint being the inability of the clay to bear it in combination beyond a certain proportion without cracking. Black clay owes its distinctive character to the presence of coaly matter, which, however, dissipates during the firing, and leaves the articles of which it is composed of a good white. Cracking clay is so called, because it is liable to crack during the first application of fire; but the goods made of it are of an extreme whiteness. A species of clay found in Cornwall, and denominated China clay, is much prized for the manufacture of the finer kinds of earthenware and porcelain; and steatite, or soapstone, has of late years been much used for the same purpose.

The first operation is to mix the clay in the purest water to the consistence of cream. In large establishments this is done in the most effectual manner by means of machinery. The pulp is then run through a series of sieves of increasing degrees of fineness, which are worked to and fro by machinery; thus the clay is refined as well as more thoroughly mixed. Flint is first burnt, and then pounded to small pieces, and ground fine in a mill with water. The dilution of clay is considered of the proper consistency for mixing when a quantity that will fill a pint measure weighs twenty-four ounces; and that of the flint is held equally suitable for use when the same bulk of it weighs thirty-two ounces. It is by a comparison of their relative densities that the manufacturer is enabled to ascertain the real proportions of the materials, and to combine them in the degrees which his experience leads him to employ for the composition of various kinds of pottery; and too much nicety can hardly be given to this important part of his labours. After this the mixture is passed through sieves, deprived of its impurities, and brought to a state of uniformity and homogeneousness throughout. It is then slowly dried on flues to the consistency of paste, cut into pieces of a moderate size for lifting, and well incorporated together or tempered, as well as deprived of its air-bubbles, by being beat with wooden mallets, and otherwise wrought. It should then be allowed to remain in a mass for a considerable time. What the relative proportions of clay and flint in pottery are, it is scarcely possible to state. Each manufacturer has his own, which he considers the best, and accordingly keeps a profound secret from every body. Vauquelin informs us that silex forms at least two-thirds of all kinds of pottery; alumine from one-fifth to one-third; lime from 1-500th to 1-2000th part; and iron from the smallest quantity up to twelve and even fifteen per cent.

After the clay has been brought to a proper state of consistency, it undergoes the operation of throwing; that is, it is shaped into vessels of a circular form by a machine called a potter's lathe. The piece of clay is placed upon a piece of wood, which is made to wheel round by a simple piece of machinery driven with the hand; and as it revolves, the potter forms it into a vessel of the proper shape wanted. The article is then partially dried for a day or two, and receives a further smoothing and polishing on the turning-lathe of the potter, which is exactly similar to that used by the turner of wood. Knives and other instruments are employed for paring and smoothing the vessel; and at this stage of the process it is furnished with handles, spouts, and other requisite appendages. For making circular dishes, plates, saucers, or shallow bowls, a plaster mould is placed upon the first lathe, and the articles are formed upon it. Ornamented spouts and handles are formed by being cast in two moulds of plaster of Paris, one-half of the figure being impressed in each of the moulds, which must fit exactly. Small ornaments in relief, which project on the sides of vessels, are first cast in moulds, and then fixed on by the parts which are to be united being moistened. The moulds used for plates, and various other kinds of dishes which are formed by pressing, are simple in their construction; but others which are used for the third department, that of casting, require much skill for their invention and execution. Casting is performed by pouring the mixture into the mould, whilst the former possesses the consistency of cream. The plaster of Paris, which has a remarkable affinity for water, quickly absorbs the liquid, and a coating of clay remains in the mould; another portion of dilute clay, but of a firmer consistency than the former, is poured in after the first has been allowed to dry; and the mould is then set in a stone, and the article removed from it when sufficiently dry to admit of separation.

Firing and Glazing.—After the vessels are brought to a state when they can undergo the first process of firing, they are placed in circular boxes made of fire-clay, called *seggars*, and which are capable of standing the most intense degree of heat without being fused. Their office is to protect the ware from the direct application of flame, and from smoke; by this means, also, the heat is more uniformly applied. Methods are adopted to keep the articles in the seggars separate from each other. A great number of these are arranged together in a cylindrical oven; and here they are baked for about fifty hours, then gradually cooled. From the similarity of its appearance to well-baked ship bread, the ware is now called *biscuit*, in which state the substance which is to impart the glaze is applied to it. It is then put into what is called the glass oven, disposed in seggars in the same way as formerly, and fired, till, by the fusion of the substance with which the vessels have been covered, they acquire a glazed surface. The glaze usually employed for common kinds of earthenware is compounded of litharge of lead and ground flints, in the proportion of ten parts by weight of the former to four parts of the latter. This mixture is called the raw glaze, and is given to vessels by their being dipped in a solution of it, of the consistency of cream, and then sent to the oven, as already described. The glazes are varied to suit the different materials of which the ware is formed, and every manufacturer has his own. Those for porcelain and the finer kinds of earthenware are generally made with white lead, ground flints, ground flint-glass, and common salt; Lynn sand, combined with soda as a flux, being frequently added. The different colours observable on the outer surface of drinking-jugs and other articles, is owing to the partial use of a glaze, the part to which this is applied becoming dark in the heat of the kiln, whilst the glazing of the light-coloured portion is caused by the introduction of salt. This acts in a similar manner to a mordant, as described under dyeing.

Painting and Engraving.—So refined and philosophical is now the process by which painting on earthenware is effected, that in some measure it deserves the name of a science. Metallic oxides form the bases of all vitrifiable colours; but they must be combined with a flux to promote their fusion, and the composition of the flux varies according to the means employed for diluting the colours at the time they are used. Where a volatile oil is chosen for this dilution, a flux composed of glass, nitre, and borax, is most proper; but when gum-water is substituted for this oil, a compound of glass, lead, and silex, is preferable. The former menstruum consists of powdered glass, forty parts; calcined borax, twenty-two parts; and refined nitre, forty-four parts. These ingredients are pounded in a mortar, and then fused into a mass in a crucible. By this flux the colours are fixed upon the porcelain, and made to assume a resplendent appearance; the metallic oxides being enveloped by the flux, are preserved from all contact with the air, and their colour is rendered permanent; the fusion taking place at a temperature too low for their destruction. Metallic oxides which would have their colours altered by a strong or often repeated heat, are employed after being mixed with their flux, but without having been previously fused with it. In many cases metallic oxides are first fused with the requisite proportion of their flux, and are then ground for use.

Enamel is glass made opaque by the oxide of tin, and made fusible by the oxide of lead. All glasses that contain lead participate in the properties of enamel. Raw glasses used for covering tender porcelain are of this nature. The colours employed in painting this porcelain are those which serve for painting in enamel; they require less flux than others, because the surface to which they are applied becomes soft enough to be penetrated by them. Hard porcelain, whose nature is identical with those of China and Saxony, has two kinds of colours applied to it. Those of the first kind, which are used in the representation of different objects, are baked by a heat much below that necessary for porcelain; whilst the other colours, which are few in number, must be exposed to the highest degree of temperature required by the porcelain itself. The glaze used for hard porcelain has little lead in its composition. In some manufactories feldspar instead of lead is employed. We may now shortly describe how the different colours are produced. Purple and violet colour are obtained by dissolving gold in aqua regia, and immersing a bar of pure tin in the solution. Violet colour is likewise made with the purple oxide of gold, requiring the presence of some portion of lead in the flux, for the developement of this shade. Red oxide of iron, prepared by the united action of fire and nitric acid, yields a red colour, which, although beautiful, is less so than that produced from gold. A very permanent red colour is obtained by calcining the oxide of iron with double its own weight of common salt. To obtain a *yellow* colour, white oxide of antimony, mixed with sand and oxide of lead, are employed, the latter substance serving as a flux to the others. Blue colours are obtained from cobalt; green from copper; black from iron; straw colour from chromium; Naples yellow from antimony and lead. By a mixture of the different kinds of oxides, a great variety of shades may be obtained.

The process of transferring printed designs to earthenware, may be shortly described. The landscape or pattern is engraved on copper, and the colour, which is mixed with boiled linseed oil, is laid on the plate in the same manner as ink is applied by copperplate printers. To increase the fluidity of the oil, the plate is then temporarily placed in a stove, a sheet of damped tissue paper is laid on it, and both are passed in the ordinary manner through the press. The paper wet with the colour is then reduced in size, by cutting away the blank part surrounding the pattern, and applied to the ware when in the state of *biscuit*. The paper after being well rubbed, so as to press the colouring matter into the article, is removed after having been dipped in a cistern of water. It comes easily off, leaving the impression entire. The ware is then placed in an oven for the purpose of dissipating the oil, preparatory to its receiving the glaze.

The great excellence of the porcelain manufactured in China is proverbially well known. The inhabitants of that country employ in the composition of this article two kinds of earths, and two oils or varnishes. Of the earths, one, which is called kao-lin, is found intermixed with particles of a shining substance resembling mica; the other is known by the name of pe-tun-tse, and is of a brilliant white, exceedingly fine in its grain, and soft to the touch. The two substances described as oil or varnish are procured, one from a combination of pe-tun-tse with another mineral substance, and the other from lime. It is the kao-lin which gives strength and body to the porcelain. Its constituents are found to be, silica, 52.; alumina, 42.; oxide of iron, 0.33. It would be useless to detail the processes by which the Chinese manufacture their ware, as they are nearly similar to our own. For the finest porcelain, equal quantities of the two minerals are intimately mixed in the usual way; and kao-lin is diminished, to form a coarser description of ware. The manufactories are of great extent, and the heat employed in baking and glazing the articles is immense. The designing of the Chinese is most execrable. Any blind asylum in Europe could produce better artists than they appear to possess.

GLASS-MAKING.

Glass is a substance too well known to require definition. Many authorities concur in assigning the merit of the invention to the Phœnicians, and the discovery, as indeed is very likely, has been attributed by Pliny to accident. The ancient Egyptians were well acquainted with the manufacture of this substance; and the glasshouses of Alexandria were long famed for the skill and ingenuity displayed by their workmen. Some are of opinion that glass-making was known to the *Druids of Britain*, but it would appear that our regular instructors in this art came from beyond seas in the seventh century, for the purpose of glazing the windows of the church and monastery of Weremouth in Durham. But the art made only slow progress amongst us; it has now, however, been brought to a high state of perfection, and is a source of considerable national revenue.

The glass of commerce is always composed of some silicious earth, the fusion and vitrification of which has been occasioned by certain alkaline earths or salts, and sometimes by the aid of metallic oxides. There are five qualities of glass:—*First*, flint-glass or crystal; second, crown or German sheet glass; third, broad or common window-glass; fourth, bottle or common green glass; and fifth, plate-glass. In giving an account of the methods of manufacturing these several compounds, one remark we shall make, which applies to the whole of them. Whilst the general processes may be depended upon as pretty nearly the same for each, the proportions of the ingredients used by different manufacturers for forming the same kind of glass vary very considerably. As we observed with respect to earthenware, each has his own recipes, and considers them as infinitely superior to those of other brethren of the trade. One fact, however, may be relied upon as essential to every kind of glass, the presence of silica and an alkali. The latter is used in the form of a carbonate, the carbonic acid flying off during the manufacture, and the result being a compound of the two substances mentioned. The variations of quality and distinctive differences observable in glass, principally result from the kind of alkali employed, and its degree of purity, as well as from the addition of other necessary ingredients, such as nitre, oxide of lead or of manganese, white oxide of arsenic, borax or chalk. Nitre, which is used in small proportions, is employed for the purpose of destroying any carbonaceous matter which may be present in the other materials. This salt is added previous to the fusion of the glass. At a degree of heat much below that of the furnace, nitre decomposes, giving out a great quantity of oxygen, which maintains the metallic oxides in their highest states of oxygenation. It is thus of use in fixing arsenic, the volatile property of which increases as it approaches the metallic state. Oxide of lead, either in the form of litharge or red lead, enters largely into the composition of flint-glass. This metal acts, in the first place, as a most powerful flux; and it also imparts valuable properties to the glass, of which it forms a part, rendering it more dense, more tenacious when red-hot, more capable of bearing uninjured sudden changes of temperature, and more efficacious in refracting the rays of light. The black oxide of manganese has a singular effect upon glass. When added in a moderate proportion to any simple glass, it imparts a purple colour; if the quantity be increased, the glass will acquire a hue nearly black. If, whilst the mass thus coloured is still in fusion, either white arsenic, or charcoal, or other carbonaceous matter, be added, an effervescence follows, the colour disappears, and the glass gradually becomes clear and transparent. Manganese is employed to counteract the green hue of glass, and the moment that the proportion put in is more than sufficient, the purple colour appears, and is corrected by thrusting a piece of wood into the melted glass, which causes the purple to vanish. If nitre be added, the purple hue is restored. Manganese and arsenic are both also used as powerful fluxes; and arsenic, like nitre, destroys any carbonaceous matter present. Borax is principally used in preparing the finest kinds of plate-glass. Lime in the form of chalk is used as a very cheap flux.

Flint-Glass or Crystal.—Messrs Aikin state that a very excellent article may be made from one hundred and twenty parts of fine clean white sand, forty of well-purified pearl-ash, thirty-five of litharge or red lead, thirteen of nitre, and a small quantity, to suit the tinge wanted, of the black oxide of manganese. These, after having been mixed together, are put into pots made of Stourbridge clay, which have previously been brought to a white heat. After vitrification has been effected, and the glass has cooled down to a proper state of consistency, a hollow tube about three feet long, called the *punty*, is dipped into it, upon which the proper quantity of material wanted for the article to be manufactured is collected. It is rolled upon a square mass of cast metal, the tube is blown into, and the fluid mass expands to the dimensions required, when by various means it is fashioned into different shapes. Glass does not suddenly assume the solid state, but remains some time in a condition fit for working, affording ample opportunities for giving to it every shape which fancy or taste may suggest. After the vessel is formed, it is put into an oven, where it is annealed, a process of very great importance, as without it glass would be liable to fly to pieces with the smallest change of temperature, or shiver with the slightest scratch. Annealing is simply a very gradual cooling, by which it would appear that the whole of the particles of the glass had an opportunity of arranging themselves at equal distances from each other. By sudden cooling, the external particles would be forcibly contracted, whilst the inner substance would remain soft and expanded. Some crystal vessels are afterwards ground into various tasteful shapes.

Crown-Glass.—The name of crown-glass is given to the best kind of glass commonly used in making windows, and for similar purposes. It has no metallic flux in its composition but manganese, and cobalt in small quantities is frequently used for correcting the colour. The following mixture is stated as forming a very superior quality of crown-glass:—White sand, one hundred and twenty parts; purified pearl-ash, sixty; saltpetre, thirty; borax, two; and arsenic, one. If the colour is yellow, it may be corrected by adding a little manganese. When these ingredients are fritted, that is, calcined in a furnace previous to vitrification, they are put into a crucible and melted. As in the case of flint-glass, a punty is dipped in and collects a quantity of glass. This dipping is repeated until nine or ten pounds of metal are attached to the end of the hollow tube, which is now blown into, and expanded into a globular form. The side opposite to the end of the tube is then flattened upon a plane surface, a small portion of glass is collected upon the end of another punty, and is applied to the centre of this flattened side, forming an union with it exactly opposite to the hollow tube, which is then removed by wetting the glass near to their points of union, leaving a circular hole in the glass about two inches in diameter. At this period the glass must be again held to one of the openings of the furnace until it has become sufficiently hot and ductile for the further alteration of its shape. The workman then dexterously twirls the punty in his hand, slowly at first, and then more and more quickly, when the glass yields to the centrifugal impulse; its diameter becomes greater and greater; the hole just mentioned expands proportionally; and when in this continued progression, the doubled portion opposite to the iron rod, and between the periphery of the glass and the orifice, is diminished to a ring only a few inches wide; this instantly flies completely open, and the glass is converted into a plane disc of fifty to sixty inches diameter, having a uniform thickness throughout the entire plate, with the exception of the spot where it is attached to the iron rod, and where there is a knot or lump, which is called a bull's eye. Twelve of these plates make up what is called a crate or [illegible] of glass.

The effect of this operation upon persons who witness it for the first time, is both pleasing and surprising in a high degree. The force wherewith the glass flies open at the close of the process would be sufficient, if its brittleness were not removed by heat, to break it into innumerable fragments. The plate, when thus finished, is detached from the rod in the usual manner, and placed, resting on its edge, in the annealing oven.

Broad-Glass is a coarse description of the article, which it is unnecessary to describe.

Bottle-Glass.—More than one-half of the entire manufacture of glass in Great Britain is composed of common green bottle-glass. The composition of the article is not at all uniform, but varies almost with every different manufactory. Loysel gives the following proportions, as those usually employed in France for the production of the material:—Common white or yellow sand, 100 parts; coarse kelp, 30 to 40; lixiviated earth of ashes, 160 to 170; fresh wood or other ashes, 30 to 40; yellow clay, or brick earth, 80 to 100; broken glass *ad libitum*, usually 100; which composition does not produce what is called glass gall.

At Newcastle-upon-Tyne, where the manufacture of bottle-glass is much encouraged by the excessive cheapness of small coal, or slack, the manufacturers employ a mixture of lime and sea-sand. This must be frequently wetted with sea-water, which, on evaporating, deposits its salt; the soda contained in this being the only alkali employed. When combined with silica, and exposed to a high degree of heat, lime appears to be endued with the property of decomposing common salt; its presence is therefore essential to the success of this operation.

Articles made of bottle-glass are fashioned by the same process as those made of flint, with the exception of wine and beer bottles, the containing parts of which are blown in metallic moulds, in order to keep them nearly of an uniform size. The green colour of this glass is owing to the presence of a portion of iron in the sea-sand, and probably, also, in the vegetable ashes of which it is composed.

Plate-Glass.—There are two kinds of plate-glass. One is made by blowing, the other by casting the melted materials upon a plane metallic surface, somewhat in the method followed in making sheet-lead. Plates of glass which are blown are necessarily limited in their size, although some of considerable dimensions are produced in this way. When cast, the extent of the plates may be much greater, and, indeed, is limited only by the very heavy expense attending the erection of machinery, and the prosecution of the manufacture in its various parts.

The well-known property of borax as a powerful flux has occasioned the suggestion that by its means glass made with potash might be caused to flow in fusion as freely as that wherein soda is employed. It has been asserted that small quantities of borax have always been used in the works at St Gobain; but the secrecy observed in regard to all the operations carried on in that establishment, renders it impossible to say what degree of truth there is in the assertion. Great care is required in mixing the materials, much more indeed than is called for in regard to other kinds of glass. The sand, lime, soda, and manganese, being properly intermingled, are fritted in small furnaces, where the temperature is gradually raised to a full red or even to a white heat, at which point it is maintained; and the materials are carefully stirred until vapour is no longer given off, and no further change is undergone by the substances. This process of fritting lasts about six hours; and when it is nearly completed, the remaining part of the ingredients, consisting of the cobalt and broken glass, are added.

When the melted glass which has been taken from the furnace and put into the cuvette (a vessel for holding it) is found to be in the exact state that experience has pointed out as being most favourable for it flowing readily and equally, this vessel is withdrawn from the furnace by means of a crane, and is placed upon a low carriage, in order to its removal to the casting-table. Measures are then taken for cleaning the exterior of the crucible, and for carefully removing with a broad copper sabre any scum that may have formed upon the surface of the glass, as the mixture of any of these foreign matters would infallibly spoil the beauty of the plate. These done, the cuvette is wound up to a sufficient height by the crane; and then, by means of another simple piece of mechanism, is swung over the upper end of the casting-table; and being thrown into an inclined position, a torrent of melted glass is suddenly poured out on the surface of the table, which must previously have been heated, and wiped perfectly clean. When the plate of glass thus formed has been sufficiently fixed by cooling, it is slipped from the table gradually and carefully into one of the annealing-ovens, where it remains in a horizontal position. The plates have then to undergo all the operations of squaring, grinding, polishing, and silvering, in order to fit them for sale.

MANUFACTURES IN METALS.

Amongst the manufactures in metals, by far the most important are those of iron and steel. Iron is rarely found in a native state, but generally in combination with combustible bodies, particularly sulphur, or as an oxide or salt. Of all the iron ores, iron pyrites is the most universally distributed; but other three kinds of the metal are likewise brought back to the metallic state by certain chemical processes. They are first roasted in large heaps in the open air, for the purpose of expelling the sulphur and arsenic with which they are commonly combined, and also to facilitate their reduction. The roasting is assisted by the combustion of coal or charcoal. The ore is then transported to the smelting furnace, where it is converted into iron by the application of a powerful heat. That form of the metal called cast or pig-iron, is obtained by exposing the ore, mixed if necessary with limestone as a flux, to the action of carbon at an elevated temperature in a furnace urged by bellows. The metal is reduced to a metallic state by being fused in a furnace, in which coke is the fuel employed. These furnaces are called *puddling furnaces*. The operation commences with melting down the cast-iron in refining furnaces. When it is properly fused, a tap-hole is opened in the crucible, and the metal flows out into a fosse bedewed with water mixed with clay, which forms a coating to prevent the metal from sticking to the ground. After being cooled with water to make it brittle, and also to oxidise it slightly, it is broken into pieces, piled up in a reverberatory furnace; it is again melted, and cooled more than once, formed into balls, and condensed under rolling cylinders.

Steel.—The following method of making steel was communicated to Dr Ure by an extensive manufacturer of Monkland.—"The chests or troughs in which the iron bars are stratified are nine feet long, and composed of an open-grained silicious freestone unalterable by the fire. The Dannemora or Oregrounds iron is alone employed for conversion into steel at Monkland. The increase of weight is from four to twelve ounces per hundredweight. The average is therefore one in two hundred and twenty-four parts. The first proportion constitutes mild, and the second very hard steel. Should the process be pushed much farther, the steel would then melt, and in the act of fusion would take a dose of charcoal sufficient to bring it to the state of No. 1 cast-iron. The charcoal used in stratifying with the bar-iron is raised, so as to pass through a quarter-inch riddle. Whenever the interior of the troughs arrives at 70° Wedgewood, the carbon begins to be absorbed by the iron. There is no farther diminution of the weight of the charcoal than what is due to this combination. What remains is employed at another charge. Great differences are found between the different kinds of bar-iron imported at the same time, which occasion unexpected differences in the resulting steel." It is further added, that cast-steel is made by being fused in a crucible *without* charcoal, which corrects a common error that carbon is indispensable in its manufacture.

The various uses to which iron and steel are adapted are too numerous to be here entered upon; indeed they scarcely lie within the limits of our subject.

Of the other metals, tin, lead, and copper are the most important in a commercial point of view. The county of Cornwall is remarkable for the variety and value of its mineralogical productions, and, amongst the rest, tin is found, and occurs in veins or fissures, locally called *lodes*, in considerable quantities. In one of the largest smelting establishments, culmcoal is used as the flux, in the proportion of about one-eighth to the ore, of which nearly six hundred hundredweight is smelted within six hours, and yields about three hundred and fifty hundredweight of tin. The tin is run like iron from the furnaces, and is shaped into blocks or pigs. The uses of tin are very numerous, and so well known that they scarcely need to be pointed out. A very important application of tin is in the coating of other metals, such as those of iron and copper, which have been formed into vessels. The silvering of looking-glasses, and the fabrication of a great variety of vessels and utensils for domestic and other uses, are among the advantages derived from this metal.

Lead.—This valuable metal is found in various parts of Great Britain, and occurs as an ore. It is first roasted to expel the sulphur, arsenic, &c.; then smelted in furnaces, and cast into long bars in iron moulds. The diversity of uses to which lead is applied in the ordinary arts and manufactures, is by far too great to admit even of enumeration.

Copper.—This metal is found, like tin, abundantly in Cornwall. Of tin ores there are hardly more than four or five, but those of copper are almost innumerable. The processes in a copper work are simple; they consist of alternate calcinations and fusions. By the former, the volatile matter is expelled, and the metals previously combined with the copper oxidised, the general fusibility of the mass being thereby increased. The furnaces in which these operations are carried on are reverberatory, and of the usual construction. This metal it is well known is applied to a great variety of uses, but it is to its combinations with other metals that we must more particularly attend.

Brass.—This is a compound metal consisting of copper and zinc, in the proportion of two of the former to one of the latter. The best brass is made by the cementation of calamine, which is the ore of zinc, with granulated copper.

Bell Metal is a compound of copper and tin, which becomes not only more sonorous, but heavier, than either of the ingredients apart. The proportions differ; in general, however, twenty-three pounds of tin are mixed with a hundred pounds of copper, the latter being somewhat increased when the bells are large. Brass, spelter, and even lead, are sometimes added, and more rarely silver, which is considered much to improve the tone of the bell.

Bronze is a mixed metal, of which copper is the principal ingredient, and a small proportion of tin. Bronze, composed of from eight to twelve parts of tin, combined with one hundred parts of copper, becomes an alloy much harder than copper, less liable to rust, and so fusible as to run thin, and be easily cast in a mould. Bronze is used for making statues, cannon, and other articles, in all of which the proportions of the ingredients vary.

Pewter.—This is a compound of tin and copper, the latter being in the proportion of about one part to twenty of the former. Other metallic ingredients are sometimes added, according to the experience of the workman, as lead, zinc, bismuth, and antimony. Dr Ure says there are three sorts of pewter, distinguished by the names of plate, trifle, and ley-pewter. The first was formerly much used for plates and dishes; of the second are made the pints, quarts, and other measures of beer, so common in London; and of the ley-pewter, wine measures and large vessels in general. The pewterers are anxious to unite in their wares the greatest degree of hardness with a white or silvery colour, and it is this which has led to such a diversified use of the above-mentioned ingredients. Various objections have, at one time or other, been raised against the large intermixture of lead or copper in the composition of culinary utensils, and not without reason, when the articles are intended to be subjected to heat. As a precaution against any poisonous properties, the more tin pewter contains, the better it is undoubtedly; on the other hand, it is worse as it contains lead in excess; not, however, that any deleterious effects are to be apprehended in the latter constitution of the alloy, as usually exhibited.

Britannia Metal is made by an alloy of $3\frac{1}{2}$ cwt. best block-tin, 28 lbs. martial regulus of antimony, 8 lbs. of copper, and 8 lbs. of brass. The amalgamation is effected by melting the tin, and raising it just to a red heat in a stout cast-iron pot or trough, and then pouring into it, first, the regulus, and afterwards the copper and brass, from the crucibles in which they have been respectively melted; the caster meanwhile stirring the mass about during the operation, in order that the mixture may be complete. The fusion of the whole being completed, by the continual application of the fire for a short time under the pot, the liquid metal is in the next place transferred therefrom, by means of large iron ladles, to the casting-boxes, which are composed of cast-iron, and give to the metal poured into them the form of a slab fifteen inches long, by six inches wide, and one inch thick. It is likewise put into other moulds, forming small ingots, for the convenience of being used in the casting of such articles as are not made out of the sheet metal.

Type Metal.—The metal used by the typefounder is a composition consisting chiefly of lead and regulus of antimony, with a little tin, and sometimes other ingredients. The chief object of mixture is to obtain perfect fluidity, so that the counterpart of the matrix shall come away sharp and perfect; moreover, that the letters shall be hard enough to wear well, and stand to their work firmly, without at the same time becoming brittle; a type, however, will break sooner than bend.

PRECIOUS METALS.

By this appellation gold and silver are commonly denoted. The simplest method of obtaining gold consists in collecting the grains or small particles from the beds of rivers, especially after rains, which bring down fresh matter from the mountains. The dust and grains of gold are smelted in Brazil with a flux of muriate of mercury; the furnaces are heated with charcoal, and the contents of the crucibles are poured into iron ingot-moulds, holding about thirty-two pounds of the metal. Gold is afterwards purified by being submitted to the processes of infiltration, parting, and quartation; by the former process the refiner gets quit of every particle of lead or other inferior metallic alloys, and by the latter, separates any portion of silver which might remain intermixed with the gold.

Silver is a much more plentiful product than gold. It is found both in a metallic state or in the shape of an ore, of which there are numerous varieties. It is extracted from these either by smelting in the usual way, or by amalgamation. The method of extracting silver from lead, with which it is often combined, is to expose the mixture to a strong heat in the open air. The lead becomes gradually oxidised, and separates from the pure silver. Native alloys of the precious metals are sometimes, but not frequently, met with. Besides their practical application in the arts and manufactures, and their use in the fabrication of goods of various kinds, silver and gold, it is well known, form the most valuable portion of the circulating medium of almost every country.

GILDING AND SILVERING.

Gilding and silvering are the arts of covering the surfaces of bodies with gold or silver; and to give an idea of the processes, we shall confine ourselves to gilding. Gold for painting must first be reduced to powder, in which state it is called shell-gold. For gilding by friction, a piece of linen rag must be steeped in a solution of gold, taken out, dried, and then burned to tinder. The article to be gilt must be well polished. A piece of cork is then dipped, first in a solution of salt water, and afterwards into the black powder. The article is then to be rubbed with it. For water-gilding, the solution of gold must first be evaporated and suffered to crystallise, and the crystals dissolved in water. This is copiously diluted with alcohol, and iron is gilded by being steeped therein. Sulphuric ether is used instead of alcohol for gilding steel. For Grecian gilding, equal parts of sal ammoniac and corrosive sublimate are dissolved in nitric acid, and a solution of gold made in this menstruum, which is concentrated. Silver becomes black when this is applied to it; but if subjected to a red heat, it assumes the appearance of gilding. Silver, brass, or copper, may be gilt by an amalgam, as follows: Eight parts of mercury and one of gold are incorporated by heat. When the gold is dissolved, the mixture is poured into cold water, when it is fit for use.

COLOUR-MAKING.

This is a subject by far too extensive to be entered upon in this paper. Colours are obtained from a variety of sources, but metallic oxides generally yield the best and most permanent. Under the heads dyeing, calico-printing, and pottery, we have mentioned what those metals are from which different colours are obtained, and also what vegetable substances yield the most beautiful descriptions of colouring matter.

GUNPOWDER.

Dr Ure thus describes the manufacture of this well-known compound:—"This explosive substance consists of an intimate mixture, in determinate proportions, of saltpetre, charcoal, and sulphur; and is better in proportion, every thing else being equal, to the quality of these ingredients. The nitre, in particular, ought to be perfectly refined, by successive crystallisations, and finally freed from adhering water, by proper drying, or by fusion in iron pots at a regulated heat. Nothing can surpass in these respects the nitre prepared in the government powder-works at Waltham Abbey. It is tested by adding to its solution in distilled water, nitrate of silver, with which it occasions no perceptible opalescence. The sulphur ought also to be of the finest quality, and purified by skimming, or even sublimation, if at all necessary. The charcoal should be newly made; it should burn without having any sensible residuum, be dry, sonorous, light, and easily pulverised. The charcoal for gunpowder is made either of alder, willow, or dogwood—the latter being preferred—which are cut into lengths, and ignited in iron cylinders. It deserves notice that the proportion of powder used for the several pieces of ordnance by the navy, &c., has been reduced one-third, in consequence of the increased strength of the composition into which this cylinder charcoal enters, compared with that manufactured formerly from charcoal made in pits. The wood, before charring, is carefully stripped of its bark.

The three ingredients being thus prepared, are ready for manufacturing into gunpowder. They are first separately ground to a fine powder, which is passed through proper sieves or bolting-machines; 2d, They are mixed together in the proper proportions. These do not seem to be definitely determined, for they differ in different establishments of great respectability, as is shown in the following table:—

	Nitre.	Charcoal.	Sulphur
Royal mills at Waltham Abbey	75	15	10
French, for war . .	75	12.5	12.5
for sportsmen .	78	12	10
for mining . .	65	15	20
Chaptal's proportions .	77	14	9
Chinese do. . . .	75.7	14.4	9.9
Mr Napier's do. . . .	80	15	5

3d, The composition is then sent to the gunpowder-mill, which consists of two edgestones of a calcareous nature, turning by means of a shaft on a bedstone of the same nature, which give no sparks, as sandstones would be apt to do. On this bedstone the composition is spread, and moistened with as small a quantity of water as will, in conjunction with the weight of the revolving stones, bring it into a proper body of *cake*, but not of *paste*. The line of contact of the edgestone is constantly preceded by a scraper, which goes round with the wheel, constantly scraping up the cake, and turning it into the track of the stone. From fifty to sixty pounds are usually worked at once in each mill-wheel. When the cake has been thoroughly incorporated, it is sent to the corning-house, where a separate mill is employed to form the cake into grains or corns. 4th, Here it is first pressed into a hard firm mass, then broken into small lumps; after which the graining is executed, by placing these lumps in sieves, on each of which is laid a disc of *lignum vitæ*. The sieves are made of parchment-skins, perforated with a multitude of round holes. Several such sieves are fixed in a frame, which by proper machinery has such a motion given to it as to make the *lignum vitæ* runner in each sieve move round with considerable velocity, so as to break the lumps of the cake, and force the substance through the sieves, forming grains of several sizes. These granular particles are afterwards separated from the finer dust, by proper sieves and reels. 5th, The corned powder is next hardened, and the rougher edges taken off, by being revolved in a close reel or cask turning rapidly on its axis. This vessel somewhat resembles a barrel-churn; it should be only half full at each operation, and has frequently square bars inside, parallel to its axis, to aid the polish by attrition. 6th, The gunpowder is now dried, which is done generally by a steam-heat, or by transmitting a body of air, slightly heated in another chamber over canvass shelves covered with the damp gunpowder.

GLUE.

Glue is an inspissated jelly, made from the parings of hides and other offals, by boiling them in water, straining through a wicker basket, suffering the impurities to subside, and then boiling it a second time. The articles should first be digested in lime-water, to cleanse them from grease and dirt; then steeped in water, stirring them well from time to time; and lastly, laid in a heap, to have the water pressed out before they are put into the boiler. Some recommend that the water should be kept as nearly as possible to a boiling heat, without suffering it to enter into ebullition. In this state it is poured into flat frames or moulds, then cut into square pieces when congealed, and afterwards dried in a coarse net. It is said to improve by age; and that glue is reckoned the best which swells considerably without dissolving by three or four days' infusion in cold water, and recovers its former dimensions and properties by drying. Shreds or parings of vellum, parchment, or white leather, make a clear and almost colourless glue.

INK.

Although ink may be obtained of almost any colour, yet we are only familiar with two kinds, black and red. Of black ink there are three principal kinds, Indian ink, printers' ink, and writing ink.

Indian Ink.—This article is used in China for writing with a brush, and for painting upon the soft flexible paper of Chinese manufacture. It is ascertained, as well from experiment as from information, that the cakes of this ink are made of lampblack and size, or animal glue, with the addition of perfumes or other substances not essential to its quality as an ink. The fine soot from the flame of a lamp or candle, received by holding a plate over it, mixed with clean size from shreds of parchment or glove-leather not dyed, will make an ink equal to that imported.

Printers' Ink.—This is a black paint, smooth, uniform in its composition, and very tenacious. Linseed or nut oil are employed in its manufacture, and lampblack is the common material used for giving the black colour, of which two ounces and a half are sufficient for sixteen ounces of the oil, which must first be boiled down to the consistency of varnish. Vermilion gives a red colour. Ten or twelve gallons of the oil are set over the fire in an iron pot, capable of holding at least half as much more; for the oil swells up greatly, and its boiling over into the fire would be very dangerous. When it boils, it is kept stirring with an iron ladle; and if it do not itself take fire, it is kindled with a piece of flaming paper or wood; for simple boiling, without the actual accension of the oil, does not communicate a sufficient degree of the drying quality required. The oil is suffered to burn for half an hour or more, and the flame being then extinguished by covering the vessel close, the boiling is afterwards continued with a gentle heat, till the oil appears of a proper consistence; in which state it is called varnish. It is necessary to have two kinds of this varnish, a thicker and a thinner, from the greater or less boiling, to be occasionally mixed together as different purposes may require; that which answers well in hot weather being too thick in cold, and large characters not requiring so stiff an ink as small ones. The thickest varnish, when cold, may be drawn into threads like weak glue; by which criterion the workmen judge of the due boiling, small quantities being from time to time taken out and dropped upon a tile for this purpose. It is very viscid and tenacious, like the soft resinous juices, or thick turpentine. Neither water nor alcohol dissolve it; but it readily enough mingles with fresh oil, and unites with mucilages into a mass diffusible in water in an emulsive form. Boiling with caustic alkali produces a soapy compound. It is by washing with hot soap-leys and a brush that the printers clean their types. The oil loses from one-tenth to one-eighth of its weight by the boiling into the thick varnish. It is affirmed that varnish containing either turpentine or litharge, particularly the latter, is more adhesive than other varnish, and presents a great difficulty in cleaning the types, which soon become clogged. Very old oil requires neither of these additions. New oil can hardly be brought into a proper state for drying, so as not to set off, without the use of turpentine.

Writing Ink.—The following is considered an excellent recipe for the manufacture of this useful liquid:—Take eight ounces of Aleppo galls (in coarse powder); four ounces of logwood (in thin chips); four ounces of sulphate of iron; three ounces of gum-arabic (in powder); one ounce of sulphate of copper; and one ounce of sugar-candy. Boil the galls and logwood together in twelve pounds of water for one hour, or till half the liquid has evaporated. Strain the decoction through a hair sieve or linen cloth, and then add the other ingredients. Stir the mixture till the whole is dissolved, more especially the gum; after which, leave it to subside for twenty-four hours; then decant the ink, and preserve it in bottles of glass or stoneware, well corked. Inks of other colours may be made from a strong decoction of the ingredients used in dyeing, mixed with a little alum and gum-arabic. For example, a strong decoction of Brazil wood, with as much alum as it can dissolve, and a little gum, forms a good red ink. These processes consist in forming a lake, and retarding its precipitation by the gum.

Sympathetic Inks.—These are inks by which any thing written with them may be invisible when first traced upon the paper, but can be rendered visible at will by certain means, such as the application of heat. By these inks the most amusing experiments may be performed. Dr Ure mentions the following as amongst the number of those which a slight knowledge of chemistry may suggest to the student:—

"1. If a weak infusion of galls be used, the writing will be invisible till the paper be moistened with a weak solution of sulphate of iron; it then becomes black, because these ingredients form ink. 2. If paper be soaked in a weak infusion of galls, and dried, a pen dipped in the solution of sulphate of iron will write black on that paper, but colourless on any other paper. 3. The diluted solutions of gold and silver remain colourless upon the paper, till exposed to the sun's light, which gives a dark colour to the oxides, and renders them visible. 4. Most of the acids or saline solutions being diluted, and used to write with, become visible by heating before the fire, which concentrates them, and assists their action on the paper. 5. Diluted prussiate of potash affords blue letters when wetted with the solution of sulphate of iron. 6. The solution of cobalt in aqua regia, when diluted, affords an ink which becomes green when held to the fire, but disappears again when suffered to cool. This has been used in fanciful drawings of trees, the green leaves of which appear when warm, and vanish again by cold. If the heat be continued too long after the letters appear, it renders them permanent. 7. If oxide of cobalt be dissolved in acetic acid, and a little nitre added, the solution will exhibit a pale rose colour when heated, which disappears on cooling. 8. A solution of equal parts of sulphate of copper and muriate of ammonia, gives a yellow colour when heated, that disappears when cold. Sympathetic inks have been proposed as the instruments of secret correspondence; but they are of little use in this respect, because the properties change by a few days remaining on the paper; most of them have more or less of a tinge when thoroughly dry; and none of them resist the test of heating the paper till it begins to be scorched. Nitrate of silver for a surface impregnated with carbonate of soda, and muriate of gold for one impregnated with proto-muriate of tin, form good indelible inks."

FERMENTATION.

The word fermentation expresses the changes which animal and vegetable matter undergoes spontaneously when the principle of life has departed from it, or when its powers are suspended in individual parts. This is at once a process of destruction and of reproduction; for although there is not produced again a regularly organised structure, there is the production of new substance, different from that which characterised the organic body previous to the change taking place. The following case will serve to illustrate the nature of fermentation and its various stages:—If a quantity of grape juice be put into a vessel, and allowed to stand for some time, only exposed to the ordinary temperature of summer, the following phenomena will be observed: the liquor becomes muddy; an internal motion is observable, and sometimes the temperature may be found to rise; air bubbles rise to the surface, occasioning a bubbling noise when they break; and the bulk of the liquid being increased, it has a tendency to boil over. From this circumstance, the process is called fermentation, from the Latin word *fervere*, to boil. The bubbles created rise to the surface involved in a viscid matter, the whole resembling froth, which, parting with the air, subsides to the bottom, and the liquor becomes tranquil and transparent. This viscid matter is well known under the name of *yeast* or *barm*, and it has the property of exciting fermentation in bodies not otherwise at the moment predisposed to it. The reason of this has not been properly explained.

The grape juice has now been entirely changed into an intoxicating liquor, the base of which is alcohol, and this process is termed *vinous fermentation*. If this liquor be kept for some time at about 75°, a new series of phenomena will take place. Providing there be a large quantity of it, the temperature may perhaps rise fifteen degrees. A slight motion takes place, accompanied with the disengagement of a small quantity of gas; and floating filaments or shreds begin to thicken in the liquid, collecting into a gelatinous cake. This is indicative of another change. The vinous flavour and the alcoholic or intoxicating quality has disappeared, whilst the liquid has become at once sour and transparent. In short, the wine has become vinegar, called in Latin *acetum*; and the process is called the *acetous* fermentation.

Let this vinegar be kept for a length of time, and another, and from the previous quality of the liquor, unexpected, change takes place. It becomes mantled with a green mould; the acidity and pungent acid smell disappear, and a fœtid odour becomes perceptible. This proceeds from the rottenness of the vegetable matter present, and the change is called the *putrifactive* fermentation, from the Latin word *putrescere*, to rot. There are thus three different kinds of fermentation, which it may be necessary more fully to explain.

The question arises, What is the nature of the different ferments which produce these changes? The attention of chemists has as yet been particularly directed only to that one called *yeast*, and even our knowledge of it is extremely imperfect. Fabroni, a celebrated chemist, considered yeast as identical with *gluten*, a substance which imparts to wheaten flour the property of forming a tough paste with water, and separable from flour by kneading under water. This gluten, or some modification of it, the above-named chemist considered as the real *vinous* ferment. It is most probably an approximation to it; and it has been conjectured that *ferment* may be as much a proximate principle of vegetables, as sugar or starch, and as extensively diffused throughout nature. A great quantity of carbonic acid is given out during fermentation, and the various changes which take place during the vinous fermentation have been thus briefly described —Some of the carbon and some of the oxygen combine to form carbonic acid; while the remainder of the carbon, the remainder of the oxygen, and the whole of the hydrogen, combine to form alcohol; and we may totally neglect the decomposition of the yeast, it amounting to almost nothing. Thus is this inert, solid, fixed, sweet matter, resolved by a new arrangement of its principles into substances which possess none of these properties, and one of which exerts a control of so singular a nature over the animal economy.

The phenomena attendant upon acetous fermentation we have already alluded to, and the question occurs, What becomes of the alcohol, the most remarkable ingredient of the original vinous liquor, when the latter is changed into vinegar? In answer to this, all that can be said is, that it has been decomposed; its elemental particles, which, united in certain determinate or definite proportions, formed one particular kind of substance, have separated, and combined again in certain other definite proportions, by this means forming an entirely new substance. It is to be observed, that in every case where vinegar is formed, whether it be from solutions of sugar, infusions of malt, or from wines, the greater the quantity of alcohol which existed in the liquor, the stronger will be the vinegar obtained, and the more difficult and slow will be its formation. All vinegars prepared by fermentation contain the following ingredients:—A considerable quantity of water, a little alcohol, some malic acid, a small proportion of sugar, some glutinous and mucilaginous matter, with what is vaguely called extractive matter, besides acetic acid.

The last stage of spontaneous decomposition is the putrifactive fermentation. It is that final change which animal and vegetable life undergoes, the resolution of organic structures into the inanimate materials of which they had been originally composed. The cause of the remarkable fœtor which accompanies it is not well understood, but it in part would appear to arise from the hydrogen gas given out, holding phosphorus and sulphur dissolved, which compounds are remarkably fœtid. It seems also partly to arise from some animal or vegetable matter, or some other substance being held in solution besides.

Upon the other and less important branches of practical chemistry, our limits prevent us from entering; but we have studied to give an account of such processes as can be easily comprehended by those who have carefully perused the number of this work upon Chemistry, and which are calculated to be most extensively useful.

THE END.

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