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IRON ARCHITECTURE.

(*For the Journal of the Board.*)*

The employment of cast-iron for the fronts of buildings in cities, has not only rendered cheap and practicable a far greater amount of tasty ornamentation than heretofore ; but singular as the proposition may seem, has actually rendered such architectural display, or some variation in the surface, essential to the obtaining of a proper degree of strength. Economy of material dictates that the actual thickness of an iron wall shall be very moderate, and in some of the first applications of wrought iron to this purpose, the walls, flat, plane, and consequently very weak, were so cracked and distorted on the occurrence of a fire, either without or within, that its use was almost abandoned. Some of the first in California thus failed, but cast-iron buildings are so profusely filled with pilasters cornices, lintels, and various other angular and curved projections and recesses, that the metal has everywhere liberal opportunity to spring, and expand or contract to any required degree, and the leverage of the parts to resist any lateral force is also increased to nearly as great an extent, as if the walls were made solid to that thickness. The practical thickness therefore, of the present styles of iron fronts is about eighteen inches, measuring for this purpose from the front of the pilasters and window caps to the recesses of the windows, while the actual thickness of the castings is nowhere intentionally made more than five-eighths of an inch, and many castings are less than three-sixteenths.

The popularity of cast iron for buildings is sufficiently evident, whether we inspect the principal streets of any of our chief cities, or note the activity in the establishments specially devoted to such constructions. In Canada, there is no one establishment which we can say is specially devoted to such manufactures, but when the writer was in New York last summer, he was in D. D. Badger & Co's, who employ over four hundred men, and although a part of the work of this company is the manufacture of iron shutters, more than nine-tenths of this force is engaged in the designing, patterning, moulding, cleaning, finishing, oiling, painting, transporting, and erecting of iron buildings.

In this last sentence is briefly analyzed the whole construction of an iron front. Some of the processes are obvious enough, but others may need explanation. A professional architect usually works out a design which in some of its features is incapable of production in iron. The first step of the constructor, then, is to alter the design, until all the parties are suited. The next is the detail drawing and pattern making, necessarily a large portion of the labor, although as the art advances and stocks of the patterns are increased, a large number of parts will be but duplicates of shapes and sizes before in existence, and therefore require little or none of this labor. Upper stories now generally resemble the lower portions, except that the height is diminished by carving off the pattern in the middle, and removing a part, and some of the smaller ornaments, especially the leaves on the Corinthian Capitals (Corinthian, is a favorite style by the way, in these buildings) are cast separately, and attached by screws or rivets. The casting is conducted in the usual manner, but the long flasks are mostly of iron, and the metal is poured at as high a heat as practicable, to ensure its filling completely the broad thin cavities. Cleaning the large, and "tumbling" the small parts are processes familiar to every body, as are also the planing and slabbing by machinery, and the more primitive processes of chipping and filing, which to save handling is often permitted to suppersede the machine work.

The establishment mentioned above is a fine building. The main shop is 300 feet long by 60 feet wide, and five stories high. The ground floor where all the heavier parts are finished, has two lines of railroad (21 inch guage) extending its whole length, and is studded with cranes to facilitate the handling of the pieces. The drilling and fitting being here completed, each part is oiled and painted. All the small parts are *boiled* in oil, by which we mean immersed in oil, at nearly its boiling or rather "frying" point, and allowed to remain in this bath until it has become thoroughly heated. This process is believed to so effectually fill the pores of the metal as to very materially add to its durability. Cast iron is very readily preserved, but the wrought iron screws or rivets, oydize with more avidity ; and this heating in linseed oil has been adopted as the best method of defence, and as contributing, as far as possible to make iron buildings absolutely unaffected by time. In addition to this oleaginous filling of the pores, the surfaces are painted once in the shop, and again twice after placing in the building before the work is finished.

Iron buildings properly constructed, combine

* Communicated.

unequalled advantages of ornament, strength, durability and economy, while they, at the same time afford a larger amount of useful interior space in a given size, (an important point in a densely crowded city), and are tolerably secure against danger from fire, lightning, or an unequal settling of the foundation. The parts are fastened together much more firmly than any mortar or cement has ever proved in practice, capable of joining stone or brick.

Different methods of joining the parts are adopted by builders. One very desirable plan is to join the whole firmly, so that it is in effect a unit, but as this has induced timidity in some, in consequence of the great range such a front would take, should it be loosened from the side walls, and fall outwards. A gentleman in New York invented and patented a very simple and admirable means, by which the front falls, *one story at the time and always inward*, upon the burning ruins, instead of upon the street.

Iron buildings are always built by contract. The cost of such iron structures, or in fact of any other varies so greatly that it may appear idle to attempt to estimate the comparative expense. Calculating from the actual contract prices of a number, however, the following is a rough approximation. City lots are generally 25 feet wide on the street; a front of this width, 5 story high, would cost in Montreal as follows :

Wood (forbidden by law)	$——
Brick (face brick)	2500
Brown stone (a kind of sand stone)......	3500
White marble................................	4000
Granite	4000
Iron (elegant style) from $ 3000 to ...	5000

In this article attention has been confined to the fronts alone. The construction of absolutely fire-proof buildings require brick and iron floors, etc., which it is unnecessary now to enter upon, but which may or may not be used in what are termed iron buildings.

PROGRESS OF GEOLOGY.

(*Continued from page 74.*)

In the last year, Mr. Barrande has most ably compared the North American Taconic group of Emmons* with his own primordial Silurian fauna of Bohemia, and other parts of Europe; and although that sound palæontologist, Mr. James Hall, has not hitherto quite coincided with Mr. Barrande in some details,† it is quite evident that the primordial fauna occurs in many parts of North America. And as the true order of succession has been ascertained, we now know that the Taconic group is of the same age as the lower Wisconsin beds described by Dale Owen, with their Paradoxides, Dikelocephalus, &c., as well as of the lower portion of the Quebec rocks, with their Conocephalus, Axionellus, &c., described by Logan and Billings. Of the crystalline schists of Massachusetts, containing the noble specimen of Paradoxides described by W. B. Rogers, and of the Vermont beds, with their Oleni, it follows that the Primordial Silurian Zone of Barrande (the lower Lingula flags of Britain) is largely represented in North America, however it may occupy an inverted position in some cases, and in others be altered into crystalline rocks.

In determining this question due regard has been had to the great convulsions, inversions, and breaks, to which these ancient rocks of North America have been subjected, as described by Professors Henry D. and W. B. Rogers.

In an able review of this subject, Mr. T. Sterry Hunt thus expresses himself:—"We regard the whole Quebec group, with its underlying primordial shales, as the greatly developed representatives of the Potsdam and Calciferous groups (with part of that of the Chazy), and the true base of the Silurian system." "The Quebec group with its underlying shales," this author adds (and he expresses the opinion of Sir W. E. Logan), "is no other than the Taconic system of Emmons;" which is thus, by these authors, as well as Mr. James Hall, shown to be the natural base of the Silurian rocks in America, as Barrande and De Verneuil have proved it to be on the continent of Europe.

In our own country a valuable enlargement of our acquaintance with the relations of the primordial zone to the overlying members of the Silurian rocks has been made through the personal examination of Mr. Salter, aided by the independent discoveries of organic remains by MM. Homfray and Ashe, of Tremadoc.

It has thus been ascertained, that the lower member only of the deposit, which has been hitherto merged under the name of Lingula flags, can be considered the equivalent of the primordial zone of Bohemia. In North Wales that zone has hitherto been mainly characterized by Lingula and the crustaceans Olenus and Paradoxides. Certain additions having been made to these fossils, Mr. Slater finds that of the whole there are five genera peculiar to the lower zone, and seven which pass upwards from it into the next overlying band or the Tremadoc slate. But the overlying Tremadoc slate, hitherto also grouped with the Lingula flags, is, through its numerous fossils (many of them of recent discovery), demonstrated to constitute a true lower member of the Llandeilo formation. For, among the trilobites, the well known Llandeilo forms of Asaphus and Ogygia range upwards from the very base of these slates. Again, seven or eight other genera of trilobites, which appear here for the first time, are associated with genera of mollusks, and encrinites which have lived through the whole Silurian series. Such for example are the genera Calymene, Illænus, among crustaceans; the Lingula, Orthis, Bellerophon, Conularia, among mollusks; together with encrinites, corals, and that telling Silurian zoophyte,

* The Silurian classification was proposed by me in 1835, and in the following year, 1836, Dr. Emmons suggested that his black shale rocks, which he called Taconic, were older than any I described.

† Nor are the writings of the Professors W. B. and H. D. Rogers in unison with the opinions of the authors here cited.

the Graptolite. By this proof of the community of fossil types, as well as by a clear lithological passage of the beds, these Tremadoc slates are thus shown to be indissolubly connected with the Llandeilo and other Silurian formations above them; whilst, although they also pass down conformably into the *zone primordiale*, the latter is characterized by the linguloid shells (Lingulella, Salter) and by the genera Olenus, Paradoxides, and Dikelocephalus, which most characterize it in Britain as in other regions.*

I take this opportunity, however, of reiterating the opinion I have expressed in my work, "Siluria," that to whatever extent the primordial zone of Barrande be distinguished by peculiar fossils in any given tract from the prevalent Lower Silurian types, there exists no valid ground for differing from Barrande, de Verneuil, Logan, James Hall, and others, by separating this rudimentary fauna from that of the great Silurian series of life of which stratigraphically it constitutes the conformable base. And if in Europe but few genera be yet found which are common to this lower zone and the Llandeilo formation (though the Agnostus and Orthis are common to it and all the Silurian strata), we may not unreasonably attribute the circumstance to the fact, that the primordial zone of no one country contains more than a very limited number of distinct forms. May we not, therefore, infer that in the sequel other fossil links, similar to those which are now known to connect the Lower and Upper Silurian series—which I myself at one time supposed to be sharply separated by their organic remains—will be brought to light, and will then zoologically connect the primordial zone with the overlying strata into which it graduates? Let us recollect, that a few years only have elapsed since M. de Verneuil was criticised for inserting, in his table of the Palæozoic Fauna of North America, a number of species as being common to the Upper and Lower Silurian. But now the view of the eminent French Academician has been completely sustained, by the discovery in the strata of Anticosti, as worked out by Mr. Billings under the direction of Sir W. E. Logan, of a group of fossils intermediate in character between those of the Hudson River and Clinton formations, or in other words between Lower and Upper Silurian rocks. In like manner, a similar interlacing seems already to have been found, in North America, between the Quebec group, with its primordial fossils, and the Trenton deposits which are, as is well known, of the Llandeilo age.

I have thus spoken out upon the fitness of adhering to the classifications decided upon by Sir Henry De la Beche and his associates, long before I had any relation to the Geological Survey, and which places the whole of the Lingula-flags of Wales as the natural base of the Silurian rocks. For English geologists should remember that this arrangement is not merely the issue of the view I have long maintained, but is also the matured opinion of these geologists in foreign countries and in our colonies, who have not only zealously elaborated the necessary details, but who have also had the opportunities of making the widest comparisons.

* In the last edition of Siluria the distinction was drawn between the lower and upper Lingula-flags, but the fauna of the latter is now much enlarged.

On the continent of Europe, an interesting addition has been made to our acquaintance with the fauna of one of the older beds of the Lower Silurian rocks, or the Obolus green sand of St. Petersburg,* by our eminent associate, Ehrenberg. He has described and figured† four genera and ten species of microscopic Pteropods, one of which he names *Panderella Silurica:* the generic name being in honor of the distinguished Russian palæontologist, Pander, who collected them. It is well to remark, that as the very grains of this Lower Silurian green sand seem to be in great measure made up of these minute organisms, so we recognize, in one of the oldest strata in which animal life has been detected, organisms of the same nature as, and not less abundant than, those which constitute the deep sea bottoms of the existing Mediterranean and other seas.

Before I quit the consideration of the older palæozoic rocks, I must remind you that it is through the discovery, by Mr. C. Peach, of certain fossils of Lower Silurian age in the limestones of Sutherland, combined with the order of the strata, observed in the year 1827, by Professor Sedgwick and myself, that the true age of the largest and overlying masses of the crystalline rocks of the Highlands has been fixed. The fossils of the Sutherland limestone are not indeed strictly those of the Lower Silurian of England and Wales, but are analogous to those of the Calciferous sand-rock of North America. The Macluria is indeed known in the Silurian limestone of the south of Scotland; but the Ophileta and other forms are not found until we reach the horizon of North America. Now, these fossils refer the zone of the Highland limestone and associated quartz-rocks to that portion of the Lower Silurian which forms the natural base of the Trenton series of North America. or the lower part of the Llandeilo formation of Britain. The intermediate formation — the Lingula-flags or "zone primordiale" of Bohemia—having no representative in the north-western Highlands, these is necessarily a complete unconformity between the fossil-bearing crystalline limestones and quartz-rocks with the Maclurea, Murchisonia, Ophileta, Orthis, Otheceratites, &c., and those Cambrian rocks on which they rest.

A great revolution in the ideas of many an old geologist, including myself, has thus been effected. Strengthened and confirmed as my view has been by the concordant testimony of Ramsay, Harkness, Geikie, James, and others, I have had no hesitation in considering a very large portion of the crystalline strata of the Highlands to be of the same age as some of the older fossiliferous Silurian rocks, whether in the form of slates in Wales, of graywacke-schist in the southern counties of Scotland, or in the conditions of mud and sand at St. Petersburg. The conclusions as respects the correlation of all the older rocks of Scotland have now indeed been summed up by Mr. Geikie and myself in the Geological Sketch-Map of Scotland ‡ which we have just published, and a copy of which

* See "Russia and the Ural Mountains."

† Monats-Bericht d. König. Akad. der Wiss. Berlin, 18th April, 1861.

‡ This map is already on sale in Manchester.

is now exhibited. Not the least interesting part of that production is that which explains the age of all the igneous or trappean rocks of the south of Scotland, as well as all the divisions of the Carboniferous formation, and is exclusively the work of my able colleague.

But if through the labors of hard working geologists, we have arrived at a clear idea of the first recognizable traces of life and their sequences, we are yet far from having satisfied our minds as to the *modus operandi* by which whole regions of such deposites have, as in the Highlands, been transmuted into a crystalline slate. Let us therefore hope that, ere this meeting closes, we may receive instructions from some one of the band of foreign or British geologists who have by their experimental researches been endeavouring to explain the processes by which such wonderful changes in the former condition of sedimentary deposits have been brought to life: such as that by which strata once resembling the incoherent Silurian clay which we see in Russia have been hardened into such rocks as the slaty grauwacke of other regions, and now hard schists of the south of Scotland have been metamorphosed into the crystalline rocks of the Highlands. But why are British geologists to see any difficulty in admitting what I have proposed, that vast breadths of these crystalline stratified rocks of the Highlands are of Lower Silurian age? Many years ago I suggested, after examination, that some of the crystalline rocks near Christiana in Norway were but altered extensions of the Silurian deposits of that region; and since then Mr. David Forbes and Mr. Kjerulf have demonstrated the truth of the suggestion. Again, and on a vastly larger scale, we know that in North America all the noted geologists, however they may differ on certain details, agree in recognizing the fact that the vast eastern seaboard range of gneissic and micaceous schists is made up of metamorphosed strata, superior even to the lowest of the Silurian rocks. Logan, Rogers, Hall, and Sterry Hunt, are decidedly of this opinion; and the point has been most ably and clearly set before the public by the last mentioned of these geologists, who, being himself an accomplished chemist, has given us some good illustrations of the probable *modus operandi* in the bringing about of these changes.

The importance of the inquiries to be made by chemical geologists into this branch of our science was not lost upon the earlier members of the British Association. Even in the year 1833, a committee was appointed to endeavour to illustrate the phenomena of the metamorphism of rocks by experiments carried on in iron-furnaces. After a series of trials on various mineral substances, the Rev. W. Vernon Harcourt, to whom we owed so much at our foundation, has, as the reporter of that committee, been enabled to present to the Association that lucid report on the actual effect of long-continued heat which is published in our l·t volume. In referring you to that document, I must, as an old practical field-geologist, express the gratification I feel in seeing that my eminent friend has, in the spirit of true inductive philosophy, arrived, after much experiment and thought, at the same conclusion at which, in common with Sedgwick, Buckland, De la Beche, Phillips, and others in my own country, and with L. Von Buch, Elie de Beaumont, and a host of geologists abroad, I had long ago arrived in the field. I, therefore, reëcho their voices in repeating the words of Mr. W. Harcourt, "that we are not entitled to presume that the forces which have operated on the earth's crust have always been the same." Looking to the only rational theory which has ever been propounded to account for the great changes in the crust which have taken place in former periods—the existence of an intense central heat which has been secularly more and more repressed by the accumulation of sediment until the surface of the planet was brought into its present comparatively quiescent condition—our first General Secretary has indicated the train of causes, chemical and physical, which resolve some of the difficulties of the problem. He has brought before us, in a compendious digest, the history of the progress which has been made in this branch of our science, by the writings of La Place, Fourier, Von Buch, Fournet, and others; as well as by the experimental researches of Mitscherlich, Berthier, Senarmont, Loubree, Deville, Delesse and Durocher. Illustrating his views by reference to chemical changes in the rocks and minerals of our own country, and fortifying his induction by an appeal to his experiments, he arrives at the conclusion, that there existed in former periods a much greater intensity of causation than that which now prevails. His theory is, that whereas now, in the formation of beds, the aqueous action predominates, and the igneous is only represented by a few solfataras, in the most ancient times the action was much more igneous, and that in the intermediate times fire and water divided the empire between them. In a word, he concludes with the expression of the opinion, which my long-continued observation of facts had led me to adopt, "that the nature, force and progress of the past condition of the earth cannot be *measured* by its existing condition."

In addition to these observations on metamorphism, let me remind you that, on the recommendation of the British Association, other important researches have been carried on by Mr. William Hopkins, our new General Secretary, and in the furnaces of our President, Mr. Fairbairn, on the conductive powers for heat in various mineral substances. Although these experiments have been retarded by a serious accident which befel Mr. Hopkins, they are still in progress, and I learn from him that, without entering into any general discussion as to the probable thickness of the crust of our planet, we may even now affirm, on experimental evidence, that, assuming the observed terrestrial temperature to be due to central heat, the thickness of this crust must be two or three times as great as that which has been usually considered to be indicated by the observed increase of temperature at accessible depths beneath the earth's surface.

Of the Devonian rocks, or Old Red Sandstone, much might be said if I were to advert to the details which have been recently worked out in Scotland, by Page, Anderson, Mitchel, Powrie and others; and in England, by the researches of the Rev. W. Symonds, and other members of the Woolhope and Malvern Clubs. But confining myself to general observations, it may be stated, that a triple subdivision of that group, which I have shown to hold good over the continent of Europe as in our own country, seems now to be generally admitted, whilst the history of its southern fauna in Devonshire has recently been graphically and ably elaborated by Mr. Pengelly, in a paper printed in our last volume.

In Herefordshire and Shropshire the passage of the upper members of the Silurian rocks into the inferior strata of the Old Red group, has been well shown by Mr. Lightbody, and the fossils of its lower members have been vigorously collected. Whilst in Scotland, Mr. Geikie and others have shown the upward passage of *its superior* strata into the base of the Carboniferous rocks; and Dr. Anderson announces the finding of shells with crustacea in the lower or grey beds, south of the Tay. I may here note, that the point which I have been for some years endeavouring to establish as to the true position of the Caithness flags with their numerous ichthyolites seems to be admitted by my contemporaries. The lamented Hugh Miller considered these ichthyolites as belonging to the lower member of the group, and had good grounds for his views, since at his native place, Cromarty, these fish-beds appear very near the base. But by following them into Caithness and the Orkneys, I have shown that they occupy a middle position, whilst the true base of the group is the equivalent of the zone with Cephalaspis, Pteraspis, and Pterygotus.

And here it is right to state, that the upper Silurian rocks which are clearly represented in Edinburghshire, and which in Lanarkshire seem to graduate upwards into the Lower Old Red or Cephalaspis sandstone, are wanting in the Highlands; thus accounting for the great break which there occurs between the crystallized rocks of Lower Silurian age and the bottom beds of the Old Red Sandstone.

Of the Old Red Sandstone of Scotland and Herefordshire I may be permitted further to observe, that its downward passage into the uppermost Silurian rock, and the upward passage of its higher strata into the Carboniferous strata has been well developed, the one near Ludlow, chiefly through the labours of Mr. Lightbody; the other in Scotland, through the researches of the Government Geologists, Howell and Geikie, as well as by those of Mr. D. Page and other observers. On this head I may, however, note, what my contemporaries now seem to admit, that the removal of the Caithness flags and their numerous included ichthyolites from the bottom of this group, and their translation to the central part of the system, as first proposed by myself, is correct. In truth the lower member of this system is now unequivocally proved to be the band with Cephalaspis, Pteraspis, &c., as seen in Scotland, England, and Russia. The great break which has been traced in the south of Scotland by Mr. Geikie between the lower and upper Old Red is thus in perfect harmony with the zoological fact that the central or Caithness fauna is entirely wanting in that region, as in England—as it is indeed in Ireland, where a similar break occurs.

It gratifies me to add that many new forms of those fossil fishes which so peculiarly characterize the Old Red Sandstones have been admirably described by Sir Philip de Grey Egerton in the Memoirs of the Geological Survey; and I must remark that it is most fortunate that the eminent Agassiz is here so well represented by my distinguished friend, who stands unquestionably at the head of the fossil ichthyologists of our country.

Very considerable advances have been made in the development of our acquaintance with that system—the Carboniferous—which in the north of England (Yorkshire) has been so well described by Professor Phillips, and with which all practical geologists in and around Manchester are necessarily most interested. The close researches of Mr. Binney, who has, from time to time, thrown new lights on the origin and relations of coal, and the component part of its matrix, established proofs, so long ago as 1840, that great part of our coal fields was accumulated under marine conditions; the fossils associated with the coal-beds being, not as had been too generally supposed, of fluviatile or lacustrine character, but the spoils of marine life. Professor Henry D. Rogers came to the same conclusion with regard to the Apalachian coalfields in America, in 1842. Mr. Binney believes that the plant Sigillaria grew in salt water, and it is to be remarked that even in the so-called "fresh water limestones" of Ardwick and Le Botwood the Spirorbis and other marine shells are frequent, whilst many of the shells termed Cypris may prove to be species of Cytherea. Again, in the illustrations of the fossils which occur in the bands of iron-ore in the South Welch coalfield, Mr. Salter, entering particularly into this question, has shown that in the so-called "Unio-beds" there constantly occurs a shell related to the Mya of our coasts, which he terms Anthracomya; whilst, as he has stated in the "Memoirs of the Geological Survey," just issued, the very Unios of these beds have a peculiar aspect, differing much from that of true fresh-water forms. They have, he says, a strongly wrinkled epidermis, which is a mark of the Myadæ, or such burrowing bivalve snells, and not of true Unionidæ; they also differ in the interior, as shown by Professor W. King. Seeing that in these cases quietly deposited limestones with marine shells (some of them indeed of estuary character) rest upon beds of coal, and that in many other cases purely marine limestones alternate frequently with layers of vegetable matter and coal, and may we not be led to modify the theory, founded on the sound observation of Sir W. E. Logan, by which the formation of coal has been rather too exclusively referred to terrestrial and fresh-water conditions? May we not rather revert to that more expansive doctrine, which I have long supported, that different operations of nature have brought about the consolidation and alteration of vegetable matter into coal? In other words, that in one tract the coal has been formed by the subsidence *in situ* of vast breadths of former jungles and forests; in another, by the transport of vegetable materials into marine estuaries; in a third case, as in Russia and Scotland (where purely marine limestones alternate with coal), by a succession of oscillations between jungles and the sea; and lastly, by the extensive growth of large plants in shallow seas.

The geological map of Edinburghshire, prepared by Messrs. Howell and Geikie, and recently published, with its lucid explanations, affords indeed the clearest proofs of the frequent alternations of beds of purely marine limestone charged with Producti and bands of coal, and is in direct analogy with the coalfields of Donetz, in Southern Russia.*

In sinking through the extensive coal tracts around Manchester (at Dukinfield), where one of the shafts already exceeds in depth the deepest of the Durham mines, rigorous attention will, I hope, be paid to the discovery of the fossils which characterize each bed passed through, not merely to bring about a correctly matured view of the whole history of these interesting accumulations, formed when the surface of our planet was first furnished with abundant vegetation, but also for the practical advantage of the proprietor and miner, who, in certain limited areas, may thus learn where iron-ores and beds of coal are most likely to be persistent. In carrying out his survey-work through the northwestern coal-tracts of Lancashire, to which the large, or six-inch, Ordnance-map has been applied, one of the Secretaries of this Section, Mr. Hull, has done good service in accurately defining the tracts wherein the elevated coal-deposits are covered with drift only, in contradistinction to those which are still surmounted by red rocks of Permian and Triassic age. In seeing that these are eagerly bought by the public, and in recognizing the great use which the six-inch survey has proved in the hands of the geological surveyors in Scotland, our friends in and around Manchester may be led to insist on having that large scale of survey extended to their own important district. By referring to the detailed delineations of the outcrops of all the Carboniferous strata in the counties of Edinburgh, Haddington, Fife, and Linlithgow, as noted by Professor Ramsay and Messrs. Howell and Geikie, the coal-proprietors of England will doubtless recognize the great value of such determinations.

Concerning the Permian Rocks, which were formed towards the close of the long palæozoic era, and constitute a natural sequel to the old Carboniferous deposits, it is to be hoped that we shall here receive apposite illustrations from some of our associates.

When Professor Sedgwick, thirty-four years ago, gave to geologists his excellent Memoir on the Magnesian Limestone of our country, as it ranges from Durham, through Yorkshire, into Nottinghamshire, he not only described the numerous varieties of mineral structure which that rock exhibits, noting at the same time its characteristic fossils, but he also correlated it, and its underlying beds, with the Zechstein, Kupferschiefer, and Rothetodte-liegende, of Germany. But whilst this is the true order in both countries, there is this considerable difference in England, that along the zone where the Magnesian Limestone exists as a mass, and where Sedgwick described it, the inferior member of the group is a thin band of sandstone, usually of a yellow colour (the Ponterfact rock of William Smith), which in its southern extremity, near Nottingham, is almost evanescent. In many parts of Germany, on the contrary, and notably in Thuringia and Silesia, the same lower band, with a few intercalated courses of lime-stone, swells out into enormous thicknesses and even constitutes lofty ridges.

In Russia the series of this age puts on very different mineral arrangement. There the calcareous bands, containing the very same species of shells as the magnesian limestone of Germany and Britain, are intercalated with pebble-beds, sandstones, marls, and copper-ores, so that, although the same lithological order does not prevail as in the Saxon or typical Permian country of the elder German geologists, the group is, through its fossil types, unquestionably the same. It was from the observation of this fact, and from seeing that these deposits, so mixed up, yet sö clearly correlated by their animal and vegetable relics, and all superposed to the Carboniferous system, occupied a region twice as large as the British Isles, in which the varieties of structure are best seen, in the government of Perm, that I proposed in 1841, that the *whole group* should have the name of "Permian."

Of late years various British authors, including King, Howse, and others, have ably described the fossil shells of this deposit as it exists on the eastern side of the Penine chain; and recently Mr. Kirkby has produced a carefully-written and well-considered memoir, showing the relations of the whole group by comparing its structure and palæontological contents in Durham with those in South Yorkshire. Whilst, in addition, my associates of the Geological Survey, particularly Mr. Aveline, have been carefully delineating the area of these beds in their northern range from Nottingham through Yorkshire, much yet remains to be done in correlating the Permian rocks lying to the west of the Penine ridge, or where we are now assembled, with their eastern equivalents.

Already, however, great strides have been made towards this desirable end. Thus, Mr. Binney has indicated the succession in the neighbourhood of Manchester, and has shown us that there some of the characteristic fossils of the eastern magnesian limestone, exist in red marl and limestones subordinate thereto, and that these are clearly underlaid by other red sandstones, shales, and limestones, which he terms Lower Permian. He has further followed these Lower Permian beds to the west and northwest, and finds them expanding into considerable thicknesses at Astley, Scarrisbrick, and other places where they overlie the coal measures, and he has also traced them into Westmoreland, Cumberland and Dumfrieshire. In the last case he went far to prove that which I suggested many years ago, that the red sandstones of Dumfriesshire containing the large footprints of chelonians, as described by Sir W. Jardine, are of Lower Permian age.

This view of the relations of the Permian rocks of the northwest has been also taken by Professor Harkness, and this summer he has successfully worked out, and has definitely applied the Permian classification to large tracts in Cumberland, as explained in a letter to myself. He finds that the breccias and sandstones of Kirby-Stephen and Appleby, which at the latter place have a thickness of three thousand feet, extend northward on the west side of the Eden (the breccia being replaced by false-bedded sandstones with footprints), and attain near Carlisle the enormous thickness of about five thousand feet. These beds he classes unhesitatingly as Lower Permian, because he finds them to be overlaid (near Ormside) by a group of

* See Russia in Europe and the Ural Mountains, Vol. I.

clays, sandstones, and magnesian limestones, containing peculiar plant remains and shells of the genus Schizodus, representing in his opinion the marlslate and magnesian limestone of Durham. These again support beds equivalent to the Zechstein, and the last are covered by the Triassic sandstone of the Solway.

A very striking fact, noticed by Professor Harkness, and corroborative of earlier researches made by Mr. Binney, is the existence of footprints, in the Lower Permian of Cumberland, similar to those of Corncockle Moor, in Dumfriesshire, where, from my own observations, including those of last year, these Lower Permian sandstones have, I am convinced, a greater thickness even than that which is assigned to them in Cumberland.

Notwithstanding these discoveries, we have still to show the continuous existence of the Lower Red Sandstone of Shropshire, Worcestershire, and Staffordshire, which I have classed as the lower member of the Permian rocks, and to decide whether it be really such lower member *only*, or is to be regarded as the equivalent of the whole Permian group, under different mineral conditions. With the extension of the Geological Survey this point will, doubtless, be satisfactorily adjusted, and we shall then know to what part of the series we are to attach the plant-bearing red beds of Coventry and Warwick, described as Permian by Ramsay and his associates. We have also to show that, in its northern course, the lower red sandstone of the central counties, with its calcareous conglomerates, graduates into the succession exhibited at Manchester, thence expanding northwards. Already, however, we have learned that in our own little England, which contains excellent normal as well as variable types of all palæozoic deposits, there exists proofs that the Permian rocks, according to the original definition of the same, present to the observer, who examines them to the west as well as to the east of the Penine chain, nearly as great diversities of lithological structure, in this short distance, as those which distinguish the strata of the same age in Eastern Russia in Europe from the original types of the group in Saxony and other parts of Germany.

(*To be continued.*)

ILLUMINATING GAS.

The price at which illuminating gas can be made and distributed is a very important question, particularly in those places where new works have been projected, and the future consumers are altogether unused to any mode of illumination than that furnished by the old-fashioned lamps and candles. In fixing upon a rate at which gas is to be sold, comparisons are instituted between the price ruling in localities somewhat similarly situated, and the question is often settled by adventitious circumstances, which, but for some unforseen occurrence, would have been decided in a manner more beneficial to both shareholders and consumers. It cannot be questioned that frequently a grasping spirit is exhibited by new gas companies, which sound judgment cannot but condemn. A too eager desire is manifested by shareholders to reap quick returns in the shape of dividends, and the ultimate prosperity of the company, as enhanced by lower prices and an increasing number of consumers, is too often lost sight of. This state of things is more liable to occur in small towns, where the people have been long accustomed to practice the severest economy, and who cling to former habits with great tenacity. Many instances of this nature have been observed in the history of British gas-light companies, in some of which prices have been kept up, while the addition of consumers has been very slow. On the contrary, in other companies, where a more liberal spirit has been manifested, and a future increase of business rather than present profit has been sought, a permanent degree of prosperity has been attained, far distancing some of the companies who pursued a different course. Our table of American Gas-Light Companies, published on pages 198 and 199 of this volume, furnish a statement of the price charged by the various companies, and other statistics of value. From these tables it will be seen that the price of gas, in the United States, varies all the way from $1.50 to $12.50 per thousand cubic feet. For the purpose of reviewing the average cost of gas to consumers, we have classified the figures charged in the various localities, and are thus enabled to present them in a more intelligible shape than when arranged merely in alphabetical order. There are, altogether 420 gas-light companies in the United States, of which 354 manufacture coal-gas, 30 rosin-gas, 1 wood-gas, and 3 water-gas. Of the coal-gas companies, our tables give the rates charged by 380 of them. Beginning at the companies whose product is sold at the lowest rate, the Brooklyn, N. Y., and Pittsburgh, Pa., gas-light companies, head the column—they disposing of their product at the remarkably low figure of $1.50 per thousand cubic feet. The Marysville, Cal., Gas-Light Company brings up the rear, with the exorbitant price of $12.50 per thousand cubic feet.

There are

2	Companies	charging	per	1,000 c. f.	......	$1 50
2	"	"	"	"	......	2 00
3	"	"	"	"	......	2 25
9	"	"	"	"	......	2 50
1	"	"	"	"	......	2 70
1	"	"	"	"	......	2 90
32	"	"	"	"	......	3 00
1	"	"	"	"	......	3 10
1	"	"	"	"	......	3 20
1	"	"	"	"	......	3 24
4	"	"	"	"	......	3 25
62	"	"	"	"	......	3 50
10	"	"	"	"	......	3 60
1	"	"	"	"	......	3 62
2	"	"	"	"	......	3 70
3	"	"	"	"	......	3 75
9	"	"	"	"	......	3 80
1	"	"	"	"	......	3 86
172	"	"	"	"	......	4 00
1	"	"	"	"	......	4 40
18	"	"	"	"	......	4 50
19	"	"	"	"	......	5 00
1	"	"	"	"	......	5 40
11	"	"	"	"	......	6 00
1	"	"	"	"	......	6 70
2	"	"	"	"	......	7 00
2	"	"	"	"	......	8 00
7	"	"	"	"	......	10 00
1	"	"	"	"	......	12 50

The average price of coal-gas in the United States, as computed from the above figures, is within a fraction of $4.06 per thousand cubic feet. In this calculation the prices of the California gas-light companies are included, which are much higher than those charged in any of the older States, owing to a variety of circumstances, and the proportional expenses of other necessaries of living.

In view of the price of gas which obtains in other countries, this average must be considered as high —too high for the mutual benefit of producers and consumers—especially when kerosene oil presents so many claims upon the attention of the public as an economical illuminating agent. Notwithstanding the danger attending the promiscuous use of some descriptions of this oil, and which is almost the only drawback to its adoption, it is used to an enormous extent, and has doubtless retarded the construction of gas-works in many places—particularly in the Western States. The cheapness of kerosene oil is easily demonstrated, and light for light, it runs a successful competition with gas, assuming the average price of the latter article as a standard. Gas engineers would do well to look this matter in the face, and act accordingly. The fact may be unpleasant to contemplate, but it is nevertheless patent to all who will take the trouble to examine it.

We have always opposed senseless agitations respecting reductions in the price of gas, and on page 248 exhibited the fallacy of the arguments generally adopted by such agitators. But while condemning such diatribes as are usually fulminated on this subject, we deem it a matter worthy of mature reflection whether the general interests of shareholders would not be better served, and a large additional consumption attained, by gradual and prudent concessions. At any rate, a perusal of statistics like the above may be suggestive, and we commend the subject to the consideration of the profession generally.

In consequence of the recent reports of Dr. Letheby and Mr. Haywood to the City Commission of Sewers, in London, recommending the extra carburation of gas supplied to the city lamps, attention has been drawn to the subject, and already plans for effecting the napthalization have been submitted both in this country and in England. On page 133 of this volume we gave an illustration of Gwynne's gas carbonizer, which is said to perform its work with great satisfaction, accomplishing a saving in gas bills which must commend it to consumers generally. Other modifications of apparatus for this purpose have been brought before the public, and it remains to be seen whether their adoption will become general.

The idea of increasing the illuminating power of gas, by saturating it with the vapor of a volatile hydrocarbon, was first suggested by Mr. Lowe, who, many years ago, proposed to pass gas through naphtha. The prospect of so largely reducing the amounts of gas bills by this expedient, which seemed imminent, was not by any means pleasing to the gas companies, who opposed the innovation with considerable energy. In consequence of this opposition, very few consumers adopted the suggestion, the companies being successful in the resistance which they interposed. In addition to the antagonism offered by the gas companies, insurance companies likewise placed obstacles in the way of the new invention, under the plea that an inflammable substance, such as naphtha, would render their risks more hazardous. The futility of this reason must be apparent to all; and the fact that many more inflammable substances are in daily use in many households, with no remonstrance being urged against them, suggests the idea that some undue influence must have been brought to bear upon the insurance companies, or that the dangerous nature of naphtha must have been described to them with a too generous use of depreciatory adjectives. Mr. Lowe's original idea was to fill an ordinary wet meter with naphtha, so that the gas might be measured and rendered more luminous at the same time. This plan proving objectionable, a box containing a number of shelves, and separated into partitions, was substituted for it. The naphtha was either poured upon the shelves in small quantities at a time, or sponges or cloths, saturated with the liquid, were placed upon them. The gas was made to traverse over and around the hydrocarbon, and was thus rendered highly luminous.

One of the great advantages claimed for naphthalized gas, in addition to that of economy, is that much less heat is generated than when gas alone is used. Those who are familiar with the subject, and who have experimented upon both methods of burning gas, say that light for light, the heating power of naphthalized gas is to that of ordinary gas in the ratio of three to four. In summing up the recommendations of naphthalized gas, Knapp says that its light is more analagous to that of the sun, and that objects illuminated by it, particularly the face, assume a much more natural appearance, and do not partake of the pallid hue which is peculiar to all objects illuminated by ordinary coal-gas.

It is stated by correspondents of the daily newspapers, that some sweeping reforms are about being inaugurated by the New York Legislature, now in session at Albany. Among the offices which rumour states are to be abolished, is that of the inspector of gas-meters. If this be true, it is an unfortunate movement, to say the least of it. We have repeatedly referred to the importance of this office, and to the able manner in which the present incumbent fulfils his duties. We trust the rumour in question may prove premature, and hope that the good sense of the members of the Legislature may induce them to see that a real wrong would be perpetrated by the repeal of the act establishing the office.—*American Gas-Light Journal.*

The Great Mont Cenis Works.

M. Sommeiller, who is the director of the great works connected with the perforation of Mont Cenis, in a letter, states that everything is proceeding satisfactorily. Hitherto the boring has been carried on at the south end, but in Jonuary or February vast machines will be set to work on the north side also. Progress is now being made at the rate of about seven feet a day, and this speed will be doubled by February; but it will take at least six years more to accomplish this extraordinary and almost super-human task.

Board of Arts and Manufactures FOR UPPER CANADA.

THE LIBRARY OF REFERENCE.

At the monthly meeting of the Committee, held on the 27th ultimo, it was

Resolved, on motion of Mr. Sheppard, "That the Library of the Board be opened to the public (for reference) on the evenings of Tuesday and Friday of each week, from 7 to 10 o'clock;" in addition to the usual hours, from 10 A. M. to 4 o'clock, P. M., daily.

The Library contains several hundred volumes of valuable books of reference in architecture, decoration and ornament, designing, encyclopœdias, engineering and mechanics, manufactures and trades, general science, patents of inventions of Great Britain, the United States and Canada, &c.

W. EDWARDS, *Secretary*.

DRAFT OF A MEMORIAL OF THE BOARD OF ARTS AND MANUFACTURES FOR UPPER CANADA RELATING TO A RENEWAL OF AN ANNUAL GRANT TO MECHANICS' INSTITUTES THROUGHOUT THE PROVINCE.

To the Honourable the Legislative Assembly of Canada, in Provincial Parliament assembled.

The Board of Arts and Manufactures for Upper Canada, respectfully beg leave to represent to your Honourable House, that during the session of the Provincial Parliament in the year 1859, as soon as it was publicly known that it was the intention of the Government to withdraw all grants to Mechanics' Institutes, a deputation was appointed by the committee of this Board to wait upon the Hon. Finance Minister, and to represent the effect of the withdrawal of Government support, not only on the different Mechanics' Institutes throughout the Province, but also on this Board.

The Finance Minister then assured the deputation that it was the intention of the Government to resume the annual grants to Mechanics' Institutes in the following year, under a new and more judicious mode of distribution.

The period for the renewal of these grants having now been deferred for three years, the Board of Arts and Manufactures for Upper Canada respectfully approach your Honourable House with the prayer that the support of the Government may no longer be withheld from the Mechanics' Institutes in existence, or which may be formed, throughout the Province; and with a view to ensure the judicious application of a Government grant, the Board respectfully suggest that the following scheme of its disbursement be adopted and authorized:

1st, A renewal of the grant of $200 per annum to be made to each properly organized Mechanics' Institute throughout the Province, embracing not less than fifty members, paying at least $1 per annum, and twenty of whom shall be working mechanics or manufacturers.

2nd. Fifty per cent. of the grant, or $100, to be appropriated to the purchase of books of an instructive character for manufacturers and artizans; such works to be supplied through the Board of Arts and Manufactures at reduced rates; but the selection from an approved list, to be made by the Institutes themselves.

3rd. Forty per cent. or $80, to be devoted to the encouragement of classes established in the respective Institutes, for class instruction in mechanical or natural sciences by lectures or otherwise; and for prizes to be given to successful competition at the Annual Examination of member of Mechanics' Institutes, established by this Board.

4th. Ten per cent., or $20, to be retained by the Board of Arts and Manufactures for prizes in the Arts and Manufactures Departments of the Provincial Exhibition.

5th. The distribution of the annual grants for Upper Canada to be made by this Board, upon approved returns from each Institute of the proper application of the funds applied for and expended in the formation and instruction of classes, or in the establishment of prizes, such returns to be forwarded by this Board to the Auditor General at the close of each year, with a report on the working of the respective Institutes.

6th. Any funds not legally claimed by the Institutes, to be set apart for the engagement of occasional lectures on subjects relating to arts and manufactures, selected by the respective Boards, and for the publication of such lectures with appropriate illustrations in the journals of the respective Boards.

Your memorialists deem it highly desirable to supply the manufacturers and artizans of Canada with easy facilities for obtaining the best information relating to the several branches of industry, and would therefore, to that end, respectfully beg leave to urge upon your Honourable House, the vast importance of renewing the annual grants to Mechanics' Institutes; believing that the means your memorialists venture to suggest are well adapted to carry out the desirable object.

Wherefore your memorialists humbly pray, that your Honourable House will be pleased to recommend to His Excellency the Governor General, that the annual grants to Mechanics' Institutes may be resumed, upon the scheme of distribution hereinbefore suggested, or upon such other plan as to your Honourable House may seem best: and your memorialists as in duty bound will ever pray, &c., &c.

PROVINCIAL EXHIBITION.

Local Committee for 1862.

Hon. G. W. Allan, Pres. Horticu. Soc., *Chairman.*
J. G. Bowes, Esq., Mayor of Toronto.
J. P. Wheeler, Esq., Warden of County.
F. W. Jarvis, Esq., Sheriff of County.
Rice Lewis, Esq., Presid. Toronto Mechanics' Inst.
Jas. Beachell, Esq., President Toronto Electoral Division Society.
Prof. Hind, Trinity College University.
Prof. Croft, University College.
Alexander Shaw, Esq.
John P. Bull, Esq.
Archibald Barker, Esq.
Aldermen Brunel, Carr, Hynes and Strachan.
The Members of the Board of Agriculture, as Council of the Association, *ex-officio.*
W. Edwards, *Secrerary* and *Treasurer.*

The Committee has adopted plans for permanent stables for 198 horses, sheds for 435 heads of cattle, and a machine and carriage shed 272 feet long by 32 feet wide.

At a meeting of the Committee on the 5th inst., tenders were accepted for the construction of the horse stables and machine and carriage shed, at a cost of $4,840.

The acceptance of the tenders for the erection of he cattle sheds is postponed until the committee is assured of having sufficient funds to meet the expense of permanent buildings.

The prize list for the Arts and Manufactures Department of the Exhibition, in which great improvements have been made on former years, appears in the present number of this *Journal.*

PROVINCIAL EXHIBITION.

PRIZE LIST—ARTS AND MANUFACTURES DEPARTMENT.

The following is the Prize List of the Arts and Manufactures Department of the Agricultural Association's Exhibition, to be held in the City of Toronto, on September 30th, and October 1st, 2nd and 3rd, 1862. The whole of the Rules and Regulations will be published in the next issue.

CLASSIFICATION OF PRIZE LIST.

ARTS, MANUFACTURES, LADIES' WORK, &c., &c.

Class 38—Cabinet Ware and other Wood Manufactures.
" 39—Carriages and Sleighs, and parts thereof.
" 40—Chemical Manufactures and Preparations.
" 41—Decorative and Useful Arts; Drawings and Designs.
" 42—Fine Arts.
" 43—Groceries and Provisions.
" 44—Ladies' Work.
" 45—Machinery, Castings, and Tools.
" 46—Metal Work (Miscellaneous) including Stoves.
Class 47—Miscellaneous, including Pottery, and Indian Work.
" 48—Musical Instruments.
" 49—Natural History.
" 50—Paper, Printing, and Bookbinding.
" 51—Saddle, Engine Hose, and Trunkmaker's Work; and Leather.
" 52—Shoe and Bootmakers' Work; and Leather.
" 53—Woollen, Flax, and Cotton Goods; and Furs and Wearing Apparel.
" 54—Foreign Manufactures.

Class 38—Cabinet Ware, and other Wood Manufactures.

Cabinet Ware.

Sect.		1st Prize.	2nd Prize.
1	Bed Room Furniture, set of	$10 00	$8 00
2	Centre Table	7 00	5 00
3	Drawing Room Sofa	7 00	5 00
4	Drawing Room Chairs, set of	7 00	5 00
5	Dining Room Furniture, set of	8 00	6 00
6	Side Board	6 00	4 00
7	Wardrobe	5 00	4 00

Miscellaneous.

Sect.		1st Prize.	2nd Prize.
8	Cooper's Work	4 00	3 00
9	Curled Hair, 10 lbs	3 00	2 00
10	Handles for Tools for carpenters, blacksmiths, gunsmiths, watchmakers, &c., &c., collection of	8 00	5 00
11	Joiner's Work, assortment of	8 00	5 00
12	Machine-wrought Moulding, and Flooring, 100 feet of each	6 00	4 00
13	Turning in Wood, collection of specimens	6 00	4 00
14	Veneers from Canadian Woods	10 00	6 00
15	Wash-tubs and Wooden Pails, three of each, factory made	4 00	3 00
16	Willow Ware, six specimens	4 00	3 00
17	Extra entries		

Class 39—Carriages and Sleighs, and Parts thereof.

Sect.		1st Prize.	2nd Prize.
1	Axle, wrought iron	$3 00	$2 00
2	Bent Shafts, half a dozen	3 00	2 00
3	Buggy, double seated	8 00	6 00
4	Buggy, single seated	7 00	5 00
5	Carriage, two-horse, pleasure	12 00	8 00
6	Carriage, one-horse, pleasure	8 00	6 00
7	Child's Carriage	4 00	3 00
8	Dog Cart, single horse	6 00	4 00
9	Hubs, two pairs of carriage	3 00	2 00
10	Rims or Felloes, two pairs of carriage	3 00	2 00
11	Spokes, one dozen machine made carriage	3 00	2 00
12	Sleigh, two-horse, pleasure	10 00	7 00
13	Sleigh, one-horse, pleasure	8 00	6 00
14	Springs, one set of steel carriage	4 00	3 00
15	Wheels, one pair of carriage (unpainted)	4 00	3 00
16	Extras		

Class 40—Chemical Manufactures and Preparations.

Sect.		1st Prize.	2nd Prize.
1	Essential Oils, assortment of	$6 00	$4 00
2	Glue, 14 lbs.	3 00	2 00
3	Isinglass, 1 lb.	3 00	2 00
4	Medicinal Herbs, Roots and Plants, native growth	12 00	8 00
5	Oils, Linseed and Rape, and other expressed kinds	6 00	4 00
6	Oil, Coal, Shale or Rock	6 00	4 00
7	Varnishes, assortment of	6 00	4 00
8	Extra entries		

Class 41—Decorative and Useful Arts, Drawings and Designs.

Sect.		1st Prize.	2nd Prize.
1	Architectural Design, with complete detail Drawings	$12 00	$8 00
2	Carving in Wood	6 00	4 00
3	Drawing of Machinery, in perspective	5 00	3 00
4	Decorative House Painting	5 00	3 00
5	Engraving on Wood, with proof	5 00	3 00
6	Engraving on Copper, with proof	5 00	3 00
7	Goldsmith's Work	5 00	3 00
8	Geometrical Drawing of Engine or Millwright work, coloured	5 00	3 00
9	Lithographic Drawing	5 00	3 00
10	Lithographic Drawing, coloured	6 00	4 00
11	Mantlepiece in marble	10 00	6 00
12	Mathematical, Philosophical and Surveyor's Instruments, collection of	15 00	10 00
13	Modelling in Plaster	6 00	4 00
14	Monumental Tomb or Headstone	6 00	4 00
15	Picture Frame, ornamented gilt	5 00	3 00
16	Seal Engraving, with wax impressions	6 00	4 00
17	Silversmith's Work	5 00	3 00
18	Stained Glass, collection of specimens	10 00	6 00
19	Extra entries		

Class 42—Fine Arts.

Professional List—Oil.

Sect.		1st Prize.	2nd Prize.
1	Animals, grouped or single	$12 00	$8 00
2	Historical Painting	12 00	8 00
3	Landscape, Canadian Subject	12 00	8 00
4	Marine Painting, Canadian Subject	12 00	8 00
5	Portrait	10 00	7 00
	In Water Colours.		
6	Animals, grouped or single	8 00	6 00
7	Flowers, grouped or single	8 00	6 00
8	Landscape, Canadian subject	8 00	6 00
9	Marine View, Canadian subject	8 00	6 00
	Pencil, Crayon, &c.		
10	Crayon, coloured	6 00	4 00
11	Crayon, plain	6 00	4 00
12	Pencil Drawing	6 00	4 00
13	Pen and Ink Sketch	6 00	4 00

Amateur List—Oil.

		1st Prize.	2nd Prize.
14	Animals, grouped or single	9 00	7 00
15	Historical Painting	9 00	7 00
16	Landscape, Canadian subject	9 00	7 00
17	Marine Painting, Canadian subject	9 00	7 00
18	Portrait	8 00	6 00

In Water Colours.

19	Animals, grouped or single	8 00	6 00
20	Flowers, grouped or single	5 00	3 00
21	Landscape, Canadian subject	8 00	6 00
22	Marine View, Canadian subject	8 00	6 00

Pencil, Crayon, &c.

23	Crayon, coloured	5 00	3 00
24	Crayon, plain	5 00	3 00
25	Pencil Drawing	5 00	3 00
26	Pen and Ink Sketch	5 00	3 00

Photography.

27	Ambrotypes, collection of	7 00	6 00
28	Photograph Portraits, collection of, in duplicate, one set coloured	10 00	8 00
29	Photograph Portraits, collection of, plain	8 00	6 00
30	Photograph Landscapes and Views, collection of	9 00	7 00
31	Photograph Portraits in oil	8 00	6 00
32	Extras		

Class 43—Groceries and Provisions.

Sect.		1st Prize.	2nd Prize.
1	Barley, Pearl	$3 00	$2 00
2	Barley, Pot	3 00	2 00
3	Bottled Fruits, an assortment, manufactured for sale	6 00	4 00
4	Bottled Pickles, an assortment, manufactured for sale	6 00	4 00
5	Buckwheat Flour	3 00	2 00
6	Cayenne Pepper, from Capsicums grown in the Province	2 00	1 00
7	Chickory, 20 lbs. of	3 00	2 00
8	Indian Corn Meal	3 00	2 00
9	Oatmeal	3 00	2 00
10	Sauces for table use, an assortment, manufactured for sale	6 00	4 00
11	Soaps, collection of assorted fancy	6 00	4 00
12	Starch, 12 lbs. of Corn	2 00	1 00
13	Starch, 12 lbs. of Flour	2 00	1 00
14	Starch, 12 lbs. of Potatoe	2 00	1 00
15	Sugar, 20 lbs. of Beet Root	3 00	2 00
16	Sugar, 20 lbs. of Corn Stalk	3 00	2 00
17	Sugar, one loaf of Refined	5 00	3 00
18	Tobacco, 14 lbs. Canadian manufactured	4 00	3 00
19	Wheat Flour	5 00	3 00
20	Extra entries		

Class 44—Ladies' Work.

Sect.		1st Prize	2nd Prize.
1	Braiding	$3 00	$2 00
2	Crochet Work	3 00	2 00
3	Embroidery in Muslin	3 00	2 00
4	Embroidery in Silk	3 00	2 00
5	Embroidery in Worsted	3 00	2 00
6	Gloves, three pairs	2 00	1 00
7	Guipure Work	3 00	2 00
8	Knitting	3 00	2 00
9	Lace Work	3 00	2 00
10	Mittens, three pairs of woollen	2 00	1 00
11	Needle Work, ornamental	3 00	2 00
12	Netting, fancy	3 00	2 00
13	Plait for Bonnets or Hats, of Canadian Straw	3 00	2 00
14	Shirt, gentleman's	3 00	2 00
15	Socks, three pairs of woollen	2 00	1 00
16	Stockings, three pairs of woollen	2 00	1 00
17	Tatting	3 00	2 00
18	Wax Fruit	6 00	4 00
19	Wax Flowers	6 00	4 00
20	Worsted Work	3 00	2 00
21	Worsted Work (raised)	3 00	2 00
22	Extra entries		

Class 45—Machinery, Castings, and Tools.

Sect.		1st Prize.	2nd Prize.
1	Castings for General Machinery	$10 00	$6 00
2	Cast Wheel, spur or bevel, not less than 50 lbs. weight	8 00	5 00
3	Castings for Railways, Railroad Cars and Locomotives, assortment of	15 00	10 00
4	Edge Tools, an assortment	20 00	12 00
5	Engine, Steam, stationary, of one to four horse power, in operation	20 00	12 00
6	Engine, Steam, stationary, five horse power and upwards, in operation	30 00	15 00
7	Engine, Hot Air, one to four horse power, in operation on the ground	20 00	12 00
8	Pump, in metal	5 00	3 00
9	Refrigerator	6 00	4 00
10	Sewing Machine, manufacturing	10 00	7 00
11	Sewing Machine, family	10 00	7 00
12	Scales, platform	5 00	3 00
13	Scales, counter	3 00	2 00
14	Smoke Consuming Furnace, in operation on the ground	12 00	8 00
15	Tools for Working in Metals, assortment of	15 00	10 00
16	Turning Lathe	5 00	3 00
17	Valves and Gearing for working steam expansively, either in model or otherwise, principle of working to be the point of competition	12 00	8 00
18	Extra entries		

Class 46—Metal Work (Miscellaneous) including Stoves.

Miscellaneous.

Sect.		1st Prize.	2nd Prize.
1	Coal Oil Lamps, an assortment	$8 00	$6 00
2	Coppersmith's Work, an assortment	7 00	5 00
3	Fire Arms, an assortment	7 00	5 00
4	Files, collection of cast steel	3 00	2 00
5	Fire Proof Office Safe	8 00	6 00
6	Gas Fittings, an assortment	7 00	5 00
7	Iron Fencing and Gate, ornamental	7 00	5 00
8	Iron Work from the hammer, ornamental	6 00	4 00
9	Iron Work, ornamental cast	6 00	4 00
10	Locksmith's Work, an assortment	7 00	5 00
11	Nails, 20 lbs. of pressed	6 00	4 00
12	Nails, 20 lbs. of cut	6 00	4 00
13	Plumber's Work, an assortment	6 00	4 00
14	Sheet Brass Work, an assortment	7 00	5 00
15	Tinsmith's Work, an assortment	6 00	4 00
16	Tinsmith's Lacquered Work, an assortment of	6 00	4 00
17	Wire Work, an assortment	6 00	4 00
	Stoves.		
19	Cooking Stove, for wood, with furniture	6 00	4 00
20	Cooking Stove, for coal, with furniture	6 00	4 00
21	Hall Stove, for wood	5 00	3 00
22	Hall Stove, for coal	5 00	3 00
23	Parlour Stove, for wood	5 00	3 00
24	Parlour Stove, for coal	5 00	3 00
25	Parlour Grate	6 00	4 00
26	Extra entries		

Class 47—Miscellaneous, including Pottery and Indian Work.

Miscellaneous.

Sect.		1st Prize.	2nd Prize.
1	Brushes, an assortment	$6 00	$4 00
2	Model of a Steam Vessel	6 00	4 00
3	Model of a Sailing Vessel	6 00	4 00
	Pottery.		
4	Filterer for water	3 00	2 00
5	Pottery, an assortment	8 00	5 00
6	Sewerage Pipes, stoneware, assortment of sizes	10 00	6 00
7	Stoneware, an assortment	10 00	6 00
8	Slates for roofing	8 00	[illegible]00
	Indian Work.		
9	Buckskin Mittens, one pair	2 00	1 00
10	Clothes Basket	2 00	1 00
11	Fruit Basket	2 00	1 00
12	Hand Basket	2 00	1 00
13	Moccasins, one pair of plain	2 00	1 00
14	Moccasins, worked with beads or porcupine quills, one pair	3 00	2 00
15	Extra entries		

Class 48—Musical Instruments.

Sect.		1st Prize.	2nd Prize.
1	Harmonium	$10 00	$6 00
2	Melodeon	6 00	4 00
3	Organ, Church	25 00	15 00
4	Piano, Square	15 00	10 00
5	Piano, Grand	15 00	10 00
6	Piano, Cottage	10 00	6 00
7	Violin	3 00	2 00
8	Extra entries		

Class 49—Natural History.

Sect.		1st Prize.	2nd Prize.
1	BIRDS—Collection of Stuffed Birds of Canada, classified, and common and technical names attached	$8 00	$6 00
2	FISHES—Collection of Native Fishes, stuffed or preserved in spirits, and common and technical names attached	8 00	6 00
3	INSECTS—Collection of Native Insects, classified, and common and technical names attached	8 00	6 00
4	MAMMALIA AND REPTILES of Canada, stuffed or preserved in spirits, classified, and common and technical names attached, a collection	8 00	6 00
5	MINERALS—Collection of Minerals of Canada, named and classified	8 00	6 00
6	PLANTS—Collection of Native Plants, arranged in their natural families, and named	8 00	6 00
7	STUFFED BIRDS AND ANIMALS of any country, collection of	8 00	6 00
8	WOODS—Collection of the Woods of Canada, in boards two feet long, one side polished; also, a portion of the tree cut in sections, showing the bark	8 00	6 00
9	Extra entries		

Class 50—Paper, Printing, Bookbinding, and Type.

Sect.		1st Prize.	2nd Prize
1	Bookbinding (blank-book), assortment of	$5 00	$3 00
2	Bookbinding (letter-press), assortment of	5 00	3 00
3	Letter-press Printing, plain	5 00	3 00
4	Letter-press Printing, ornamental	5 00	3 00
5	Paper Hangings (Canadian paper), one dozen rolls, assorted	7 00	5 00
6	Printing, Wrapping, and Writing Papers, one ream of each	7 00	5 00
7	Printing Type, an assortment	7 00	5 00
8	Extra entries		

Class 51—Saddle, Engine Hose, and Trunk Makers' Work, anth.ed Lear

Saddlery, &c.

Sect.		1st Prize.	2nd Prize.
1	Engine Hose and Joints, $2\frac{3}{4}$ inches diameter, 50 feet of copper rivetted	$6 00	$4 00
2	Harness, set of double carriage	8 00	6 00
3	Harness, set of single carriage	6 00	4 00
4	Harness, set of team	5 00	3 00
5	Saddle, Ladies' full quilted	8 00	6 00
6	Saddle, Ladies' quilted safe	6 00	4 00
7	Saddle, Gentlemen's full quilted	7 00	5 00
8	Saddle, Gentlemen's plain shaftoe	5 00	3 00
9	Trunks, an assortment	8 00	6 00
10	Valises and Travelling Bags, an assortment	5 00	3 00
11	Whips, and Thongs, an assortment	6 00	4 00
12	Hames, four pairs of iron carriage or gig	3 00	2 00
13	Hames, three pairs of iron cased team or cart	3 00	2 00
14	Hames, six pairs of wooden team	3 00	2 00
	Leather.		
15	Belt Leather, 30 lbs.	3 00	2 00
16	Brown Strap and Bridle, one side of each	3 00	2 00
17	Carriage Cover, two skins	3 00	2 00
18	Deer Skins, dressed	2 00	1 00
19	Harness Leather, two sides	3 00	2 00
20	Hog Skins, for saddles, three	4 00	3 00
21	Patent Leather, for carriage or harness work, 20 feet	6 00	4 00
22	Skirting for saddles, two sides	4 00	3 00
23	Extra entries		

Class 52—Shoe and Boot Makers' Work, Leather, &c.

Boots, &c.

Sect.		1st Prize.	2nd Prize.
1	Boots, Ladies, an assortment	$7 00	$5 00
2	Boots, Gentlemen's sewed, an assortment	7 00	5 00
3	Boots, pegged, an assortment	5 00	3 00
4	Boot and Shoemakers' Tools, an assortment	8 00	6 00
5	Boot and Shoemakers' Lasts and Trees, an assortment	8 00	6 00

Leather.

6	Calf Skins	3 00	2 00
7	Calfskins, two morocco	3 00	2 00
8	Cordovan, two skins of	3 00	2 00
9	Dog Skins, two dressed	3 00	2 00
10	Kip Skins, two sides	3 00	2 00
11	Linings, six skins	3 00	2 00
12	Patent Leather for bootmakers, 20 feet	6 00	4 00
13	Sheep Skins, six coloured	3 00	2 00
14	Sole Leather, two sides	3 00	2 00
15	Upper Leather, two sides	3 00	2 00
16	Extra entries		

Class 53—Woollen, Flax, and Cotton Goods; and Furs and Wearing Apparel.

Sect.		1st Prize.	2nd Prize.
1	Bags, from flax or hemp, the growth of Canada, one dozen	$5 00	$4 00
2	Bags, one dozen cotton	4 00	3 00
3	Blankets, woollen, one pair	6 00	4 00
4	Carpet, woollen, one piece	8 00	6 00
5	Carpet, woollen stair, one piece	6 00	4 00
6	Cloth, fulled, one piece	6 00	4 00
7	Cloth, broad, one piece	6 00	4 00
8	Counterpanes, two	5 00	3 00
9	Cordage and Twines, from Canadian flax or hemp, assortment of	10 00	6 00
10	Check for horse collars, one piece	4 00	3 00
11	Drawers, factory made, woollen, one pair	4 00	3 00
12	Flannel, factory made, one piece	5 00	3 00
13	Flannel, not factory made, one piece	5 00	3 00
14	Flannel, scarlet, one piece	5 00	3 00
15	Fur Cap and Gloves	4 00	3 00
16	Fur Sleigh Robe	5 00	3 00
17	Gloves and Mits of any leather, an assortment	4 00	3 00
18	Horse Blankets, two pairs	5 00	3 00
19	Kersey for horse clothing, one piece	5 00	3 00
20	Linen Goods, one piece	5 00	3 00
21	Winsey, checked, one piece	5 00	3 00
22	Satinet, black, one piece	6 00	4 00
23	Satinet, mixed, one piece	5 00	3 00
24	Shirts, factory made, three woollen	5 00	3 00
25	Silk and Felt Hats	5 00	3 00
26	Stockings, and Socks, factory made, woollen, three pairs of each	4 00	2 00
27	Stockings, and Socks, factory made, mixed woollen and cotton, three pairs of each	4 00	2 00
28	Suit of Clothes of Canadian Cloth	10 00	6 00
29	Tweed, Winter, one piece	6 00	4 00
30	Tweed, Summer, one piece	6 00	4 00
31	Twines, linen and cotton, an assortment	3 00	2 00
32	Woollen Cloths, Tweeds, &c., an assortment	10 00	6 00
33	Woollen Shawls, Stockings, Drawers, Shirts, and Mits, an assortment	10 00	6 00
34	Yarn, white and dyed, one pound of each	2 00	1 00
35	Yarn, fleecy woollen for knitting, one pound	2 00	1 00
36	Yarn, cotton, two pounds	2 00	1 00
37	Extra entries		

Class 54—Foreign Manufactures.

Foreign Articles will be admitted for exhibition only; but Certificates will be awarded to any article of worth or peculiar merit.

REPORT OF MR. C. McNAUGHTEN.

To the Directors of the Board of Arts and Manufactures, Toronto.

GENTLEMEN,—I beg to draw up a report of my labors during the time which I have been engaged by your Board.

The first point east of Toronto where it may be said manufactures are carried on is Whitby. Although in a commercial point of view, from its fine harbour, and the quantity of produce of various kinds shipped therefrom, and the wide range of fine agricultural country in the rear and upon each side of it, yet it is not particularly noted for its manufactures; although, like other towns of the kind, it has its share of artizans and mechanics necessary for its local trade, yet, strictly speaking, the only manufactures of this place for export are those of pianos, and a foundry. The former of these, belonging to Mr. Rainer, has lately become of some notoriety; this does not consist of so much in the number made but in their excellence, both in richness and deepness of tone and fineness of finish, he has been awarded the first prize by the association for them. He can dispose of all he manufactures.

The foundry heretofore has been engaged in making ploughs and executing general custom work; it has, however, lately been enlarged and re-opened. It is the property of Mr. Brown, but the Messrs. Patterson's, of Belleville, have now an interest in it, and intend carrying on the manufacturing of mowing, reaping and threshing machines. This locality has not before had anything of the kind, although agents from Brantford and Richmond Hill have been located here. The reputation of the Messrs. Patterson's stand very high; their opening an establishment situated in such a fine agricultural County as Ontario, will ensure to themselves success, and become a great acquisition to the Town of Whitby.

OSHAWA.—This village is the next point east, although it is only classed as a village yet there is no town and few cities that can boast of or come near to the standard of manufacturing of this place. There are plenty of places where more manufactures are carried on, but I speak of the extent in one particular or separate branch in one shop.

The most important of these are, A. S. Whitney & Co., scythe, fork and hoe manufacturers; Joseph Hall, thrashing machine and clover mill manufacturer, and Fuller & Co., cabinet ware manufacturer.

The operations in the factory of A. S. Whitney & Co. for this year are 2,500 dozen scythes, 1600 dozen forks, 1000 dozen hoes; they also manufacture scythe snathes, cast steel rakes, and many other small wares suitable for garden culture, but taking the three first articles above enumerated, and putting them at their average cost, they will amount to over $50,000. A few years back such an article as a scythe manufactured in Canada was not to be had. Mr. Whitney has long enjoyed an extensive business in this line; he imported all his articles, but the protective duty imposed upon such induced him to open an establishment for the manufacturing of them here; his enterprise has met with the greatest success, it has been yearly increasing, and is destined to do so. The articles manufactured are of a high order and give entire satisfaction. Although the above large quantity is manufactured here, yet it is not a tithe of what is required in the Province. Those imported, especially from England, do not come up to the mark, the fault being in the tempering.

On first entering this establishment, the blowing of the many furnaces, and the heavy quick thump of the trip hammers, would lead one to believe that they were paying a visit to one of the establishments of Birmingham; but, notwithstanding the confused noise, everything was going on in the most orderly way, every one was busy and at his post. There are over fifty men employed, and each one is employed by the piece; they are obliged to make so many dozen per day. In this way the manufacturer can tell exactly how much each piece will cost, and what the value of each man is to him.

The making of scythes is unlike most other kinds of tools, for, while in ordinary cases—such as axe making—the one person can do the various parts necessary, in this establishment they pass through the hands of 8 persons before they are finished. They require workmen well skilled, for in either of the operations which they have to go through they are liable to be injured.

The establishment of Joseph Hall is also very extensive, it is confined to agricultural implements. He employs fifty men; they work by piece-work, but the men are able to make from $1.50 to $2.50 per day. He has turned out two hundred thrashing machines, fifty clover mills, 1,000 ploughs, (principally cast-steel mould board). The shop at present is in full operation, they are making clover mills; this is a new patent, and the only place in the Province where they are manufactured, they are the most complete machines of the kind now made. The clover in the straw is put into the mill, and when you next see it it is in the bag ready for market. It will thresh and clean up in this way from forty to fifty bushels per day; upon the old principle fifteen bushels per day was the very best that could be done, and if a little damp not over half that quantity.

Mr. Hall is also going to manufacture mowing and reaping machines, which will add another to the many of the same kind now rising up in various parts of the Province. The same motive power, an engine of 100 horse, is used by Messrs. Hall and Whitney, but so much has the business of each increased that the one is crowding the other. Mr. Hall has purchased Mr. Whitney's shops, and going still further to enlarge this already large establishment, in consequence of adding new branches to it.

Mr. Whitney has purchased a very fine water privilege, south of the station at Oshawa, where he is going to put up a very large establishment.

Messrs. Fuller & Co's establishment is one of considerable size and where a large amount of business is done. They keep from forty to fifty men employed, and the wages may be taken at an average of $1.25. There is a great portion of their furniture bought by the retail trade. The good character of their furniture is also well known; they have succeeded upon more occasions than one in carrying off first prizes. I believe they also send certain kinds of furniture to the United States and get remunerative returns. As the head of this establishment was not seen it was not convenient to obtain the extent of their operations.

Bowmanville.—There are two foundries which do a good local trade. Their principal operations are in ploughs, stoves, and general custom work, and occasionally, but to a limited extent, mill work.

Messrs. Norton & Odell do a good business in fanning mills, straw cutters, churns, washing machines, mangles, &c. The whole of the articles which they manufacture are of their own invention, and for which they have secured patents. Their fanning mill is perhaps one of the very best, they have secured a patent right for it in England.

Newcastle.—There is but one foundry here, it it the establishment of H. A. Massey. He manufactures agricultural implements of various kinds, and is a general machinist. He employs from twenty to twenty-five hands, and the best mechanics will make $2 per day. The reputation of this manufacturer is more particularly known to the public in his successful manufacturing of combined mowing and reaping and horse power threshing machines.

There are much larger establishments in the country, and some where more machines are turned out during the year, but from what we have seen and heard from others, we question whether any better workmanship or more serviceable machines are to be found in them.

Mr. Massey has for many years labored in perfecting these machines, keeping steadily in view the points most desirable, simplicity and durability of construction, ease of draft, perfection of work, lightness and cheapness. These he has in a great measure secured, and were we to judge by the number of machines sold (taking into consideration the extent of his works) we would say his labors have been duly appreciated by the public.

From the unlooked for increased demand he was unable to fulfil all orders for the past year. His operations for 1862 are to be upon a much more extensive scale. He has added to his premises another large workshop, which will give him additional facilities.

The following are some of his sales for the past year: 50 combined mowers and reapers, 20 threshing machines, 50 two horse steel cultivators, 200 fanning mills, 500 ploughs (most of these the steel mould board). He has also done a good business in mill castings and engine work. For common work he uses the "Scotch Pig Iron," but for his machines he uses American, which is firmer and tougher.

His machines have hitherto been combined, this year he is going to make a single mower, a perfect novelty, the whole weight of which, when completed, will only be 450 lbs. The draft, with a cut of 4½ feet, will be 200 lbs. The patentee of this machine is W. A. Woods, of Kossick Falls, U. S. It was patented in 1859, and so complete is it, and answering the wants of the agriculturist, that the demand is greater than the supply. That gentleman manufactured last year the almost incredible number of 8,000; of that number 1,500 were sold in England. We could scarcely believe this statement ourselves were it not from the reliable source from which it was obtained.

It is a two horse machine, it runs on two driving wheels placed 30 inches apart, each wheel is 24 inches in diameter. The frame rests upon and is firmly secured to the axle of the wheels, and supports the gearing and a seat for the driver. The finger bar is elastic, and is three eighths of an inch in thickness and made of steel; it is attached to the machine by one bolt, and can be easily removed by taking off one nut, and when placed upon the frame under the seat the machine can be driven from field to field as easily as a light cart. The knife is driven by a crank pin projecting from a well-adjusted balance wheel, which gives it a steady uniform motion. It has a rapid motion with a short stroke, which enables the machine to do good work when the team moves as slow as horses can walk. These machines can be easily and instantly thrown out of gear, thereby giving motion to the driving wheels only when moving. They cut a swath of 4½ feet wide, and are warranted capable of cutting ten acres of grass per day.

These machines will be made of the best material, and for beauty and style of finish will, we believe, surpass anything heretofore offered in this class of machinery. Mr. Massey purposes selling them at $80 cash.

ORONO.—Messrs. Hutton & Rowe have a foundry, their principal business is in ploughs, in which they do a good business; they also make box stoves, sugar kettles, and do general custom work. There are six hands employed, their average wages will be about $1.25.

James Dyer, wool carding and cloth dressing. This establishment does a very good country business. They turn out good cloth, flannel, blankets, &c. Their business is altogether local. The hard times which have existed throughout the country for the past year or two has rather increased their business, for farmers have doffed the broad cloth and taken to the homespun. We think this a wise policy, encourage home manufactures we say, such a policy will soon make our country prosperous.

PORT HOPE.—There are two iron-founders and machine shops of some size. That of Mr. Pollard's has lately been erected and driven by water power. He is engaged in manufacturing mowing and reaping machines, plows, and general work. He is not under full "blast" yet, we therefore cannot say the extent of his capabilities; we are aware, however, that his machines are highly spoken of. He has at present ten men employed, their average wages will be $1.25 per day.

Thomas Zealand is a general machinist. He manufactures agricultural machines, such as mowers, reapers and ploughs; he also does a good business in heavy mill work, and manufactures portable steam engines. He is now making a very fine engine of ten horse power; it is his intention to have it on exhibition this Fall in Toronto. This being a dull time of year he has not as many hands as he generally employs. The wages average $1.50 per day.

(To be continued.)

BOOKS ADDED TO THE FREE LIBRARY OF THE BOARD DURING THE MONTH.

CLASS VI.

Unique Fancy Ornaments, designed for the use of Silversmiths, Chasers, Die Sinkers, Modelers, &c., &c., 1 vol. 4to .... *F. Knight.*
Scroll Ornaments, do. do. 1 vol. 4to .... "

CLASS XIV.

Cotton Manufacture of Great Britain investigated and illustrated; with an introductory view of its comparative state in Foreign Countries. 2 vols. 12mo., 1861 .... *Dr. Ure.*

CLASS XVIII.

Alphabetical Index of Patentees, 1 vol. 8vo, 1859 .... *British.*
Chronological Index of Patents, 1 vol. 8vo, 1859 .... "
Subject Matter Index of Patents, 1 vol. 8vo, 1859 .... "
Specification of Inventions, Letter Press, 26 vols. 8vo, 1859 .... "
" " Plates, 33 vols. folio, 1859 .... "
" " Abridgments, 8 vols. 12mo, 1859 .... "

CLASS XIX.

Rules, Orders and Forms of Proceedings of the Legislative Assembly of Canada. Journals and Appendixes of the Legislative Council and Assembly of Canada, for 1861.

CLASS XX.

American Gas Light Journal, Vols. I. and II, for 1859–60 and 61 .... *J. Murray.*
Scientific American, new series from vol. I. .... *Munn & Co.*

CLASS XXII.

Transactions of the Board of Agriculture of Upper Canada, for the years 1855–6–7–8 and 9, 4 vols. 8vo.
Transactions of the Board of Agriculture of the State of Maine, for the years 1857–8–9 and 60, 4 vols. 8vo.
Transactions of the Board of Agriculture of the State of Illinois, for the years 1859 and 60, 1 vol. 8vo.

HAMILTON AND GORE MECHANICS' INSTITUTE.

The annual meeting of this Institution was held on the 28th of February, when the following gentlemen were elected the Board of Directors for 1862:—

President, F. J. Rastrick, Esq.; Vice President, A. McCallum, Esq.; Directors: Richard Bull, Dr. Craigie, Thomas McIlwraith, C. R Murray, George Murison, Alexander Stuart, H. M. Melville, Thomas Hilton, William McMichael.

We take the following extracts from the Report of the retiring Directors:—

"During the past year there has been a steady increase in the Membership of the Institution, with every indication of its continuance.

Number of Members as shown on the Register on the 1st February, 1861..................	396
Number joined since that date......................	168
	564
Number resigned, died, left town, or in bad standing on the books............................	89
Total number of Members, 1st Feb., 1862......	475

"The Receipts of the year, as per Financial Statement, have amounted to $3,692 17½; the Expenditure to $3,549 64½; leaving a Balance in hand of $142 53.

The Final Balance Sheet shows Assets by cash in hand, value of Library, Furniture and Building, $25,179 38; Liabilities by Mortgage account and Interest, and outstanding debts, $13,059 54; Profit and Loss, $12,119 85.

"Total number of Books in the Library on the 1st February, 1862, 2,702 volumes.

"Since the close of the Financial year, however, your Directors are happy to say, that they have been enabled to make an addition to this most important branch of your Institution. Mr. Brydges, in presenting the usual Annual Grant of the Great Western Railway Company, stipulated that the sum of $100 be devoted to the purchase of Books. In this your Directors most willingly acquiesced to carry out Mr. Brydges' wishes. This they have done so far as lay in their power.

"It will thus be seen that the Library has participated in the improvement which has marked the other branches of the Institute.

"The cordial thanks of the Mechanics' Institute are due, and hereby tendered, to the proprietors of the papers hereafter named, for their continued liberality in supplying the Reading Room with the following publications, free of charge.

[Here follows a list of 36 periodicals.]

In addition to the free list referred to, the Directors report 54 other periodicals as being regularly received at the Reading Room.

"The Directors are gratified to find that the attendance at the News Room is largely increased; and in order to keep up the interest thus shown, they have used their utmost endeavours to have the most popular magazines and periodicals on the table at the earliest possible date after publication.

"Owing to the loss sustained by the course of Lectures given in 1860 and 1861, and the fact that the Lecture Season of this year was marked by an unfortunate war excitement, your Directors did not deem it prudent to organize a course. They regard the Lecture, nevertheless, as an Educational instrument which such an Institute as ours ought not to be without. They trust, therefore, that it will not be lost sight of.

"The Directors have much pleasure in stating that in the beginning of the month of August last, Isaac Buchanan, Esq., M. P. P., presented this Institution with the elegant Drinking Fountain which now stands in the Reading Room—the benefit of which appears to be fully appreciated by those visiting the room.

"Your Board have pleasure in referring to the efficient manner in which the Superintendent, Mr. Rutherford, continues to discharge the various duties devolving upon him. They believe that to his uniform courtesy, and the constant attention which he gives to the interests of the Institute, we are largely indebted for the present satisfactory condition of its affairs; and in consideration of which your Board would recommend that an increase of seventy-five dollars be made to his salary for the ensuing year.

"In conclusion, your Directors would congratulate the Members on the improved position of the affairs of the Institute, as compared with what they were twelve months ago. The amount of old debts paid off, the increase in the subscription list, and the additional sum derived from Rent of Hall, afford ample proof that progress has been made. They are sanguine that such will continue during the coming year, and believe that with an efficient Board of Directors, and the cordial coöperation of the individual members, your Institution may at no distant date, compare favourably with any similar Institution in the Province."

Resolutions of thanks were passed to the Directors, Superintendent, and Auditors; and also to C. J. Brydges, Esq., and the Directors of the Great Western Railway, "for the very handsome yearly donation of $400 to the Institute."

ABRIDGED SPECIFICATIONS OF ENGLISH PATENTS.

Full specifications of all English patents issued may be obtained on application to Bennet Woodcroft, Esq., Great Seal Patent Office, 25 Southampton Buildings, Holborn, London; the price of which—varying from 3d. to 5s. sterling—must be remitted by Post Office order, made payable at the Post Office, Holborn.

Lists of all specifications may be seen at the Free Library of Reference of the Board of Arts and Manufactures, Toronto, as published in the Commissioner of Patents Journal.

1773. T. Cobley. *A process for preserving and indurating timber, wood, and other vegetable matters, and for rendering the same non-inflammable.* Dated July 15, 1861.

Here a strong solution of potash, baryta, lime, strontia, or any of their salts, or of the salts of any metallic or other base capable of forming an insoluble compound with hydro-fluo silica acid, is forced into the timber, wood, or other vegetable matter to be acted upon by hydraulic or other means, and this process is repeated until the wood, &c., is sufficiently charged or impregnated with the solution to enable it to withstand the influence of flame. After the impregnation has been thoroughly effected with any of the given solutions, hydro-fluo silicic acid is forced into the wood, &c., by analagous means, with a view to render the solutions insoluble.

1783. E. G. F. De La Provotais. *Extracting the fibres from genista scorparia (broom) and other application to manufacturing paper and fabrics, and also treating the washing waters so as to obtain dyeing products therefrom.* Dated July 15, 1861.

The patentee claims, 1. Preparing ligneous fibres from genista scorparia (broom) for the manufacture of paper, pasteboard, and also of fibres intended to be converted into fabrics. 2. Colouring products from the washing waters remaining after the treatment of the fibres.

1802. A. V. Newton. *An improved process and improved machinery for obtaining fibres from the stalks or leaves of fibre yielding plants.* (A communication.) Dated July 17, 1861.

The object of the first part of this invention is to obtain directly from stalks, or leaves of fibre-yielding plants, the fibres in the white state, and of full strength. To this end the fibres are separated from extraneous matter of the stalks or leaves (which have been cut from the plants before the sap has ceased to flow through such stalks or leaves and while they are yet in the green state) by breaking, beating, scraping, or combing, or by other like mechanical operation, the extraneous matter being removed from the fibres whilst the fibres are protected from the action of the colouring agents by the presence of water or other equivalent fluid, which will prevent the extraneous colouring matter of the plant from impregnating the fibres. The second part of the invention consists in an arrangement of mechanism, whereby the stalks or leaves are held firmly and introduced slowly to the action of rapidly-moving combs and scrapers, which break through, loosen, and scrape off the extraneous substances from the fibres. When this is effected, then the motion of the feeding mechanism is reversed. The portion so acted upon is by this reverse motion withdrawn, and the other ends of the stalks or leaves are presented in like manner to the action of the comb and scrapers.

1836. C. N. Kottula. *Certain new compositions to be used in the manufacture of soap.* Dated July 22, 1861.

This invention consists in forming new compositions, by mixing alum with caustic soda, or with soda ash. When the caustic soda composition is dissolved in water, and the soda ash composition in water to which lime has been added in the usual manner in making ley, purified leys are produced superior to any hitherto obtained for the manufacture of soap.

1894. E. H. Joynson. *Improved machinery or apparatus for disintegrating, crushing, or drawing out vegetable fibres.* Dated July 29, 1861.

The improved machine consists as a travelling endless table, composed of metal plates joined together in the form of an endless chain, which passes round two octagonal or prism rollers, to which motion is communicated from the prime mover by any convenient arrangement of gearing. A stationary table on which the vegetable fibre to be operated on is placed by the attendant, is situated at one end of the machine, and another table, inclined board, or suitable receptacle, to receive the disintegrated fibres after they have passed through the machine, is situated at the other end.

1947. M. A. F. Mennons. *An improved odontalgic elixer.* (A communication.) Dated August 6, 1861.

This consists in the preparation of a medical extract, applicable to the treatment of caries and other diseases of the teeth. This extract is obtained as follows:—To about ten quarts of cognac brandy are added cochlearia two and a quarter pounds (avoirdupois), milfoil, thirteen and a half ounces, pulverized cloves, one ounce, pulverized cinnamon, one ounce, pulverized cochineal, two ounces. The mass is left to infuse for fifteen days, after which it is filtered and completed by the addition of tincture of quinquina, ten ounces, concentrated essence of aniseed one and two third ounces, concentrated essence of mint, two-thirds of an ounce.

1956. W. Clark. *Improvements in bleaching and clarifying saccharine matters and an apparatus for the same.* Dated August 6, 1861.

This consists mainly in treating saccharine juices of all kinds, either in a heated or cold state, by animal black in a state of fine powder, together with argillaceous or other earths; stirring up the mixture with a suitable agitator. After stirring for a certain time, the juices are bleached by fine black argillaceous or other earths, and one or several jets of steam introduced into the mixture, which produces a violent effervescence, and sets the whole mixture in motion, and after continuing this for a certain time the juices will become bleached. A mechanical agitator may be used as well as the steam jets to produce more complete agitátion of the liquid.

1997. A. Barclay. *Improvements in machinery or apparatus for raising, lowering, or moving heavy bodies.* Dated August 10, 1861.

Under one modification this crane consists of a main pillar or column, fitted in a footstep bearing, and movable or not about its axis. This pillar has jointed to it a jib extending upwards in angular direction, and having jointed to its free extremity a secondary jib or beam, which sustains the load to be raised or moved. This secondary jib or beam is jointed to the main jib at about one-third of its length from the upper extremity, which is connected to the main pillar by a connecting rod or radius bar. A pulley is fitted to the lower end of the secondary beam, over this the chain to which the load is attached is carried, and this chain is carried up over a pulley at the junction of the secondary beam and the radius bar, and down to an ordinary winding barrel, which is fitted to the main pillar, and may be actuated either by hand or steam-power. The hoisting chain is wound round the front of the barrel, and there is a second chain for drawing in the main jib, which is wound on a duplex barrel in a direction contrary to that of the twisting chain. The free end of this second chain is attached to the upper end of the jib, where it is jointed to the secondary beam. The winding barrel on which the hoisting chain is wound is made with a second barrel, which runs loosely upon it, but is caused to rotate with the primary barrel by a clutch actuated by a hand lever. To raise the load, the primary barrel is put in motion, then if the second barrel is put into gear, the main jib is quickly drawn in, and the load moves inwards in a horizontal line, in readiness to be at once deposited in the truck, waggon, or other receptacle placed in readiness to receive it.

RULES AND REGULATIONS

Made by the Commissioners of Patents for Inventions, and by the Lord Chancellor and the Master of the Rolls, under the Acts 15 *&* 16 *Vic., cap.* 83, *and* 16 *and* 17 *Vic., cap.* 115. *Followed by Specimen Forms of the Provisional Documents printed on sheets of the prescribed size.*

First Set of Rules and Regulations under the Act 15 & 16 Vic., cap. 83, for the passing of Letters Patent for Inventions.

By the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain, the Right Honourable Sir John Romilly, Master of the Rolls, Sir Frederic Thesiger, Her Majesty's Attorney General, and Sir FitzRoy Kelly, Her Majesty's Solicitor General, being four of the Commissioners of Patents for Inventions under the said Act.

Whereas a commodious office is forthwith intended to be provided by the Crown as the Great Seal Patent Office; and the Commissioners of Her Majesty's Treasury have, under the powers of the said Act, appointed such office as the office also for the purposes of the said Act:

I. All petitions for the grant of Letters Patent, and all declarations and Provisional Specifications, shall be left at the said Commissioners' office, and shall be respectively written upon sheets of paper of twelve inches in length by eight inches and a half in breadth, leaving a margin of one inch and a half on each side of each page, in order that they may be bound in the books to be kept in the said office.

II. The drawings accompanying Provisional Specifications shall be made upon a sheet or sheets of parchment, paper, or cloth, each of the size of twelve inches in length by eight inches and a half in breadth, or of the size of twelve inches in breadth by seventeen inches in length, leaving a margin of one inch on every side of each sheet.

III. Every Provisional Protection of an Invention allowed by the Law Officer shall be forthwith advertised in the London *Gazette*, and the advertisement shall set forth the name and address of the petitioner, the title of his invention, and the date of the application.

IV. Every Invention protected by reason of the deposit of a Complete Specification shall be forthwith advertised in the London Gazette, and the advertisement shall set forth the name and address of the petitioner, the title of the Invention, the date of the application, and that a Complete Specification has been deposited.

V. Where a petitioner applying for Letters Patent after provisional protection, or after a deposit of a Complete Specification, shall give notice in writing at the office of the Commissioners of his intention to proceed with application for Letters Patent, the same shall forthwith be advertised in the London *Gazette*, and the advertisement shall set forth the name and address of the petitioner and the title of his invention; and that any persons having an interest in opposing such application are to be at liberty to leave particulars in writing of their objections to the said application at the office of the Commissioners within twenty-one days after the date of the *Gazette* in which such notice is issued.

VI. The Lord Chancellor having appointed the Great Seal Patent Office to be the office of the Court of Chancery for the filing of Specifications, the said Great Seal Patent Office and the office of the Commissioners shall be combined; and the Clerk of the Patents for the time being shall be the Clerk of the Commissioners for the purposes of the Act.

VII. The office shall be open to the public every day, Christmas Day and Good Friday excepted, from ten to four o'clock.

VIII. The charge for office or other copies of documents in the office of the Commissioners shall be at the rate of twopence for every ninety words.

(Signed) St. Leonards, C.
John Romilly, M.R.
Fred. Thesiger, A.G.
Fitzroy Kelly, S.G.

Dated the 1st October, 1852.

By the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain, and the Right Honourable Sir John Romilly, Master of the Rolls.

Ordered, that there shall be paid to the Law Officers and to their clerks the following fees:—

By the Person opposing a Grant of Letters Patent.

To the Law Officer	£2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the Petitioner on the Hearing of the Case of Opposition.

To the Law Officer	£2	12	6
To his clerk	0	12	6
To his clerk for summons	0	5	0

By the Petitioner for the Hearing, previous to the Fiat of the Law Officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

To the Law Officer	£2	12	6
To his clerk	0	12	6

By the Person opposing the Allowance of such Disclaimer or Memorandum of Alteration, on the Hearing of the Case of Opposition.

To the Law Officer	£2	12	6
To his clerk	0	12	6

By the Petitioner for the Fiat of the Law Officer allowing a Disclaimer or Memorandum of Alteration in Letters Patent and Specification.

To the Law Officer	£3	3	0
To his clerk	0	12	6

(Signed) St. Leonards, C.
John Romilly, M.R.

Dated the 1st October, 1852.

Ordered by the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain.

I. All Specifications in pursuance of the conditions of Letters Patent, and all Complete Specifications accompanying petitions and declarations before grant of Letters Patent, shall be filed in the Great Seal Patent Office.

II. All Specifications in pursuance of the conditions of Letters Patent, and all Complete Specifications accompanying petitions for the grant of Letters Patent, shall be respectively written bookwise upon a sheet or sheets of parchment, each of the size of twenty-one inches and a half in length by fourteen inches and three fourths of an inch in breadth; the same may be written upon both sides of the sheet, but a margin must be left of one inch and a half on every side of each sheet.

III. The drawings accompanying such Specifications shall be made upon a sheet or sheets of parchment, each of the size of twenty-one inches and a half in length by fourteen inches and three fourths of an inch in breadth, or upon a sheet or sheets of parchment, each of the size of twenty-one inches and a half in breadth by twenty-nine inches and a half in length, leaving a margin of one inch and a half on every side of each sheet.

IV. The charge for office or other copies of documents in the Great Seal Patent Office shall be at the rate of twopence for every ninety words.

(Signed) St. Leonards, C.

Dated the 1st October, 1852.

Note.—*It is recommended to Applicants and Patentees to make their elevation drawings according to the scale of one inch to a foot.*

Second Set of Rules and Regulations under the Act 15 & 16 Vic., cap. 83, for the passing of Letters Patent for Inventions.

By the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain, the Right Honorable Sir John Romilly, Master of the Rolls, Sir Frederic Thesiger, Her Majesty's Attorney General, and Sir FitzRoy Kelly, Her Majesty's Solicitor General, being four of the Commissioners of Patents for Inventions under the said Act.

I. The office of the Directory of Chancery in Scotland, being the office appointed by the Act for the recording of transcripts of Letters Patent, shall be the office of the Commissioners in Edinburgh for the filing of copies of specifications, disclaimers, memoranda of alterations, provisional specifications, and certified duplicates of the register of proprietors.

II. All such transcripts, copies, and certified duplicates shall be bound in books, and properly indexed, and shall be open to the inspection of the public at the said office, every day from ten to three o'clock.

III. The charge for office copies of such transcripts, copies, and certified duplicates, recorded and filed in the said office, shall be at the rate of twopence for every ninety words.

IV. The Enrolment Office of the Court of Chancery in Dublin, being the office appointed by the Act for the enrolment of transcripts of Letters Patent, shall be the office of the Commissioners in Dublin for the filing of copies of specifications, disclaimers, memoranda of alterations, provisional specifications, and certified duplicates of the register of proprietors.

V. All such transcripts, copies, and certified duplicates shall be bound in books and properly indexed, and shall be open to the inspection of the public at the said Enrolment Office every day, Christmas Day and Good Friday excepted, from ten to three o'clock.

VI. The charge for office copies of such transcripts, copies, and certified duplicates, enrolled and filed as aforesaid, shall be at the rate of twopence for every ninety words.

VIII. A provision is to be inserted in all Letters Patent in the respect whereof a Provisional and not a Complete Specification shall be left on the application for the same, requiring the Specification to be filed within six months from the date of the application.

IX. No amendment or alteration, at the instance of the applicant, will be allowed in a Provisional Specification after the same has been recorded, except for the correction of clerical errors or of omissions made *per incuriam.*

X. The Provisional Specification must state distinctly and intellibly the whole nature of the invention, so that the Law Officer may be apprized of the improvement, and of the means by which it is to be carried into effect.

(Signed) St. Leonards, C.
John Romilly, M.R.
Fred. Thesiger, A.G.
Fitzroy Kelly, S.G.

Dated the 15th October, 1852.

Ordered by the Right Honourable Edward Burtenshaw Lord St. Leonards, Lord High Chancellor of Great Britain.

Every application to the Lord Chancellor against or in relation to the sealing of Letters Patent shall be by notice, and such notice shall be left at the Commissioners' office, and shall contain particulars in writing of the objections to the sealing of such Letters Patent.

(Signed) St. Leonards, C.

Dated the 15th October, 1852.

Third Set of Rules and Regulations under the Act 15 & 16 Vic., cap. 83, for the passing of Letters Patent for Inventions, and under the Act of the 16 & 17 Vic., cap. 115.

By the Right Honourable Robert Monsey Lord Cranworth, Lord High Chancellor of Great Britain, the Right Honourable Sir John Romilly, Master of the Rolls, Sir Alexander James Edmund Cockburn, Her Majesty's Attorney General, and Sir Richard Bethell, Her Majesty's Solicitor General, being four of the Commissioners of Patents for Inventions under the said Act of the 15 & 16 Vic., cap. 83.

It is ordered as follows:

Rule VII. of the Second Set of Rules and Regulations of the Commissioners, dated the 15th October, 1852, is hereby rescinded.

I. Every application for Letters Patent, and every title of Invention and Provisional Specification, must be limited to one invention only, and no provisional protection will be allowed or warrant granted where the title or the Provisional Specification embraces more than one invention.

II. The title of the Invention must point out distinctly and specifically the nature and object of the Invention.

III. The copy of the specification, or Complete Specification, directed by the Act 16 & 17 Vic., cap. 115, sec. 3, to be left at the office of the Commissioners on filing the specification or Complete Specification shall be written upon sheets of brief or foolscap paper, briefwise, and upon one side only of each sheet. The extra copy of drawings, if any, left with the same, must be made as heretofore, and according to the directions contained in Rule III. of the Lord Chancellor, dated the 1st October, 1852.

IV. The copy of the Provisional Specification to be left at the office of the Commissioners on depositing the same shall be written upon sheets of brief or foolscap paper, briefwise, and upon one side only of each sheet. The extra copy of drawings, if any, left with the same, must be made as heretofore, and according to the directions contained in Rule II. of the Commissioners, dated the 1st October, 1852.

V. All specifications, copies of specifications, provisional specifications, petitions, notices, and other documents left at the office of the Commissioners, and the signatures of the petitioners or agents thereto, must be written in a large and legible hand.

VI. In the case of all petitions for Letters Patent left at the office of the Commissioners after the 31st day of December, 1853, the notice of the applicant of his intention to proceed for Letters Patent for his Invention shall be left at the office of the Commissioners eight weeks at the least before the expiration of the term of Provisional Protection thereon, and no notice to proceed shall be received unless the same shall have been left in the office eight weeks at the least before the expiration of such Provisional Protection; and the application for the warrant of the Law Officer and for the Letters Patent must be made at the office of the Commissioners twelve clear days at the least before the expiration of the term of Provisional Protection, and no warrant or Letters Patent shall be prepared unless such application shall have been made twelve clear days at the least before the expiration of such provisional protection: Provided always, that the Lord Chancellor may in either of the above cases, upon special circumstances, allow a further extension of time, on being satisfied that the same has become necessary by accident, and not from neglect or wilful default of the applicant or his agent.

(Signed) CRANWORTH, C.
JOHN ROMILLY, M.R.
A. E. COCKBURN, A.G.
RICHARD BETHELL, S.G.

Dated the 12th of December, 1853.

RULE IN RESPECT OF APPLICATION TO THE LORD CHANCELLOR TO EXTEND THE TIME FOR SEALING LETTERS PATENT.

By the Right Honourable Robert Monsey Lord Cranworth, Lord High Chancellor of Great Britain.

Whereas by the Act 16 & 17 Vic., cap. 115, the Lord Chancellor is empowered to extend the time for the sealing of Letters Patent for an Invention, and for the filing of the Specification thereon, limited to the period of one month after the expiration of the six months of provisional protection of such Invention, provided the delay in sealing such Letters Patent and in filing such Specification has arisen from accident, and not from the neglect or wilful default of the applicant.

It is Ordered as follows:

Every petition addressed to the Lord Chancellor, praying for the extension of time for the sealing of Letters Patent, and for the filing of the Specification thereon, under the provisions of the Act of the 16 & 17 Vic., cap. 115, and the affidavit accompanying the same, shall be left at the office of the Commissioners of Patents. And in every case where the delay in sealing such Letters Patent before the Law Officer to whom such objections may have been referred, the petitioner, before leaving his petition as aforesaid, shall obtain the certificate of such Law Officer, to the effect that the allegations in respect of such adjourned hearings and causes of delay are in the opinion of such Law Officer correct, and that the delay arising from such adjourned hearings has not been occasioned by the neglect or default of the petitioner. And such certificate shall be written at the foot or shall be annexed to such petition.

(Signed) CRANWORTH, C.

Dated this 17th day of July, 1854.

PETITION.

To the Queen's Most Excellent Majesty.

The humble Petition of —— ——

Sheweth,

That Your Petitioner —— —— in possession of an Invention for —— which Invention —— —— believe will be of great public Utility; that*

and that the same is not in use by any other Person or Persons to the best of —— —— knowledge and belief.

Your Petitioner therefore humbly prays that Your Majesty will be pleased to grant unto —— —— Executors, Administrators, and Assigns, Your Royal Letters Patent for the United Kingdom of Great Britain and Ireland, the Channel Islands, and the Isle of Man, for the term of Fourteen Years, pursuant to the Statutes in that Case made and provided.

And Your Petitioner will ever pray, &c.

Her Majesty is pleased to refer this Petition to Her Majesty's —— General to consider what may be properly done therein.

Clerk of the Commissioners.

The words in the Act are * "that he is the first and true Inventor," which must be used when not a communication.

The name and address of the Petitioner, and the title of the Invention, to be written very legibly.

DECLARATION.

—— —— do solemnly and sincerely declare that —— —— in possession of an Invention for —— which Invention —— —— believe will be of great public Utility; that

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and that the same is not in use by any other Person or Persons to the best of —— —— knowledge and belief, and —— —— make this Declaration, conscientiously believing the same to be true, and by virtue of the provisions of an Act made and passed in the Session of Parliament held in the fifth and sixth years of the Reign of His late Majesty King William the Fourth, intituled "An Act "to repeal an Act of the present Session of Parlia- "'ment, intituled, 'An Act for the more effectual "'Abolition of Oaths and Affirmations taken and "'made in various Departments of the State, and "'to substitute Declarations in lieu thereof, and "'for the more entire Suppression of voluntary "'and extra-judicial Oaths and Affidavits,' and to "make other provisions for the abolition of unne- "cessary Oaths."

*

Declared at —— this —— day of —— in the Year of our Lord 185 ,
Before me,

To be signed by the Party making the Declaration, where the Asterisk is placed.

PROVISIONAL SPECIFICATION.

—— —— do hereby declare the nature of the said Invention for ——

BRITISH PUBLICATIONS FOR FEBRUARY.

Basham (W. R.) On Dropsy connected with Disease of the Kidneys, 2nd ed, 8vo	£0	9	0	*Churchill.*
Bemrose (W. J.) Manual of Wood Carving, &c., 4to	0	5	0	*Whittaker.*
Beveridge (Henry) Comprehensive History of India, vol. 2, illustrated, sup. royal, 8vo	1	1	0	*Blackie.*
Bland (Wm.) Principles of Construction in Arches, Piers, &c., new ed., 12mo.	0	1	6	*Weale.*
Bohn's Pictorial Hand-Book of Geography, 2nd edition, corrected, post 8vo., 6s.; cold.	0	7	6	*Bohn.*
——— Stand. Liby. Luther's Life, by Himself, arranged by Michelet, post 8vo	0	3	6	*Bohn.*
Brown (Henry) Victoria as I Found It during Five Years of Adventure, post 8vo	0	10	6	*Newby.*
——— (J.) Course of Drawing for Primary Schools, Part 1, 6s.; Part 2	0	8	0	*Longman.*
Buckingham (Richard Duke of) Private Diary, 3 vols. post 8vo	1	11	6	*Hurst & Black.*
Cambridge Senate House Examination Papers, 1860-61, cr. 8vo	0	2	6	*Macmillan.*
Cariboo, the newly-discovered Gold Fields of British Columbia, cr. 8vo	0	1	0	*Darton.*
Cassell's Educational Series, DeLolme's French Reader, new ed., 12mo, 2s, sd.	0	2	6	*Cassell.*
Chemical Society Quarterly Journal, vol. 14 (1861)	0	13	0	*Bailliere.*
Chichester Cathedral, The Architectural History of, by Rev. R. Willis, &c. 4to.	1	10	0	*Bell & Daldy.*
Churchill (C. C. H.) Druzes and the Maronites under the Turkish Rule, post 8vo., 5s.; 8vo	0	10	0	*Quaritch.*
Ciceronis Orationes, vol. 1, with Commentary by G. Long, 2nd ed., 8vo	0	16	0	*Whittaker.*
Clinton (H. F.) Fasti Romani, an Epitome of the Chronology of Rome and Constantinople, 8vo	0	7	6	*Oxford University Pr.*
Combe (George) Elements of Phrenology, 9th ed., cr. 8vo	0	3	6	*Simpkin.*
Crabbe (Rev. G.) Life of, with his Letters and Journals, by his Son, fcap. 8vo., reduced to	0	3	0	*Murray.*
Cranborne (Viscount) Historical Sketches and Reviews, 8vo	0	12	0	*Mitchell.*
Cust (Hon. Sir E.) Annals of the Wars of the 18th Century, 3rd ed., 5 vols. 12mo. each	0	5	0	*Murray.*
Cutler (G. O.) Philosophy of Intellectual Education, Ancient and Modern, sm. post 8vo	0	3	6	*Simpkin.*
Dalhousie (Marquess of) Administration of British India, by Edwin Arnold, vol. 1, 8vo	0	15	0	*Saunders & O.*
Dalzel (Andrew) History of the University of Edinburgh, with Memoir, 2 vols. 8vo	1	1	0	*Edmonston.*
Davidson's Choral Services of the Church of England, oblong	0	5	0	*Musical Publishing Co.*
Drayson (Capt. A. W.) Common Sights in the Heavens and how to See them, fcap. 8vo	0	8	0	*Chapman & Hall.*
Dublin Examination Papers for 1862, 12mo	0	2	6	*Longman.*
Duke of York's (The) Campaign in Holland in 1799	0	2	6	*W. Mitchell.*
Eadie (J.) Ecclesiastical Encyclopœdia; or, Dictionary of Christian Antiquities, Sects, &c., post 8vo	0	8	6	*Griffin.*
Edgar (J. G.) Memorable Events of Modern History, illust., cr. 8vo	0	6	6	*W. H. Allen.*
Education (The) of the Middle Classes, by A. B.	0	1	0	*J. H. & J. Parker.*
Field Exercise and Evolutions of Infantry, as revised by H. M. Command, 1861, 18mo	0	1	0	*Parker & Son.*
Frome (Col.) Method of Conducting a Trigonometrical Survey, 3rd edition, revised, 8vo	0	12	0	*Weale.*
Gairdner (W. T.) Public Health in Relation to Air and Water, fcap. 8vo	0	7	6	*Edmonston.*

Guernsey (E.) Homœopathic Domestic Practice, ab. and ed. by H. Thomas, 3rd edition, fcap. 8vo	0	5	0	*Turner.*
Handbook (The) of the Court, Peerage and House of Commons, 1862, r. 16mo.	0	5	0	*P. S. King.*
Hastings (J.) Medicinal Value of Excreta of Reptiles in Phthisis, &c., p. 8vo.	0	5	0	*Longman.*
Heale (James Newton) On the Phisiological Anatomy of the Lungs, 8vo	0	8	0	*Churchill.*
History of Printing, new edition, fcap. 8vo	0	2	6	*Society Pr. Ch. Kn.*
Johnston (Keith) Physical Atlas of Natural Phenomena, new edition, imp. fol. reduced to	8	8	0	*Blackwoods.*
Life Amongst the Colliers, post 8vo	0	5	0	*Saunders & O.*
Lillywhite's Guide to Cricketers, winter ed., 1862, 12mo	0	1	3	*Lillywhite.*
Lucas (Capt. T. J.) Reminiscences of a Campaign in South Africa, il. sm. fol.	1	1	0	*Day & Son.*
Macduff (Rev. J. R.) Sunsets on the Hebrew Mountains, 4th thous., p. 8vo	0	6	6	*Nisbet.*
Men of the Time: a Biographical Dictionary of Eminent Living Characters, new edition, cr. 8vo	0	10	6	*Routledge.*
Railway Construction, Instructions on the Science of, new ed., 12mo	0	1	6	*Weale.*
Ruffin (S. M.) Chronological Tables of Contemporary Sovereigns, Dates, &c., 2nd ed., royal 4to	0	3	6	*Lockwood.*
Sharpe (S.) Egyptian Antiquities in the British Museum, post 8vo	0	5	0	*J. R. Smith.*
Timbs (John) School-Days of Eminent Men, 2nd ed., revd., &c., fcap. 8vo	0	5	0	*Lockwood.*
——— ——— Year Book of Facts in Science and Art, 1862, fcap. 8vo	0	5	0	*Lockwood.*
Tourrier's Model Book, 7th ed., post 8vo	0	6	6	*Nutt.*
Weale's Rudy. Ser., v. 3. Bland on Arches, Piers, Buttresses, &c. n. ed, 12mo.	0	1	6	*Weale.*
——— ——— v. 61. Arman (A.) Land Measurem't Ready Reck'r, 12mo.	0	1	6	*Weale.*
——— ——— v. 62 Science of Railway Construction, new ed., 12m.	0	1	6	*Weale.*
Wood (Rev. J. G.) Illustrated Natural History, new ed., sm. cr. 8vo	0	6	0	*Routledge.*

AMERICAN PUBLICATIONS FOR MARCH.

Bullion (Rev. P.) Copious and Critical Latin Dictionary, 8vo	$3 00	*Sheldon & Co.*
Dana (A. H.) Ethical and Physiological Inquiries, 12mo	1 00	*Scribner.*
Davis (A. J.) Medical Prescriptions for the Human Body and Mind, 12mo	1 00	*A. J. Davis & Co.*
Harbison (J. S.) The Bee-keeper's Directory; or, the theory and practice of Bee Culture in all its departments, 12mo	1 75	*H. H. Bancroft & Co.*
Hittell (John S.) Mining in the Pacific States of North America, 16mo	1 25	" "
New (The) American Cyclopædia, vol. 14, Reed, Spire, 8vo	3 00	*Appleton & Co.*
Van Ness (Capt. W. W.) Elementary Work on Military Tactics, 16mo	0 50	*Carleton.*
Whitmore (Wm. H.) A Hand-Book of American Genealogy, 4to	3 00	*Joe Munsell.*

Correspondence.

To the Editor of the Journal of the Board of Arts and Manufactures, Upper Canada.

MONTREAL, March 13, 1862.

SIR—Having been much interested in the progress of your Board, and all matters pertaining thereto since its inception, I wish to make a few suggestions in reference to matter which I believe it would be profitable to introduce into the pages of the *Journal*; to give you something of the results of my observation of a four months' residence here, during what may be termed the season of instruction to mechanics and others of the industrial classics.

In the first place, I think it would be very advantageous to builders, contractors, and the public generally, if the architects and engineers were invited by circular or through the *Journal* to furnish the amount of the tenders for works of any importance in like manner as they are given in the *Builder*, published in London, England; and also if a price list of raw material at the different leading points, similar to market price lists usually published in the ordinary papers of the day—was furnished.

The Mechanics' Institute of Montreal, from what I have seen of it during my residence, is energetically conducted, and I cannot help observing that I never knew a President so indefatigably attentive as Mr. Munro. There have been several classes in successful operation, more especially the drawing, geometrical, ornamental and the French classes. The reading room is well supplied with newspapers and periodicals, and is largely attended, but there have not been any lectures delivered under the auspices of the Institute, and in fact there have been but few lectures of any practical usefulness to mechanics as such, by any other of the associations. True, the series of lectures called the Somerville Lectures, at the rooms of the Natural History Society, have been very interesting and pleasing, and well attended, but chiefly by the juvenile part of the community, for which they were intended, and also the series under the Young Men's Christian Association have been of a very intellectual and moral character, and have also been well attended by the religious portion of the population but the void remains. Musical entertainments have predominated, and are very numerously attended.

It is much to be regretted that the Board of Arts here are not in that position of usefulness which it is desirable it should be. The construction of the Exhibition building has so involved it in debt, that without some extraordinary relief or assistance it cannot move; but I hope that the Government will be able to possess the building for some public purpose and give the Western Board something like an equivalent, one item of which I would suggest should be duplicates of all useful material in the collection of the geological survey.

I am, dear Sir, yours very obediently,

J. E. P.

THE ANTIQUITY OF MAN.

The lecture recently delivered by Professor Huxley, at the Royal Institution, on the Fossil remains of man was bold, comprehensive, and eloquent. After glancing at the different forms of human heads in different parts of the world, the professor said :—Passing to the old world, accurate knowledge was confined in Europe. Archæology shows us beyond the middle ages and beyond the epoch of the Romans, another group, a longheaded people of Germanic origin, well acquainted with the use of iron. Beyond this came another race of greater antiquity, of smaller stature, and in general character more like the Hindu, who worked in bronze. Beyond this again, archæologists produce another race, neither characterized by manufactures of iron nor of bronze, but forming their weapons and tools of the hardest stone. These stone implements are found in their tumuli, with the skeletons of the race who made them. The buried warrior is found sitting upright, with his heavy stone axe beside him, ready to meet, in the "fields of happiness," his companions or his enemies face to face. The crania of these people were rounder than those of the iron or of the bronze age; and some of them had flat foreheads and strong ridges over the eyes, with large but not prognathic jaws. Such were the skulls of the people of the stone epoch. If it be asked, how far distant was this stone epoch in time, it would be difficult to give the precise date beyond the birth of history, and yet there is a mode by which the period can be given with considerable comparative accuracy.

Denmark is covered by numerous peat-bogs, often very deep. In digging into these, trees, which have fallen in, are often met with—great beech trees, such as are now the glory of the country. Digging deeper, we come to the relics of another forest—a forest of oaks, large, too, in size, with their tops lying towards the centre of the bog. Cutting down again still lower, we meet with yet another buried forest, neither of beech, nor of oak, but of pine,—great trees of 3 or 4 feet in diameter, and with the straightest trunks, showing themselves thus of forest growth. In the memory of man there have been no other trees than beech. The climate of the country, then, must have changed since the ancient growth of oaks; it must have changed again since the indigenous growth of the pine forests.

Men of the iron age are found in the peat; beneath the oak forest men of the bronze epoch; and from beneath the pines the stone implements of those of the stone age are brought to light. Still lower, in the lowest peat, there are no weapons, no traces of man at all. What is meant by this chronicle, not of time, but of facts? How vast must be its remoteness if measured by ordinary human standards? But so far as we have yet been speaking, the physical geography of the earth remained like to what it is, with rivers running in their present channels, sea coasts bounding seas of like extent, while the dry land of to-day was dry land then, The hill-caves too, were high and dry, without water flowing through them.

By a singular accident we have gained a knowledge of the habits of these stone-workers, and from their refuse bone-heaps we know that in Denmark they hunted the Aurochs and the *Bos primigenius*. We know that these "stone" people built huts on piles in the lakes of Switzerland, what implements they had, what weapons, what food. The animals which supplied the last were much the same as now, except the *Bos urus* and *Bos primigenius*.

Beyond all traces of the stone age, there was an utterly different period—a time when what is now sea and seashore held different relations, when what was forest and much of what is now dry land was under water, when other rivers flowed in other channels, and have left their deposits now raised a hundred feet above the flow of existing rivers—a time when the physical features of the country were altogether different. And when we arrive at this age we find the whole fauna of the region to be largely changed.

Mammoths and rhinoceroses swarmed over the land, just as badgers and weasels do now, and their bones, with those of the cave-bears and hyænas, have been washed down in the *débris* of the soil and preserved. Where was man in that age? Until within a few years the answer would have been, "Not there." Preconceived belief was so strong that, although the evidence existed thirty years ago, his presence was ignored. But of late the proofs have so rapidly accumulated as to break down all the barriers of predjudice, and the evidence that man was associated with the *Bos primigenius*, the cave-bear, and tichoner rhinoceros, by the discovery, within the last few years, of such numbers of his worked flint implements—not ground to a face or edge, but simply chipped into form—in proximity to the bones of those great beasts, has been so well authenticated that no instructed person now doubts for one moment the contemporaneity of man with the mammoths.

ON SUBSTITUTES FOR RAGS IN PAPER MAKING.

During the last five or six years the paper manufacture has been in an extraordinary state of, if we may use such an expression, disturbed equilibrium. First came a sort of furore for the discovery of some material to take the place of rags, the supply of which, it was believed, was fast becoming insufficient to meet the constantly increasing demand. After that set in the agitation in connection with the repeal of the duty upon paper; and so the whole trade has been kept in a state of uncertainty to the present moment.

With respect to the discovery of new materials of a fibrous character, fit for paper making, a great deal has been written and said, and a vast amount of time spent, we may say wasted, in investigations, which would never have been the case had the authors, and speakers, and experimenters possessed any real knowledge of the requirements of the paper maker. And so slight has been the advancement made by virtue of all these exertions that the question remains practically very much where it was at the beginning; indeed, none but the experienced manufacturer knows how very difficult this problem is, and how very little progress has been made towards its solution. It is a popular idea that any fibrous material from which a sheet of paper can be made may be applied to the uses of the paper maker; there can be no greater fallacy; almost any vegetable material can in fact be converted into paper, there are scores of substances which can be readily bleached, beaten into pulp, and converted into good, some into excellent, paper. But there are many things to be thought of besides this, and it is really going but a very little way into the actual question of the substitution of other materials for rags in a commercial sense. The real gist of this question lies in the implication that any material to substitute rags must produce paper equal to that from rags at less, or at least not greater cost. The new material must yield paper equally good with rag paper, and costing no more. This being the question, is there any material which can be said to, in any wise, take the place of rags in paper making? At present there is none. Although almost every conceivable fibrous substance has been the subject of experiment, and most of them of patent, in relation to paper, and although numberless ingenious and active minds are ever at work upon this object, there is not, at the present time, any new raw material employed in paper making, with the exception of straw, and perhaps a comparatively small quantity of the Esparto, or Spanish grass; and with respect to straw the use is almost wholly exceptional, as the paper can scarcely be ranked with rag paper. In applying any of these prepared fibrous materials to the manufacture of paper in competition with rags, there are many important points for consideration. In the first place (and this forms a sort of standard to which the question must constantly be referred), rags are a refuse material; throughout the civilized world rags are produced spontaneously, as it were, with as much certainty as time passes away; it requires neither capital nor industry; neither sowing nor reaping; neither sunshine nor rain, to produce rags; changes of season, commercial crises do not interfere with their production; within narrow limits, therefore, the supply is certain and invariable. Add to this that rags are a material already prepared to the hand of the paper maker, they have already undergone treatment which must be applied in a greater or less degree to all fibrous substances before they can be fitted for his use, and that, above all, rags are perfectly suited to the object in question, so that, irrespective of cost and trouble of manufacture, no substance has been discovered capable of producing paper equal in all respects to that made from rags. The fact that rags are refuse material places a difficulty, *in limine*, with respect to the introduction of raw material, properly so called, to take their place. Raw material must be raised by cultivation, which requires labour and capital; it must be dependent upon the character of the seasons, and upon a hundred circumstances which will affect the certainty of the supply, and enhance the cost—that is, the first cost. Coming then to the paper maker, it requires to be treated by peculiar methods irrespective of paper making but necessary to reduce the crude material to a manageable form; and then comes lastly the comparison between the new substance and rags, in facility of working, and in the quality of paper produced.

It is generally believed that linen enters much more largely into the composition of fine paper than is really the case. Cotton is by far the more staple commodity, and constitutes probably at least four-fifths of the best papers. The fibre of cotton is remarkably adapted to the production of a fabric like paper, in which the strength is wholly due to a natural interlacing of the fibres similar to what exists in felt. Examined under the microscope, it will be seen that the fibres in paper run in every possible direction, intertwining and winding about each other so as to give firm consistency and considerable strength. It is not every kind of vegetable fibre which possesses the property of interlacing together in this manner, and paper made from fibre deficient in this property can never be equal to paper made from linen and cotton, which do possess it pre-eminently. The fibre from many vegetable substances is almost straight, the fibres laying together naturally in fasiculi or bundles, and devoid of the curling property by which the fibres are enabled to twist themselves together when the natural structure is broken down—such matters will never make a good tenacious paper. Other fibrous materials are naturally endued with, that is cemented together by, or encased in, substances which must be wholly removed before the paper maker can avail himself of their otherwise valuable qualities; in flax, for instance, the fibre is encased in a coating of siliceous matter, which, when the structure of the plant is broken down, developes itself in what is technically called shive. In preparing flax for textile purposes the shive is removed by various processes, the value of the material being sufficient to justify the outlay; but if the same outlay were incurred upon raw flax for the uses of the paper maker, the value of flax thus prepared would exceed that of the best linen rags; and this brings us back to the starting point, that all new materials have to contend with a refuse material in paper making.

It would be a vain and humiliating thing to say that as knowlege advances no substitute can be found to take the place of rags in the paper mill. In all probability the reverse will be the case, and the time will come when cheap and appropriate substances will be produced, affording to the paper maker a regular and economical supply of raw material, as suitable to his use as rags now are; but there are many things to be considered before it can be assumed that any substance, simply because it is found by experiment capable of being converted into paper, will become a competitor with rags on the commercial scale.

It will be remembered by most of our readers, that some time since the proprietors of the *Times* newspaper offered a splendid premium for the production of a new raw material which could be employed in paper-making in substitution of rags. What was the result of this offer, which is known to have been entirely *bonâ fide?* Simply nothing, but about two years of constant trouble to the appointed referees, leaving the question at issue just where it was when the premium was offered, and where it remains at the present moment.—*The Artizan.*

DIALYSIS, AND ITS APPLICATION TO THE MANUFACTURING ARTS.

Under the title of dialysis a most remarkable series of phenomena has been brought before the notice of the scientific world by Mr. Graham, the Master of the Mint. His discoveries on this subject are the result of a carefully conducted series of laborious experiments extending over a long term of years. They offer to those who can afford the time necessary to trace them, step by step, as they have been published in the Transactions of the Royal Society, a most instructive example of the progressive growth of a series of inductive experiments, at first purely abstract, without any evident practical bearing, but eventually resulting, as all scientific truths must result, in extending man's dominion over natural objects, and thus aiding the arts of life and civilisation. The steps of the progressive discoveries of Mr. Graham are hardly suited to our pages, or to the wants of the readers of a journal so essentially practical as the *Mechanics Magazine.* We propose, therefore, to take the facts as they are now ascertained, and to show their practical bearing upon many of the manufacturing arts.

Dialysis depends upon the circumstances ascertained by Mr. Graham, that certain solutions possess the power of diffusing themselves through water with very great facility, and that others do not possess this property. In a very rough and coarse manner these facts might be illustrated by the following examples:—Suppose four deep glasses to be taken, and in one to be placed a few grains of common salt; in the second an equal quantity of sugar; in the third, gum; and in the fourth, albumen, or dried white of egg. Let us now imagine the glasses to be each filled up with water, but with such precautions as should entirely prevent any agitation of the contents of the vessel. If the whole were left undisturbed, the solids, after a short time, would dissolve, and their solutions, being heavier than water, would remain at the bottom of the vessel in obedience to the law of gravity. But this law would soon be counteracted by another, namely, that of diffusion. The solution of salt, for example, would, in opposition to gravity, gradually rise and diffuse itself through the whole liquid. The solution of sugar would follow the same course, but with less than half the rapidity of the solution of salt. The gum, again, would be four times longer in mixing itself than the salt; when the albumen would require nearly twenty times the time. In fact, so different is the diffusive power of a solution of salt and one of albumen, that supposing the two mixed together, the salt would diffuse itself in the water, leaving the albumen in a pure state. On examination, it is found that those bodies are most diffusible which are crystaline, and that those are the least so which have an uncrystallizable character, and resemble gum, glue, and albumen, in this respect. As convenient names for these two classes of bodies, Mr. Graham has proposed the terms *crystalloids* and *colloids.*

Another fact of great importance with regard to the right of understanding of the phenomena of diffusion is, that a solution of a diffusible substance or crystalloid will diffuse itself into, or through, a solution of a colloid body almost as rapidly as through pure water—but that the solution of another colloid body possesses no such power. It is upon this last fact that the practical application of dialysis and the construction of the dialyser depend. This instrument may be compared in form to a tambourine, in which the flat circle is formed of gutta-percha rings, and the membrane consists of parchment paper (a singularly tough imitation of animal parchment, obtained by the action of sulphuric acid on ordinary paper). If a liquid be poured into the dialyser it does not pass through by filtration, parchment paper being impervious to the mechanical passage of fluid. But if the dialyser be floated on pure water, and then a mixed solution of a colloid and a crystalloid substance be poured into it, the latter rapidly diffuses itself through the substance of the parchment paper into the water beneath the colloid remaining behind. By this simple means the solution is separated into two parts, or *dialysed.*

Simple as this operation may appear, and as it really is, it gives us a power that we have never before possessed, namely, that of separating in the most easy and least expensive manner any mixture of different substances belonging to these two groups. Thus, a solution of sugar and gum is placed in the dialyser; the sugar passes through, the gum remains behind. A solution of white arsenic is mixed with a variety of substances, such as would constitute the contents of the human stomach; this is thrown into a dialyser, when the arsenic, being crystalloid, passes through into the clear water, and can be readily discovered by the usual tests, whilst the mixture of the various colloids, constituting the food, remains.

It is, however, in the power it affords of obtaining pure solutions of substances hitherto thought insoluble that the process offers the greatest advantages. Thus, by its aid have been obtained perfectly pure solutions of silica or flint, alumina or the basis of clay, of peroxide of iron, Prussian blue, oxide of tin, and a variety of substances of the same insoluble character.

Let us take flint, for example. It is usually regarded as one of the most insoluble bodies known; but by the aid of the dialyser it can be obtained dissolved in pure water, and may be used instead of tannin, or oak bark, for converting skins into leather. If it be fused with an excess of soda, it is converted into the well-known soluble or water glass. This, when acidified by hydrochloric acid, is decomposed, the acid unites with the soda to constitute common salt, whilst the silica remains dissolved. If this mixed solution be dialysed, the salt passes through, and a pure solution of silica in water remains behind. Thus, solutions containing three per cent. of silica may be formed as limpid as water, with a feebly acid reaction on test-paper, but insipid to the taste. In this later character the solution resembles many colloid bodies which seem not to have sufficient diffusive power to pass through the membrane covering the tongue in order to reach the nerves of taste. After having been made some days, the solution of silica assumes the consistence of glycerine, and afterwards gelatinizes, silica eventually separating in a solid insoluble form. The solution has a peculiar action upon gelatinous substances, such as skins, being absorbed by them, and converting them into a kind of leather, so that it is possible that flint may eventually become a cheap substitute for oak-bark in the process of tanning. On the addition of any carbonate, as chalk or limestone, the silica is caused to solidify in its substance in a hard flint-like form, and offers the possibility of converting soft and perishable limestone, by artificial means, into a hard and enduring siliceous stone.

Again, peroxide of iron may be dissolved in hydrochloric acid, thus constituting the perchloride of iron. This has the power of dissolving a large excess of the peroxide of iron. If this solution of the peroxide in the perchloride of iron be dialised, the chloride passes through, leaving the pure oxide dissolved in water in a colloid state. This also can be rendered gelatinous in the same manner as silica.

Prussian blue, insoluble in water, is perfectly soluble with oxalic acid, and if this solution be dialised, the oxalic acid passes away, and a solution of pure Prussian blue remains. This may be gelatinised by the addition of a little dilute sulphuric acid and by many other re-agents.

After having enumerated these examples, it is scarcely required to indicate the probable practical value of the process. It will certainly be employed to prepare solutions of many colloid dyeing materials, which will afterwards be caused to precipitate on the cloth, and so be capable of being used cheaply, and without a mordant. As a means of separating many mixtures, its use is obvious. It is probable that many valuable crystalized ingredients that now require for their preparation expensive and troublesome operations, may be separated from the crude mass of vegetable tissues with which they are associated naturally, by the inexpensive process of dialysis.

In fact, in all those arts which act by purifying, by refining, by separating different ingredients, and in those which like dyeing, require the employment, in a soluble state, of substances which are usually insoluble, we cannot discern a limit to the practical application of this new operation.

ARTESIAN WELLS.*

By G. R. Burnell, C. E., F. G. S.

The next important artesian borings executed of late years in chronological order, were those undertaken under the superintendance of the French military authorities in the Desert of Sahara, avowedly for the purpose of forming stations for the caravans trading between Algeria and Central Africa. They were executed by means of tools made by Messrs. Degoussee and Laurent, who seem also to have occasionally acted as consulting engineers, but the works were actually performed by the soldiers, or the labourers employed by the "Corps du Genie Militaire" It appears that up to the month of June, 1860, no less than 50 of these wells had been sunk in the desert, and that they pour upon its thirsty surface no less than 7,920,000 gallons of water per day. Similar works were, according to Aime Bey, executed in the deserts of Ancient Egypt, as was before alluded to, and there are good reasons for believing that the system of artesian borings might advantageously be applied in the deserts of north-western India, and of Australia.

Some interesting artesian wells and borings have also been executed in various parts of England and of the continent, to a few of which I propose to return hereafter, but in the meantime, I pass to the description of the great work lately completed at Passy, as being the one which has attracted the most universal attention. When the great works of the Bois de Boulogne were commenced, it was soon discovered that pumps of Chaillot would not be able to furnish the quantity of water required for the lakes and waterfalls of the new park, and the Municipal Council of Paris, encouraged no doubt by the commercial results of the previous operation at Grenelle (which had eventually cost the sum of £14,000, and had repaid its cost several times over), resolved to execute a second boring to the lower green sand, in order to secure an independent supply. It was originally proposed to execute this well of the same dimensions as that at Grenelle, that is to say, to finish with an eight-inch bore; but before it was commenced, M. Kind, a German engineer, (who had already carried out some very important works upon a system, and by the aid of tools patented by himself,) offered to contract for the new well to finish with a bore of 2 ft. in diameter, and to deliver the water at 92 ft. above the level of the ground, at the rate of nearly 3 million gallons per day. He undertook to complete the work for the sum of £14,000 within the space of two years. After some opposition, based principally on the doubts expressed by engineers, who had been consulted on the subject, with respect to the increased delivery over that of the well of Grenelle, this offer of M. Kind's was accepted, and on the 23rd December, 1854, the vote of the Municipal Council in favour of the contract with him was passed. The work was commenced shortly afterwards, and by the 31st of May, 1857, the boring had already reached the depth of 1,732 feet from the surface, when suddenly the upper portion of the tube lining collapsed, at a distance of about 100 feet from the surface, and choked up the bore-hole. This accident delayed the completion of the work for three years, and led to the rescinding of the contract with M. Kind; but the engineers of the city of Paris were so satisfied with his zeal and ability, that they confided to him the conduct of the remaining works. A new well was sunk to a depth of 175 feet 4 inches, and the boring was then cleaned out and resumed. Much trouble was encountered in traversing the strata below the distance of 1,732 feet above quoted, and at length, at the distance of about 1,894 feet from the surface, the first water bearing stratum was met with, but the water, after several oscillations did not rise to the level of the ground. The boring was continued below this level, until, on the 24th September, 1861,

*Abbreviated from the Journal of the Society of Arts.

at midday, at the depth of 1,923 feet 8 inches, the true artesian spring was tapped. When this spring rose to the surface, it discharged at the rate of 5,582,000 gallons per day. The yield has since then oscilliated, but so long as the column had not been raised above the level of the ground, the total quantity does not seem to have fallen short of 4,465, 600 gallons. The well of Grenelle, (which by the way had been falling off in its yield for some time before the completion of the Passy boring, no doubt on account of some obstruction in its ascensional tube, but which for several days before the 24th September discharged regularly 200,000 gallons per day) fell, in about 30 hours after the Passy spring hadbeen tapped, to a yield of about 173,000 gallons, at which rate it remained stationary, until the tube of the Passy boring was raised so as to allow the water to stand at the same height in the two wells, when the original rate of delivery of the Grenelle well was resumed, but the rate of delivery of the Passy well fell to two million gallons per day. It is intended eventually to cause the column of water of Passy to rise to a height of 1,977 feet above the bottom of the boring, or about 54 feet above the surface of the ground. The horizontal distance of the Passy well from the one at Grenelle is about 3,830 yards; and it will be observed from the section on the wall, that the water-bearing stratum is nearly 100 feet nearer the mean level of the sea at Grenelle than it is at Passy, whilst the surface of the ground is about 35 feet higher at the latter locality than it is at the former one.

Unquestionably the effect produced upon the respective sources of supply, by the alteration in the heights of the columns of water, proves that the wells of Passy and of Grenelle are fed from the same stratum; and there can be no reason, therefore, to suppose that, when the Passy spring shall have cleared its water passages there should be any difference in the qualities of the waters at the two places. M. Peligot has carefully analysed the Grenelle waters, and he found that they contained 0·000142 of saline matters, composed principally of the carbonates of lime, potash, and magnesia, associated with a compound of sulphur, and of soda of variable proportions and conditions, and with the carbonate of the protoxide of iron and silica. The salts of the sulphate of lime, or of the more permanently insoluble description are absent, and it would appear that the gases diffused through the water are of considerable volume, the carbonic acid gas being one of the most so. There is a sensible evolution of sulphuretted hydrogen from both the wells of Passy and of Grenelle, and it is worthy of remark that the same gas is given off from the water in Mr. Gatehouse's well at Chichester, though in the latter instance the smell is sufficiently strong to render the water positively repulsive. At the present day the water at Passy is still foul, on account of the matters it brings up in suspension; but, as in the case of the Grenelle well, this inconvenience will no doubt soon disappear. The temperature at which it reaches the surface is identical in the two wells, and is about 82° Fahrenheit.

It may be worth while to call attention to the mechanical means adopted by M. Kind in sinking a boring of the large diameter of 2 feet 4 inches, to the enormous depth of nearly 2,000 feet from the surface. The work was commenced by a shaft, as usually is the case, and after it had been sunk to a depth of about 50 feet, the boring commenced, and was continued with as nearly as possible the same diameter to the bottom. M. Kind employed for this purpose what may be called rods with releasing joints, very closely resembling the joints introduced by Œuyenhausen, which allowed the cutting portion of the tool to be raised a certain height, and then to be released automatically; this arrangement was adopted in order to avoid the lashing of the sides of the bore by the long rods, and to regulate the force of the blow. The cutting tool used by M. Kind also differed from the tools generally employed, for it consisted of a single or a double trepan, according to the nature of the ground, instead of the ordinary chisels and augurs. A patent was taken out for these tools by M. Kind, No. 13,478, of the year 1854, the printed specification of which contains a series of engravings of the various modifications proposed for the various kinds of rocks; in the *Annuaire Scientifique* for 1861, illustrations will also be found of the ordinary trepans and of the slide joints. M. Kind is able, by these combinations, to strike as many as twenty blows in a minute with the greatest regularity at a depth of 2,000 feet. The patent of 1854 specifies also certain methods of lining the sides of the borings; but it must be confessed that they do not seem to me to possess any great merit, and indeed M. Kind had more difficulties to encounter at Passy from the collapsing of his tubes, than from any other cause. It is a common error of well borers to undervalue the effort exerted by clays swelling when charged with water; and the great delays encountered in sinking the Passy well were precisely caused by the false economy introduced in the execution of the tube linings. The time actually employed in sinking the Passy well was nearly the same as that employed at Grenelle; in the former instance it was 6 years 275 days, in the latter it was 7 years 90 days. The cost of the Grenelle well, as above stated, was £14,000; that of the well at Passy was £40,000, but it must be observed that the quantity of water, delivered at the same height in the two cases, is ten times greater at Passy than it is at Grenelle; the rates of delivery are, in fact, nearly in the direct ratios of the diameters.

Miscellaneous.

ILLUMINATING GAS FROM PETROLEUM.

The following circular speaks for itself. We may soon hope to see an abundant use for the Canadian petroleum.

109 King Street West, Toronto,
April 3, 1862.

Sir,—We beg to inform you that we have secured a patent in Canada for the manufacture of Illuminating Gas from Crude Petroleum.

Our process is susceptible of being applied on any scale, from the lighting of a dwelling house to that of the largest city.

Three materials are employed in the manufacture of our Illuminating Gas. These are, Crude Petroleum, Water and Charcoal or Coke, all of them accessible and cheap, and from the extraordinary abundance of Petroleum in Canada and the United States, this body is likely to remain so.

The qualities which we confidently expect will secure for Petroleum Gas your favour, are—

1st. *Its extraordinary illuminating power.*

2nd. *The mildness and softness of its light.*

3rd. *Its cheapness.*

4th. *The ease with which a supply can always be controlled for illuminating, heating, or cooking purposes.*

A ONE foot burner gives a flame as large as a FOUR foot burner of the common coal gas supplied to cities and towns. The comparative smallness of the flame greatly diminishes the heat, which is often found so oppressive in large rooms lighted with coal gas. The absence of the flickering, which is often disadvantageous and disagreeable in common coal gas, is another quality which it can be made to possess. Until the recent adoption by the public of coal and petroleum oil lamps, coal gas was considered to be by far the cheapest illuminator known. Since the discovery of a process for manufacturing gas from petroleum, to burn without smoke or smell from ordinary gas burners when properly made, coal gas has been far surpassed in cheapness by petroleum gas, and a milder, steadier, yet stronger light secured.

Its cheapness may be inferred from the following brief statement:—

Five gallons of crude petroleum distilled and converted into gas according to our process, make one thousand cubic feet of gas. But one cubic foot of the petroleum gas is equal in illuminating power to *four* cubic feet of common coal gas, so that in effect five gallons of petroleum are capable of producing an amount of light represented by 4,000 cubic feet of coal gas, or from $12 to $16 in money, according to the present ratio of gas charges in Canada. Where gas is required to be manufactured on a large scale, it is desirable to remember that petroleum and water are easily handled, and can by their own flow supply the retorts continuously and without waste, thus doing away with the unceasing labour of continually replenishing the retorts with coal, and the expense entailed in the maintenance of numerous hands.

With respect to public buildings, one man giving three hours' attention per day to the manufacture of petroleum gas, can produce by our patent process, enough gas to supply 100 burners with full pressure for ten hours, at a cost of material not exceeding ONE DOLLAR, fuel for distillation included, or at from one-fourth to one-third the cost usually charged by the gas companies now existing in Canada.

The substitution of petroleum for coal in gas works now in operation, can be effected with very little additional expense.

In public and private buildings where it is desirable to introduce petroleum gas, a detached room would be required, according to the capacity of the works. The pipes and burners now used by gas companies are in all respects adapted to the petroleum gas, with this difference, that where a FOUR foot burner (the one in common use) for coal gas is employed, a ONE foot burner for petroleum gas would have to be substituted. Petroleum gas burning through a FOUR foot coal gas burner is a magnificent illuminator, and one which would not often be used for ordinary purposes.

Any communications relative to the introduction of the Patented Petroleum Gas into public buildings or private houses, may now be addressed to James E. Thompson, 109 King Street West, Toronto; and if the applicant state the number of burners required to be supplied, an estimate of the size and cost of the apparatus will be returned without delay.

We are Sir,
Your obedient servants,
JAS. E. THOMSON,
Hydraulic & Gas Engineer.
HENRY YOULE HIND, M.A.,
Prof. of Chem. & Geol. Trin. Coll., Toronto.

CAUTION TO THE PUBLIC.

The public are respectfully informed that Messrs. James E. Thompson and H. Y. Hind, have secured patents for—

First. An *opparatus* for the manufacture of Illuminating Gas from Crude Petroleum or Rock Oil.

Second. A *process* for the manufacture of Illuminating Gas from Crude Petroleum or Rock Oil.

And they claim—

1st. "The invention of a portable or stationary iron or clay Compound Retort for the simultaneous production of gases from petroleum and water, by means of which retort a useful, rich, and economical illuminating gas can be obtained."

2nd. "The simultaneous production within the same Compound Retort, of gases from crude petroleum and water, or in a different and separate retort, if the gases are subsequently brought together at a red heat, to effect the requisite combinations; also the purification and deodorizing of the gases by means of dilute hydrochloric acid, or other suitable acids, so as to fit the gases for combustion under ordinary circumstances."

The Patentees will take legal proceedings against parties infringing their patented rights.

Charcoal as a Disinfectant.

Dry charcoal, in the presence of atmospheric air, is a powerful means of destroying the mephitic gases and vapours of sewers and house drains. Charcoal filters may be used with efficacy in the course of the air channels from the drains and closets of houses, as well as in the ventilation of the public sewers; in applying the charcoal, those contrivances should be used which offer the least resistance to the free passage of the air; the situation of the filters is best when the charcoal is protected from wet and from dirt, and is easily accessible; and from the ascertained efficacy of charcoal in destroying the dangerous emanations from sewers, the system may be generally applied with great advantage.

There were two varieties of mechanical arrangements adopted for applying the charcoal in the late experiments instituted in London (England); one was that patented by Messrs. Bean and Burge, which consisted of one large seive with compartments, the other was an adaptation of our own, and consisted of a series of trays for holding the charcoal, and were so constructed as to be capable of being readily removed from the frames into which they fitted.

Wood charcoal was employed, broken into pieces of the size of a filbert. It was packed closely, but without compression, upon the various trays; and each tray held about $1\frac{1}{12}$ lbs. of charcoal, making altogether $6\frac{1}{2}$ lbs., distributed over the six trays of each air filter.

The charcoal appears to lose much of its power when saturated with water; and as the position in which the trays containing it are placed is such that leakage of water into them in times of rain is, to some extent, all but impossible; and as, moreover, the atmosphere of the sewers is always very moist, the charcoal becomes so wet as to require removal before it has failed as a deodoriser. Upon an average the sieves have been recharged about once in three months. Those which have been in very wet situations have been re-filled much more frequently, and those in dry situations less.

Commerce of Montreal.

The number and tonnage of vessels entered inwards at the port of Montreal, up to the 21st November in each year for the last ten years, show the following figures:

	No. of Vessels.	*Tonnage.*
1852	191	45,802
1853	242	58,894
1854	275	72,305
1855	197	47,904
1856	230	69,777
1857	208	65,330
1858	191	70,183
1859	191	85,193
1860	240	118,216
1861	498	247,247

The enormous increase in the tonnage in 1861 shows how exceedingly prosperous has been the trade in 1861 as compared with that of former seasons.

Steam Boiler Explosions Prevented.

A correspondent of the *Mining Journal* says:—As any proposition for the prevention of loss of life unnecessarily is worthy of consideration, it may be interesting to know that Ericsson's caloric engine is now in use in 500 practical instances in the United States, the purposes to which it is applied being almost equally varied—this source of motion having been adopted for making matches and for draining mines, for making hooped skirts, for picking hair, for irrigation, and for supplying villages with water, as well as for quartz crushing, grinding coffee, and numerous other purposes. The manufacturers of Ericsson's engine claim that by the use of hot air engines steam boiler explosions would be effectually prevented, and that there are few forms of labour employing steam in which this inexplosive and safe motor, Ericsson's caloric engine, might not be advantageously employed.

Geoffrey St. Hilaire.

Late news from Europe contains intelligence of the decease of this renowned zoologist, in Paris, on the 9th ult. He was born in 1805, and was therefore 56 years of age at his death. He was the son of E. Geoffrey the celebrated French anatomist, and was a prodigy of scientific learning at 19 years of age. He was a professor of th e natural sciences and published several works on anatomy and physiology, which have won for him a high position among the great names of the earth. He was one of those cool, utilitarian French philosophers, and was the first to advocate the use of horse-flesh for human food in France.

Gases given off by plants under the influence of Light.

M. Boussingault has discovered (*Comptes-Rendus*, t. liii., p. 862) that under the influence of direct sunlight, the leaves of aquatic plants give off a notable proportion of carbonic oxide and carburetted hydrogen. He thinks that this emanation of carbonic oxide may be one of the causes of the unhealthiness of marshy districts. The fact he points out is important, and the subject will, no doubt, receive further investigation.

Photographic Ware Baths.

We find continual allusion and constant praise given in the American journal to a new material for baths. "At presnt" observes a writer in *Humphrey's Journal*, "probably, the most popular bath is known as the photographic ware, an invention of George Mathiot, an electrotypest, of Washington. The invention grew out of a want in Mr. Mathiot's business, viz., a cheap ware which will hold acid solutions, and consists simply in soaking the vessels of unglazed and porous porcelain in melted wax. Thus Mr. Mathiot killed two birds with one stone, and did a very handsome thing for photography as well as for electrotype. Such ware costs but a trifle, is neat, handy, and durable. Would not paraffin be a useful substitute for the wax? There is no compound known which is so little effected by corrosive matters."—*Mech. Mag.*

Port Dover Woollen Factory.

The Woollen Factory at Port Dover has been completed, and the works were opened on Friday, 7th February. The mill is nearly 300 feet long, and four stories in height. Its machinery is driven by a head of water of about 13 feet. The machinery for carding, spinning, weaving, and dressing, is of very superior description, and all details appear to have been attended to with judgment and practical skill. A description of this establishment will be found in the last No. of the Journal.

International Cattle Show, 1862.

The Royal Agricultural Society of England and the Highland and Agricultural Society of Scotland, have jointly arranged to conduct an International Cattle Show in London next summer, and Battersea-park has been granted for the purpose, where the necessary enclosure and buildings will be made. The show will take place during the week commencing the 23rd of June, 1862. The prizes offered by the Royal Agricultural Society, consist of money and medals.

The Ordeal Root.

At a recent meeting of the Pharmaceutical Society, Professor Bentley exhibited a specimen of the Ordeal Root spoken of by M. du Chaillu in his book on Western Africa. It is there said to be in use among some African tribes as a test for witchcraft—an individual suspected of that crime being required to imbibe a strong infusion of the root. It is intensely poisonous, and if the individual dies he is supposed to have been guilty, but if, from any cause, he should survive the ordeal, he is considered innocent. The observed effects of the poison, and the character of the bark on the root, the Professor said, left no doubt on his mind that it was derived from a species of strychnos.