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THE TEST WELL AT ENNISKILLEN.

An important undertaking is in active progress at the Oil Springs, Enniskillen, for the alleged purpose of endeavouring to strike the subterraneous source of Petroleum from which the flowing wells in that township are thought to have been supplied. It is in contemplation to penetrate 1000 feet, if necessary, into the rock, with a view to ascertain whether there does or whether there does not exist a great reservoir of petroleum within the limits above mentioned. If a permanent supply of this valuable fluid should be obtained by this enterprise, the future of Oil Spring village is established; if the contrary should be the case, what then? In this article we propose to enumerate the most important known facts with respect to petroleum and its geological relations, and endeavour to exhibit the chances for and against a successful issue of this project.

Distribution of Petroleum in North America.

It is well known that petroleum is no novelty on this continent, but it is not so generally known that it exists in extraordinary abundance in a region remote from civilization, namely, in the North West Territory. More than seventy years ago Sir Alexander Mackenzie described the "bitumenous fountains" on the Athabaska River "into which a pole twenty feet long could be inserted without the least resistance." Sir John Richardson has also described the limestone beds on Athabaska River as covered with a bitumenous deposit upwards of one hundred feet thick. Further down the river there is a copious spring of mineral pitch issuing from a crevice in the cliff composed of sand and bitumen, it lies a few hundred yards from the river bank in the forest. "The whole country" in this part of the Athabaska River "is so full of bitumen that it flows readily into a pit dug a few feet below the surface." The limestone associated with the bitumens is referred to by Sir John Richardson as probably belonging to the Marcellus Shale, a formation represented in Canada by the base of the Hamilton group of rocks, the same which occurs in the township of Enniskillen. Petroleum exists in rocks of all geological ages, from the most ancient Lower Silurian to the comparatively modern Tertiary. It occurs in Canada in the Bird's-eye limestone on the Montmorenci, and in the Trenton limestone at Pakenham, both of which are Lower Silurian rocks. On the great Manitoulin Island a spring issues from the Utica Slate, from which rock illuminating and lubricating oil was distilled at Collingwood some years ago. It is also found near Hamilton rising through the red shales of the Medina Sandstone, near the base of the Upper Silurian series. In the Niagara limestone it is comparatively abundant, and in the Corniferous limestone, a rock of Devonian age, natural springs occur. At the base of the Hamilton group it is very abundant in the North West Territory as before stated, and natural springs are found in this group at Enniskillen, coming probably from the underlying Corniferous limestone. In Ohio and Pennsylvania the oil is obtained from the Portage and Chemung group of rocks, also of Devonian age, and some of the wells are bored through Carboniferous strata.* The Triassic Shales at Southberry, Connecticut, far above the coal, yield a liquid petroleum; and in the Island of Trinidad petroleum is abundantly found in Tertiary rocks. Hence it appears that this substance exists in rocks belonging to all the grand divisions into which geologists have divided the different fossiliferous strata forming the crust of the earth, from the most ancient Palæozoic formations to those of Tertiary age.

It is still a subject much discussed among geologists as to the origin of petroleum, whether from vegetable or animal remains; probably the correct view lies between these extremes, namely, that petroleum may be produced from the decomposition under peculiar circumstances both from animals and vegetables. Dr. Hunt draws an important distinction between the rocks which contain true bitumen and the so called bitumenous shales. "Besides the rocks which contain true bitumen, we have what are called bitumenous shales, which, when heated, burn with flame, and by distillation at a high temperature, yield, besides inflammable gases, a portion of oil not unlike in its characters to petroleum. These are, in fact, argillaceous rocks intermixed with a portion of organic matter allied to peat or lignite, which by heat is decomposed and gives rise to oily hydrocarbons. These inflammable or lignitic shales, which may be conveniently distinguished by the name of *pyroschists*, (the brandschiefer of the Germans) are to be carefully distinguished from rocks containing ready formed bitumen: this being easily soluble in benzole or sulphure of carbon can be easily dissolved from the rocks in which it occurs, while the

* See Notes on the History of Petroleum or Rock Oil, by T. Sterry Hunt, M.S., F.R.S., in the *Canadian Naturalist and Geologist* for August, 1861.

pyroschists in question yield, like coal and lignite, little or nothing to these liquids.

"It is the more necessary to insist upon the distinction between lignitic and bitumenous rocks, inasmuch as some have been disposed to regard the former as the source of the bitumen found in nature, which they conceive to have originated from a slow distillation of these matters. The result of a careful examination of the question has, however, led us to the conclusion that the formation of the one excludes more or less completely that of the other, and that bitumen has been generated under conditions different from those which have transformed organic matters into coal and lignite, and probably in deep water deposits, from which atmospheric oxygen was excluded. Thus in the palæozoic strata of North America we find in the Utica and Hamilton formations, highly inflammable pyroschists which contain no soluble bitumen; and the same is true to a certain extent of some limestones, while the Trenton and Corniferous limestones of the same series are impregnated with petroleum or mineral pitch, and, as we shall show, give rise to petroleum springs. The fact that intermediate porous strata of similar mineral characters are destitute of bitumen, shows that this material cannot have been derived from overlying or underlying beds, but has been generated by the transformation of organic matters in the strata in which it is met with. This conclusion is in accordance with that arrived at by Mr. S. P. Wall, in his recent investigations in Trinidad. He has shown that the asphalt of that island and of Venezuela belongs to strata of the tertiary formation (of upper miocene or lower pliocene age), which consist of limestones, sandstones and shales, associated with beds of lignite. The bitumen is found not only in the famous pitch lake, but *in situ*, where it is confined to particular strata, which were originally shales containing vegetable remains. These have undergone 'a special mineralization, producing a bitumenous matter instead of coal or lignite. This operation is not attributable to heat, nor of the nature of a distillation, but is due to chemical reactions at the ordinary temperature, and under the normal conditions of climate.' He also describes wood partially converted into bitumen, which last, when removed by solution, leaves a portion of woody tissue. (Proc. Geol. Soc., London, May, 1860.)"

The results of boring for petroleum in Enniskillen have developed some curious facts in relation to the supply of oil, wholly unexpected and extremely perplexing. The sudden stoppage of a number of flowing wells, is a new feature, well calculated to cause some degree of alarm among the well-owners and refiners, but not to such an extent as to favor the expectation entertained by many that the supply is about to fail.

The cause of the cessation is, in some instances, to be attributed to the exhaustion of the motive power which forced the oil to and above the surface —namely, the gas and vapours of hydrocarbons, which accompany the oils; in others, this cannot be the true explanation, for salt or brackish water continues to flow with diminished force. And, in other cases, gas alone has been observed to issue from the pipe without water or oil; but more frequently intermittent jets of salt water, mixed with petroleum and gases. Another curious fact has been observed with reference to the depth of the wells from which the present supply of petroleum is obtained. It is the deepest wells which have failed—namely, those above 200 feet in the rock; whereas others not more than 150 to 180 feet deep still continue to yield a stream of diminished force.* Wells situated within a few yards of one another are not equally productive; and borings have been made between two flowing wells a short distance apart, without touching the fissure or cavity containing the petroleum which supplied its neighbors, thus showing within what narrow limits the chances lie of striking a productive "vein of oil."

That the rocks in which the flowing wells are situated are not saturated with petroleum is shown by the occurrence of layers of rock destitute of any trace of this substance, and, consequently, impervious to it. If the Corniferous limestone is the source of the petroleum in Enniskillen, it is quite possible that a rich supply will be found at the junction of that rock and the overlaying Hamilton shales, into the cracks, cavities, fissures or joints, of which it has risen by its superior levity. But this will only be in certain localities; for a well has been sunk at Petrolia upwards of 300 feet in the rock, probably through the Hamilton group to the Corniferous limestone, and only intermittent supplies of petroleum and salt water have been obtained.

The question which has to be determined is the depth or thickness of the Hamilton shales in the township of Enniskillen. This formation in the middle of the State of New York is 1,000 feet thick, but they thin out rapidly to the west, so that on the south shore of lake Erie they are not 500 feet thick. On the banks of some of the tributaries of the Sable river, north of Enniskillen, Mr. Murray found a "nearly complete section of the Hamilton

* A very interesting paper on the Oil Wells of Enniskillen was read before the Canadian Institute on February 28th, by Sandford Fleming, Esq., C.E. It will be published in the next number of the *Canadian Journal*.

group," and he gives the thickness at 133 feet. The thickness of these rocks in Enniskillen may be from 150 to 180 feet. They are distinguished in the State of New York by the remarkable extent and regularity of the joints which intersect the strata. This tendency to a *jointed structure* may have a great influence on the accumulation of petroleum in these rocks. The joints would run in the direction of the anticlinal axis, or, to use a more familiar expression, they would follow the course of the upheaval which has elevated and arched the rocks from lake St. Clair to London, and thence towards and beyond Hamilton.

The organic remains found in the Hamilton shales and in the Corniferous limestone, may furnish some clue to the source of the petroleum in these rocks. In the Hamilton beds, the evidence of verdure over the land is no longer doubtful, according to Dana. The remains show that there were trees, and of large size. The plants found in them belong to the Lycopodia (ground pine) of modern damp woods. The earliest representatives of the type had trunks a foot or more in diameter, and may have been more than a score of feet in height. The orders of sea weeds are common, and one of them is sometimes a foot in diameter. The waters were marine, and the seas shallow. But it is in the Corniferous limestone that we find the most extrordinary distribution of life. The Upper Helderberg series, to which the Corniferous belongs, "is eminently the coral-reef period of the Palæozoic age."* Many of the rocks abound in corals, and are as truly coral-reefs as the modern reefs of the Pacific. The hornstone from which it derives its name, contains spiculæ of sponges, and Desmids or small microscopic plants. Protophytes are abundant throughout it. The hornstone of this rock is analogous to flint in origin as well as in its mode of occurrence. Hence, besides a vast profusion of corals in the Corniferous period, we have the organic origin of the hornstone indicating an extraordinary distribution of life. From these sources—namely, Corals and Desmids, petroleum may have been produced by slow decomposition, as in the island of Trinidad, in more recent epochs.

The exact thickness of the Corniferous limestone in Enniskillen is unknown; but it can be approximately estimated. In some places in New York the thickness of the series is 350 feet, but generally they do not exceed 70 feet. In Monroe county, Michigan, the thickness is 60 feet; but as it is probable that this limestone in Enniskillen, being situated in a geological depression running across the anticlinal, may not have been subjected to so great denudation as in Monroe county. The Corniferous limestone in Michigan is particularly bitumenous. It is also extensively intersected by divisional planes; and at a quarry in Monroe county, petroleum is so abundant as to exude in the form of a natural spring, and float on the surface of the water. This series of rocks in Canada does not probably exceed in and near Enniskillen 200 feet in thickness.

In boring a test-well for oil at Enniskillen, if a spring of petroleum were not touched in one or more of the joints in the Hamilton shales, where it has probably accumulated, a depth of 400 feet in the rock would reach the surface of the Onondaga salt group; and expectations are entertained by some that brine of great strength would be found in place of oil, and thus lead to a new industry, equally profitable with that of petroleum, as is now in process of development in the neighboring State of Michigan. But the geological features of the two areas are widely different, and it is doubtful whether the brine of Enniskillen could compete with those of the natural but ancient salt lagoons of that State.

The prolific salt wells at Syracuse and Salina, in the State of New York, are sunk in this rock to the depth of 150 to 340 feet, and they yield one bushel of salt from 35 to 45 gallons of water, whereas it requires about 350 gallons of sea water to obtain the same result. The physical geography of the area occupied by the Onondaga salt group in New York is thus described by Dana:—"The position of the saliferous beds over the State of New York indicates that the region which, in the preceding period, was covered with the sea and alive with corals, crinoids, mollusks and trilobites, making the Niagara limestone, had now become an interior shallow basin, or a series of basins, mostly shut off from the ocean, where the salt waters of the sea, which were spread over the area at intervals—intervals of days or months it may be—evaporated, and deposited their salt over the clayey bottoms. In such inland basins the earthly accumulations in progress would not consist of sand or pebbles, as on an open sea coast, but of clay or mud, such as is produced through the gentle movements of confined waters." Brine springs are not necessarily associated with the Onondaga salt group, as the foregoing conditions involved in their occurrence show; and they would be found in the greatest abundance near the shores of the ancient sea in which those rocks were deposited. Generally brine springs occur near the outcrops of formations, except, as in the case of Michigan, where a geological depression has occasioned the accumulation of salt in the interior of the basin which is so characteristic of the physical structure of that State. The

* Dana.

known facts respecting copious brine springs of considerable density, are opposed to their existence in the Onondaga salt group of Enniskillen; and it is more than probable that a well sunk to the depth even of 1,000 feet would fail to tap salines commercially valuable.

It would inevitably lead to disappointment if deep borings were to be made in Enniskillen in the hope of obtaining rich brines, grounded only upon the success which has attended similar enterprises in the neighboring state. The recently discovered rich supplies of brine in Michigan are derived from rocks which do not appear in Western Canada, and which are far above the Hamilton shales. The highest rock in Western Canada belongs to the Portage group; and these shales and sandstones, although they have a thickness of 1,400 feet near lake Erie, occur but in limited area and thickness between lakes Erie and Huron. Above these lie the Chemung rocks, not known to be represented in Canada, without it is thought proper to consider the Portage and Chemung as one group, and its representatives in the small areas of the Portage found in Western Canada. Of the Subcarboniferous rock no trace has yet been found in the Western Province, nor is there any probability that the smallest fragment exists. The great uplift, with its subordinate depression, before referred to, as extending from lake St. Clair to lake Ontario, through London and the neighborhood of Hamilton, probably took place before the era of the Subcarboniferous rocks, and occasioned that symmetrical and independent carboniferous basis, which is so characteristic of the geology of Michigan.

As an independent basin it contains four groups of strata, according to Dr. Winchell: the first, or lower, 171 feet of grits and sandstone (the Marshall group); the second, 123 feet of shales and sandstone (the Napoleon group); the third, 184 feet of shales and marl, with limestone and gypsum, called the Michigan salt group; the fourth, the carboniferous limestone, 66 feet thick. This is followed by a sandstone, 105 feet thick; and then by coal measures, 123 feet thick. None of these rocks are present in Canada, and it is from them that the rich brines in Michigan are obtained.

"The following is a statement of the strata passed through in the salt wells of the Saginaw valley, grouped and named in accordance with the Geological Reports made to the governor, December 31st, 1860:—

1.	Alluvial and drift materials, consisting of sand, clay, and boulders............feet	100
2.	"Woodville sandstone," brown and coarse.	65
3.	Coal measures, consisting of shales, with some sandstones, limestones, and coal...	130
4.	"Parma sandstone," white and porous....	115
5.	Carboniferous limestome, often highly arenaceous..............................	75
6.	"Michigan salt group," consisting of argillaceous, pyritous, and gypseous shales, their beds of arenaceous, and magnesian limestone and thick beds of gypsum.....	170
7.	"Napoleon sandstone," light buff, coarse...	110
	Total........................	765

"The foregoing table exhibits the average thickness of the strata in the vicinity of East Saginaw. From a point near the centre of the city, the rocks appear to dip both toward the north and the south; so that the total depth of wells four miles south is about 810 feet, while in the vicinity of Bay City the bottom of the Napoleon sandstone is found at a depth of 1,000 feet and over.

"The strata of the Michigan salt group outcrop toward the northeast at the mouth of Pigeon river and in Tawas Bay, on opposite shores of Saginaw Bay. It is an unexpected result, therefore, to find the saliferous basin depressed 200 feet deeper at points ten or fifteen miles nearer its margin. This local northern depression is filled by an extraordinary thickening of the shales of the coal measures. At the same time the underlying "Parma sandstone" is found charged with a brine of great purity, and of a density of 60° to 84° of the salometer. Persons engaged on the lower river, therefore, mistaking this saliferous sandstone for the one encountered at East Saginaw and vicinity, suspended their operations at this horizon; and up to the present time the manufacturers in the lower part of the valley have derived their supplies of brine from this source. It is only the result of a recent examination of specimens of the borings of these wells, and comparison of statements of well-borers, that this important conclusion has been fully decided upon; and we have the peculiar satisfaction of learning, while penning this article, that one well on the lower river, having been sunk to the depth of 916 feet, has just struck upon the true Napoleon sandstone, at the depth of 54 feet, in which a brine has been brought up *fully saturated.*

"It may not be uninteresting to observe that the Parma sandstone seems to be the equivalent of the carboniferous "conglomerate" of Ohio, which constitutes the reservoir of the brine supplying the wells of the Ohio and Kanawha rivers. It constitutes, moreover, the third or upper saliferous horizon known to exist in Michigan—that of the Onondaga salt group being the lowest. This recent discovery, moreover, discloses the probability that in the deeper portions of the general basin, the coal measures may be found similarly expanded in thickness, and the Parma sandstone similarly salt-bearing." *

The dish-shaped conformation of the strata of the lower peninsula of Michigan, has prevented the escape to the sea of such soluble substances as were originally embraced in the marine deposits from which the rocks were formed. The subterranean basins of Michigan furnish three great salt lakes. The first is in the subcarboniferous rocks, being on a parallel with the gypsiferous formation of Nova Scotia (Dr. Winchell); the second in the Parma sandstone; and the third, the only one which occurs in Canada, is the lowest or Onondaga salt group; but, unfortunately, instead of the group occupying a basin, it is distributed in Canada more in the form of a hill, sloping to Lake Erie and to Lake Huron, with a central highest axis between the two lakes. The transverse trough or depression passing through Enniskillen, connects the *basins* of Lake Michigan with those of Pennsylvania.

Although rich brines may not be found by boring in Enniskillen, yet petroleum still offers an encouraging prospect. It is important to bear in mind the peculiar character of the jointed structure of the rocks of the Hamilton group, and the vast area of rock surface those joints may connect into one narrow reservoir, or many independent narrow reservoirs. The underlying Corniferous limestone is also extensively intersected by divisional plains in Michigan, and thus presents an open character. It is even supposed by many in that State, that owing to the open joints in this rock, a subterranean communication exists between Lake Michigan and Lake Huron, in the southern part of the peninsula. The petroleum wells in Enniskillen are governed in their flow by the same laws which regulate the flow of brine springs and ordinary springs of fresh water; and these, we know, are in many instances of an intermittent character, dependent upon atmospheric and other changes. The fact that the brackish water should also have ceased to flow from some of the wells, affords a good ground for the expectation that many of the oil wells partake of this intermittent character; and owing to the complex ramifications of the joints in the rock, which form the narrow reservoirs from which they spring, many of them will probably yet gladden the hopes of their proprietors by a renewed but intermittent flow.

The conclusion at which we arrive with regard to the results which may be expected to be obtained by the "Test well" in Enniskillen, as far as brines are concerned are the following: If petroleum is not found at a less depth than 400 feet in the rock, it will not be found in deeper borings. As soon as the Onondaga salt group or the junction between the Onondaga and Corniferous group are reached, brine will probably be found, but not sufficiently rich for profitable working; and that deeper borings in the Onondaga salt group will fail to reach salines which can compete with the more abundant distribution of salt in the detached basin of Michigan, where all the conditions for the accumulation of this important product appear to have been fulfilled.

* From a paper in *Hunt's Merchants' Magazine* for September, 1862.

GOLD IN INDIANA.

In a report of a geological reconnaisance of Indiana, made under the direction of the late David Dale Owen, M.D., by Richard Owen, M.D. mention is made of the new gold region in Indiana at Hamlin's Fork of Salt Creek. Dr. Owen expresses the opinion that the gold is invariably associated with drifted quarternary material derived from a matrix at least from four to six hundred miles distant in a northerly direction. If this should prove true, the greater distance may bring the source of the gold within British territory on the north shore of Lake Huron. If the source should be west of north, the rocks of the south shore of Lake Superior will be its matrix; and as the formations there developed are of considerable extent in Canada, gold may yet be found in situations not far from the shores of those lakes in British territory.

It is important to bear in mind that the source of a great part of the gold as yet found in the world is the veins which were formed in rocks of Palæozoic age. The rocks which, in the neighborhood of Lakes Superior and Huron, were erupted during this period may, possibly, be the source of the gold found in the drift of Illinois. A range of volcanic or trap rocks extends from the extremity of Keeweenaw Point to Montreal River in the northern peninsula of Michigan, from two to eight miles wide, and running nearly parallel to the lake coast. Twelve miles from Montreal River and east of it the range widens to fifteen miles, sending off spurs to the southern extremity of Agogebic Lake and the Porcupine Mountains. These rocks were erupted during the period of the Potsdam Sandstone. They occur on Isle Royal and in Canada south-east and north of Black Bay, Lake Superior, and on numerous islands, such as St. Ignace and the islands of Neepigon Bay and other portions of the north shore. Intrusive rocks also occur west of Lake Superior as far as Rainy Lake. But their age is not so well established as those on the south shore. The supposition of Dr. Owen will doubtless direct attention to the erupted rocks of Palæozoic age in the Lake Superior district, and *veins of this age* should be sought for which are the true source of gold. It is important to notice that gold has not yet hitherto been found in the so-called Azoic rocks, although these are often abundantly intersected with veins.

DESCRIPTION OF THE CHIEF FOREST TREES OF UPPER CANADA.

BY DR. HURLBERT.

The samples of wood about to be described, sent to the International Exhibition, have been collected from the extreme eastern and western, and central parts of Upper Canada, for the purpose of showing the extent of country over which the most valuable timbers grow.

1. The most important collection is in the form of planks, twelve feet long and four inches thick, with the bark on both edges. Of these (sixty in number) there are superb samples of white cak, four feet wide; white wood, black cherry, black walnut, button-wood, white ash, sugar maple and soft maple, from three to four feet wide; one plank of pine, from the township of Bayham, twelve feet long (and it could have been cut fifty feet long) and fifty inches wide, without a knot, sawn from a tree 22 feet in circumference and 120 feet to the first limb; the first four logs, twelve feet long, making 8,000 feet of lumber after being squared.

2. The second class of woods are sections of the trunks of the chief of the valuable timbers, with the bark on, taken from the three divisions of the Province above named. Of these there are thirty-four.

3. The third are neatly planed and polished specimens of all our chief woods—one side varnished, the other plain—veneers of the plain wood, of crotches, of roots, &c., of the most choice varieties. Of these there are two collections, each of 73 specimens, with some smaller ones; in all, about 250.

4. The fourth class consists of the sections of the trunks (from three to six inches in diameter), one foot on, with the bark on, so cut as to shew the grain of the wood and the polish it will take, accompanied with twigs, leaves, and flowers of the trees. In this class are five valuable collections, from the distant parts of Upper Canada, of some 90 distinct kinds of native woods and shrubs. Of these there are 203 pieces.

The common and scientific names of all the woods are given, with the size and height of the trees, the specific gravity of the wood, its weight compared with shell-bark hickory (which, being the heaviest of all our woods, is taken as the standard), its uses, prices at the lake ports, and at Quebec, &c.

5. The fifth class contains samples of tool handles, shafts, and poles of carriages, spokes, naves, &c., showing the common purposes for which the woods are best adapted and most used.

From a pamphlet issued from the Bureau of Agriculture, at Quebec, we learn that Canada exports annually about 30,000,000 cubic feet of timber in the rough state, and about 400,000,000 feet board measure, of sawn timber. The revenue derived by the province, during the year 1860, for timber cut in the forests, amounted to about 500,000 dols. Of the sixty or seventy varieties of woods in our forests, there are usually only five or six kinds which go to make up these exports so vast in quantity; the remaining fifty or sixty timber trees are left to perish, or are burned as a nuisance, to get them out of the way. By showing, in the markets of the world, that we have these valuable woods, and can furnish them at such unprecedentedly low prices, we shall secure additional purchasers. The collections here named were made chiefly in reference to this point, and are, in their nature and in their intrinsic value, it is believed, well adapted for that purpose.

In extent, in the variety and value of its woods, the great forests of deciduous trees of North America surpass all others; and the most remarkable of this great mixed forest is that growing in the valley of the St. Lawrence. The western coasts of both continents, in high latitudes, furnish only or chiefly the Coniferæ. The high summer temperatures and abundant summer rains, are, unquestionably, those conditions of climate necessary to produce these peculiar forest trees. The western coasts of both continents, in high latitudes, have the necessary moisture, but not the high summer temperature; the western prairies, east of the Mississippi, and the vast deserts west of it, have the summer heat but not the moisture; hence the absence of all trees in the one region, and of the deciduous trees in the other.

1. White Pine (*Pinus strobus*).—Grows in all parts of Canada in extensive groves, or scattered amongst the deciduous forests. Average height, 140 to 160 feet; average diameter, 3 and 4 feet; but common at 5 and 6 feet in diameter and 200 feet high, especially near the shores of Lake Erie. Trees of 22 feet in circumference and 220 feet in height and 120 to first limb, are sometimes found. The trunk is perfectly straight. The wood is soft-grained, easily wrought, and durable; used in immense quantities in architecture. The large trunks are particularly sought for masts of ships. Largely exported to England, where it is called "Weymouth pine." Specific gravity, 0·46; weight of cubic foot, 29 lbs.

2. Red Pine (*Pinus resinosa*).—Found in dry soils and in the cooler latitudes of Canada, and attains the height of 80 feet, with a trunk 2 feet in diameter, very straight and uniform. It affords a fine-grained, resinous timber, of much strength and durability, and highly valued in architecture. Specific gravity, 0·66; weight of cubic foot, 40 lbs.

3. Yellow Pine (*P. mitis*).—Grows in dry and sandy soils, common in all parts of the country; attains the height of 60 feet; wood close, fine-grained, durable, and moderately resinous, and much used for ship building and all kinds of architecture. Specific gravity, 0·52; weight of cubic foot, 30 lbs.

4. White Oak (*Quercus alba*).—Widely distributed throughout Canada in all rich soils. Average height, 130 feet; height to first limb, 70 feet: diameter, 30 inches, and quite common, 60 inches in diameter, found 84 inches in diameter in the western parts of Upper Canada. Of the twenty varieties of oaks in North America, the white is the most valuable. The wood is of great strength and durability, and extensively used in ship building, for staves of casks, spokes and naves of waggon wheels, railway ties, &c.; bark useful in

tanning and in medicine. The timber is largely exported to England and the West Indies, and can be furnished in the remotest parts of Upper Canada at 40*l.* sterling per 1,000 cubic feet; freight to Quebec about 11*l.* sterling per 1,000 cubic feet. Specific gravity, 0·84; weight of cubic foot fully seasoned, 50 lbs. Potash obtained from outer wood, 13·41, and from heart wood, 9.68 per cent.; value for heating purposes 81 (shell-bark hickory being 100).

5. Black Oak (*Quercus tinctoria*).—One of the largest trees of our forest, 100 to 130 feet in height, and 4, 5, and 6 feet in diameter. Not so common or so valuable as white oak. The bark used in tanning, and for obtaining *quercitron*, used in dyeing.

6. Red Oak (*Quercus rubra*).—Grows extensively throughout Canada, is a lofty, wide-spreading tree, of an average height of 130 feet, and of 70 feet to the first limb, and common at 30 inches in diameter. Makes best casks for oils and molasses. Too little sought after, because of the great abundance and greater value of white oak. Can be furnished in the remote parts of Western Canada at 35*l.* sterling per 1,000 cubic feet; freight to Quebec about 10*l.* sterling; specific gravity, 0·675; weight of cubic foot, 40 lbs.; value for heating purposes, 69; outside wood yields 20·5 per cent., and the inside 14·79 per cent. of potash.

7. Swamp Oak (*Q. prinus*, var. *discolor*).—A beautiful tree, widely diffused, attaining the height of 70 to 90 feet. Grows in swampy alluvial grounds; timber preferred to that of the red oak, resembling more the white oak, and called also swamp white oak. The specific name *discolor* or *bicolor* is derived from its rich and luxuriant foliage. Specific gravity, 0.675; weight of cubic foot, 40 lbs; value for heating purposes, 68.

8. Chesnut (*Castanea vesca*).—Grows only in the western parts of Upper Canada, and on rocky or hilly lands; a large tree, 80 to 100 feet in height and 36 inches in diameter. The timber is coarse grained, strong, elastic, light, and very durable; posts of chesnut have been known to stand in the ground for forty years. The young wood is very elastic, and is used for rings of ship masts, hoops for tubs, &c. Chesnut is distinguishable from oak in having no large transverse septa, though in every other respect the two woods are remarkably similar in texture and colour. The nuts are much esteemed, and sweeter than those of the European variety (the Spanish chesnuts). Outside wood contains 4·56 per cent. of potash; inside 2·73 per cent. Specific gravity, 0·5; weight of cubic foot, 32 lbs.; value for heating purposes, 52.

9. Black Walnut (*Juglans nigra*).—Grows abundantly on the rich soils of the western and south-western parts of Upper Canada, of an average height of 120 feet, 70 feet to the first limbs, and 36 inches in diameter. Sections of the wood 6 feet in diameter are not uncommon. The wood is compact, strong and tough, of a deep violet colour, surrounded by a white alburnum. It is used extensively for building, for furniture, and in the form of veneers. It can be furnished along the line of the Great Western Railway, or at the lake ports, for 60*l.* sterling per 1,000 cubic feet; freight thence to Quebec, about 11*l.* per 1,000 cubic feet. Specific gravity, 0·5; weight of cubic foot, 30 lbs., well seasoned; value for heating purposes, 65.

10. Butternut (*Juglans cinerea*).—A large forest tree of an average height of 100 feet, 65 feet to the first limb, and 24 to 30 inches in diameter; found over extensive areas in Canada on elevated river banks, and on cold, uneven rocky soils. The wood is of a reddish hue, lighter than the black walnut, shrinks but little, and is used in panneling, in ornamental work, and for furniture. The bark is used in dyeing, and from it is extracted an excellent cathartic. Specific gravity, 0·426; weight of cubic foot, 26 lbs.; outside wood contains 4·42 per cent. potash; inside, 1·42 per cent.

11. Shell-bark Hickory (*Carya alba*).—A tall and slender forest tree, of an average height of 110 feet, 50 feet to the first limb, and 18 inches in diameter. The fruit is covered with a very thick epicarp, separating into four parts, and containing a thin-shelled, highly-flavoured kernel. The tree is covered with shaggy bark, consisting of long, narrow plates loosely adhering by the middle; hence called shell or shaggy-bark hickory. It is also called walnut in parts of the country where the black walnut does not grow. It is the heaviest of all Canadian woods, strong, compact, and elastic, and much used where these qualities are required, as for the handles of all kinds of tools, and spokes of carriage wheels, shafts and poles of carriages, hoops, whip stalks, hand-spikes, &c. From the bark is extracted a yellow dye. Specific gravity, 0·929; weight of cubic foot, 58 lbs.; value for heating purposes, 100* (the best of all Canadian woods); inside wood contains 20 per cent. of potash; outside, 7·5 per cent.

12. Smooth-bark Hickory (*Carya glabra*).—Nearly all the remarks made in reference to the shell-bark hickory apply to this species, and the wood is used for the same purposes, although it is not quite so highly esteemed. The bark of the tree is smooth, and the kernel of the nut very bitter in contrast with the other or sweet nut hickory.

13 and 14. Sugar or Hard Maple and Bird's-Eye Maple (*Acer saccharinum*) and Red or Swamp Maple (*A. rubrum*).—Found abundantly throughout Canada in all rich soils, and attains a height of 130 feet and 12 feet in circumference. From its beauty and abundance in Canada, the leaf of the maple has been adopted as the national emblem. The timber is very beautiful, and is distinguished as bird's-eye maple and mottled or curly maple (*Acer rubrum*), and is much used for picture frames and in furniture; the less ornamental portions of the timber are much used for house carpentery and furniture. When well seasoned it is one of the hardest kinds of wood; carriage and waggon-makers prize it highly for axles and for purposes where great strength and the least deflection are required. Its value for heating purposes is unsurpassed. It is from this maple that so much sugar is made. This and the soft maple (*Acer dasycarpum*) are most planted for ornamental and shade trees in lawns and gardens. The wood can be furnished at Quebec at about 45*l.* sterling per 1,000 cubic feet.

* In estimating the value of the several kinds of woods for fuel, the shell bark hickory is made the standard, and called 100.

Potash in the outer wood, 8·77; in the inner, 4·21 per cent. Specific gravity, 0·6; weight of cubic foot, 38 lbs.; value for heating purposes, 80, but mostly used for fuel, and generally preferred to all other woods.

15. Soft or White Maple (*Acer dasycarpum*).—This species much resembles the last, but its leaves are larger, and its winged fruit larger. It is common in all low, damp, rich soils; sometimes attains a diameter of 4 feet, and a height of 80 feet. Not so abundant as the hard maple, nor so valuable; the wood is white and soft; the bark is used for dyeing. As an ornamental tree, it is preferred to the hard maple, as having a denser foliage, and being of more rapid growth.

16. White Ash (*Fraxinus Americana*).—Grows abundantly throughout Canada, and attains an average height of 110 feet, and 60 feet to the first limb, and 26 to 36 inches in diameter. The timber is much valued for its toughness and elasticity; excellent for works exposed to sudden shocks and strains, as the frames of machines, wheel carriages agricultural implements, the felloes of wheels, &c., handles of implements, and for numerous similar purposes. The young branches serve for hoops of ships' masts, tubs, for coarse basket work, &c., It grows rapidly, and the young or *second growth* wood is more valuable than that of the old trees. Can be furnished in almost every part of Canada for 35*l.* sterling per 1,000 cubic feet, and at Quebec for about 45*l.* Specific gravity, 0·616; weight of cubic foot, 40 lbs.; value for heating purposes, 70.

17. Red Ash (*Fraxinus pubescens*).—A smaller tree than the white ash, of much rarer occurrence, and not so valuable, but still a very valuable timber, resembling very much the white ash, and often confounded with it. The wood is also used for the same purposes. Specific gravity, 0·7; weight of cubic foot, 40 lbs.

18. Black Ash (*Fraxinus sambucifolia*).—Found in moist woods and swamps, grows to the height of 60 to 70 feet, with a diameter of 2 feet; the wood is tough and elastic, but much less durable than white ash; the young saplings are in great requisition for hoops, and mature trunks for baskets. The timber is very durable under water. Specific gravity, 0.7; weight of cubic foot, 40 lbs.

19. Rim Ash (*Celits occidentalis*).—Grows to the height of 30 to 40 feet, and 1 foot in diameter. The trunk has a rough but unbroken bark. The wood is very tough, and used for hoops of barrels.

20. Rock Elm (*Ulmus racemosa*).—Found in most parts of Canada, and grows very large in the western counties, averaging 150 feet in height, and 80 to the first limb, with a diameter of 22 inches. Is abundant in the western part of Upper Canada; preferred to even white ash by some carriage and waggon makers for the poles and shafts of carriages and sleighs. The wood bears the driving of bolts and nails better than any other timber, and is exceedingly durable when continuously wet: it is, therefore, much used for the keels of vessels, water-works, piles, pumps, boards for coffins, and all wet foundations requiring wood. On account of its toughness, it is selected for the naves of wheels, shells for tackle-blocks, and sometimes for gunwales of ships. It can be laid on board of vessels at the ports of the lakes for 40*l.* sterling per 1,000 cubic feet; freight to Quebec about 11*l.* Specific gravity, 0·59; weight of cubic foot, 36·75 lbs.

22. American or White Elm (*Ulmus Americana*).—A majestic tree, attaining a diameter of 60 inches in some of the western counties of Upper Canada, and of great height, with wide spreading branches. Grows in most woods and along rivers, in rich soils. The wood is tough and strong, used for the naves of wheels, and preferred by wheelwrights to the English elms. Can be furnished at the same price as the rock elm.

23. White Beech (*Fagus sylvestris*).—Grows in almost every part of Canada, of an average height of 110 feet, height to the first limb 50 feet, and diameter 18 inches. It is distinguished from the red beech by its size, the ligher colour of the bark and wood; it is also of more difficult cleavage, of greater compactness and strength, and is much used for planes and other tools of carpenters; also for lathe-chucks, keys and cogs of machinery, shoe-lasts, toys, brushes, handles, &c.; in architecture, for in-door work; common bedsteads and furniture; for carved, moulds for picture frames, and large letters used in printing; it is easily worked and may be brought to a very smooth surface. Vast quantities of it are used for firewood. Specific gravity, 0·672; weight of cubic foot, 41 lbs.; outside wood contains 12 per cent., inside 4 per cent. of potash. Value for heating, 65.

24. Red Beech (*Fagus ferruginia*).—The red beech is regarded by many as only a variety of the beech, with the wood softer and of more easy cleavage than the white, with also a slight difference in foliage. The timber is not so valuable as that of the white beech, but used for the same purposes. It is also abundant throughout Canada. The nuts of both kinds are small, two together in the four-lobed burr, oily, sweet and nutritious.

25. Blue Beech (*Carpinus Americana*).—Common along streams; grows 10 to 20 feet high, with ridged trunk; an exceedingly hard, whitish wood; excellent for cogs of wheels and for purposes requring extreme hardness. The trunk is also made into brooms by being peeled by a knife, and is the most durable and soft of the splint brooms. Specific gravity, 0·79; weight of cubic foot, 47 lbs.; value for heating, 6·5.

26. White Birch (*Betula alba*).—Grows on the hill-sides and the banks of rivers; a slender and beautiful tree of from one to two feet in diameter and 50 feet high, but usually not so large. The trunk is covered with a tough cuticle, consisting of numerous laminæ, the outer of which is snow-white. The wood is of a fine compact texture, tough but not durable, and is used in turning and furniture. Specific gravity, 0.5; weight of cubic foot, 32; value for heating, 48.

27. Paper Birch, White Birch (*B. papyracea*).—A large tree, with fine grained wood, and a very tough, durable bark, splitting into paper-like layers. It is of the bark of this birch that the Indians make their canoes; hence the name, Canoe Birch. The wood is very similar to the last, and used for similar purposes. There is also a dwarf mountain variety.

28. Black Birch (*Betula lenta*).—The largest of the birches, two to three feet in diameter, and 60 to 70 feet in height; found over an extensive area,

but more abundant in Lower than in Upper Canada. The trunk is covered with a dark brown or reddish bark, which becomes rough in old trees, and has a very agreeable aromatic flavour. The wood is of a reddish colour, strong, compact, and takes a high polish; much used in furniture, and almost as handsomely figured as Honduras mahogany, and, when coloured and varnished, is not easily distinguished from it. It is used, also, by carriage builders, and in frames of ships, and parts under water; it is more prized as it becomes better known, as no wood sustains shocks and friction better than birch. A good deal of it is exported to Europe. The bark is harder than the wood, and used by Indians and backwoodsmen for shoes, hats, tiles of roofs, canoes, &c. Specific gravity, 0·65; weight of cubic foot, 46 lbs.; value for heating, 65.

29. Yellow Birch (*B. excelsa*).—A lofty, beautiful, slender tree, of 80 feet in height and 10 inches in diameter, with a thin, yellowish cuticle. Not very abundant; used for much the same purposes as the black and white birches, and valuable for fuel.

30. Wild Black Cherry (*Cerasus serotina*).—Grows to an average height of 120 feet, with trunk of uniform size, and undivided to the height of 70 feet in the forests, of an average diameter of 24 inches, not uncommonly 36 inches and found 48 inches in diameter. Not very abundant, but found over extensive areas, not in groves, but in single trees interspersed in the forests of deciduous trees, and springs up freely and grows rapidly after the primal forests are cleared off. The timber, of a pale red brown, is compact, fine, close-grained, receives a high polish, and is extensively used in cabinet work. The bark has a strong bitter taste, and is used in medicine as a tonic. The fruit, black when mature, is pleasant to the taste. The timber can be furnished in the western part of Canada at 60*l*. sterling per 1,000 cubic feet; freight to Quebec about 11*l*. Specific gravity, 0·56; weight of cubic foot, 34 lbs.

31. Wild Red Cherry (*Cerasus Pennsylvanica*).—Much smaller tree than the black cherry, of rapid growth, and found mostly succeeding the original forests, attains 40 to 50 feet in height, and 12 to 15 inches in diameter. The flowers are white, the fruit red and very acid.

32. Basswood (*Tilia Americana*).—Common forest tree throughout Canada, of an average height of 110 feet, height to first limbs, 65 feet, and diameter 24 to 30 inches; often much larger. The wood is white, soft, close-grained, and not liable to warp or split, much used in cabinet work and furniture, in pianofortes and musical instruments, for cutting-boards for curriers, shoemakers, &c., as it does not bias the knife in the direction of the grain; it turns cleanly, and is much used in manufacturing bowls, pails, shovels, &c. Cost, at the ports of the lakes, 37*l*. sterling per 1,000 cubic feet; freight to Quebec, 7*l*. Specific gravity, 0·48; weight of cubic foot, 26 lbs. Of the same genus as the lime or linden in England.

33. White Wood (*Liriodendron tulipifera*).—Grows only in the western parts of Upper Canada, and attains a height of 130 feet, 70 feet to the first limb, and 36 inches in diameter, and not uncommon 60 inches in diameter. Very abundant in the south-western counties of Canada, and can be furnished at 35*l*. sterling per 1,000 cubic feet; freight to Quebec, 8*l*. It is called also the tulip tree; and in some localities, erroneously, yellow poplar. The wood is extensively used as a substitute for pine for building and cabinet purposes. It is easily wrought, durable, and susceptible of a fine polish. Specific gravity, 05; weight of cubic foot, 30 lbs.

34. Buttonwood (*Platanus occidentalis*).—Called also plane-tree, and, improperly, sycamore. It is very abundant in the western and southwestern parts of Canada, attaining an average height of 120 feet, 60 feet to first limbs, and 30 inches in diameter, and not uncommon at 60 inches in diameter. It yields a clean wood, softer than beech, very difficult, almost impossible, to split. Sometimes mottled, used in furniture, chiefly for bedsteads, pianofortes, and harps, for screws, presses, windlasses, wheels, blocks, &c., and immense quantities exported to Virginia for tobacco boxes. Prices and freight same as for white wood. Specific gravity, 0·5.

35. Poplar (*Populus monilifera*).—Called also cotton wood. A large forest tree occurring on the margins of lakes and rivers. The timber is soft, light, easy to work, suited for carving, common turning, and works not exposed to much wear. The wooden polishing wheels of glass grinders are made of horizontal sections of the entire tree. The seeds are clothed in white cotton-like down, hence the name. Specific gravity, 0·4.

36. Balsam Poplar (*Populus balsamifera*).—Also a large tree, growing in wet, low lands; wood resembling the previous. None of the poplars are used as large timbers.

37. White Willow (*Salix alba*).—A familiar tree of rapid growth, attaining a height of 50 to 80 feet; originally from Europe. The timber is the softest and lightest of all our woods. The colour is whitish, inclining to yellowish grey. It is planed into chips for hat-boxes, baskets, &c. Attempts have been made to use it in the manufacture of paper; small branches are used for hoops for tubs, &c.: the larger wood for cricket bats, boxes for druggists, perfumers, &c. Specific gravity, 0·4; weight of cubic foot, 24 lbs.

38. Ironwood (*Ostrya virginica*).—A small, slender tree, 40 to 50 feet in height, and 8 to 10 inches in diameter. The bark remarkable for its fine, narrow, longitudinal divisions, and of a brownish colour. The wood hard, strong and heavy; used for hand-spikes and levers, hence the name lever wood; it is also called hop hornbeam. Found only sparsely scattered through the forests of deciduous trees. Specific gravity, 0·76; weight of cubic foot, 47·5 lbs.; much prized for fuel.

39. White Thorn (*Cratægus punctata*).—A common shrub or small tree, 15 to 20 feet high, and 6 inches in diameter, found in thickets on dry rocky lands. Thorns stout, rigid, sharp, and a little recurved, 1½ inches long. Flowers white, fruit bright purple, and some varieties white. The wood extremely hard, used by wood engravers for mallets, &c. Specific gravity, 0·75; weight of cubic foot, 46 lbs.

40. Black Thorn (*Cratægus tomentosa*).—A large shrub or small tree, 12 to 15 feet high, thorns 1 to 2 inches long, found in thickets and hedges.

Flowers large, fragrant, and white; fruit orange red; wood hard, like white thorn.

41. WILD APPLE TREE (*Pyrus coronaria*).—A small tree, 15 to 20 feet high, common in the western part of Upper Canada. Wood hard, like the thorn; flowers large, rose-coloured; fruit one inch in diameter, yellowish, hard, and sour, but esteemed for preserves.

42. PEPPERIDGE (*Nyssa multiflora*).—Found only in the western part of Upper Canada, and of an average height of 100 feet, of 60 feet to the first limb, and of 12 to 18 inches in diameter; scarce. The bark light grey, similar to that of the white oak, and broken into hexagons. The wood is white, fine-grained, soft, the texture consisting of interwoven fibres, rendering it very difficult to split. It is therefore, useful for beetles, naves of wheels, and for purposes requiring the toughest timber.

43. DOGWOOD (*Cornus florida*).—Common in Upper Canada, grows 20 to 30 feet high, and 8 inches in diameter. The wood is very hard and compact, and hence the name *Cornel*, from the Latin *Cornu*, a horn; used for mallets, and is well adapted for the same purposes as box-wood. It is so remarkably free from silex, that splinters of the wood are used by watchmakers for cleaning the pivot-holes of watches, and by the optician for removing the dust from small lenses. The bark is rough, extremely bitter, and used in medicine as a tonic. Specific gravity, 0.78; weight of cubic foot, 50 lbs.

44. WHITE CEDAR (*Thuja occidentalis*).—Found extensively over Canada on the rocky borders of streams and lakes, and in swamps. It grows to the height of 60 to 70 feet, rapidly diminishing in size, throwing out branches from base to summit. The wood is light, soft, coarse-grained, and very durable; much used in frame work of buildings and for the upper timbers of ships, as posts for fences, gates, &c. It is one of the most durable of Canadian woods; much esteemed also for making split laths, known as cyprus laths. Specific gravity, 0·45; weight of cubic foot, 26 lbs.

45. RED CEDAR (*Juniperus Vriginiana*).—Grows in many parts of Canada in dry rocky situations. It sometimes attains the size of 24 inches in diameter, but mostly smaller. Leaves are dark green, the younger ones small, ovate, acute, scale-like, overlying each other. The wood is fine-grained, compact, of a reddish hue, very light and durable. It is used for fences, aqueducts, tubs and pails, and as cases for drawing pencils—hence called pencil cedar.

46. HEMLOCK (*Abies Canadensis*).—Common in the hilly, rocky lands of Canada, attaining the height of 80 feet, and 3 feet in diameter. The timber is soft, elastic, of a coarse, loose texture, not much used, but sometimes substituted for pine; resists well the effects of moisture, and for this reason is used for railway ties. The bark is extensively used in tanning. Specific gravity, 0·45.

47. BLACK SPRUCE (*A. nigra*).—This fine tree abounds in the higher and mountainous land of Canada, attains a height of 80 feet. The timber is light, strong, and elastic, and, though inferior to white pine, is still valuable. From the young twigs spruce beer is made.

48. WHITE SPRUCE (*A. Alba*).—A smaller tree than the black spruce, but attains a height of 50 feet. Trunk from 12 to 18 inches in diameter. Timber much the same as that of the black spruce.

49. CANADA BALSAM. BALSAM FIR (*Abies balsamea*).—Common in humid grounds in the cooler latitudes of Canada, and attains a height of 30 to 40 feet. The bark is smooth, abounding in reservoirs filled with a resin or balsam, which is considered valuable in medicine.

50. BALSAM FIR (*A. Fraseri*).—A smaller tree than the last. A highly ornamental shade tree.

51. TAMARAC (*Larix Americana*).—A tall, slender tree, rising to the height of 80 to 100 feet, abundant in Canada in low wet lands. The wood is considered very valuable, being heavy, strong, and durable. Called also American larch, and hackmatac. It has recently come into great demand for ship building and railway ties, for which latter purpose it is found to be well adapted, and very durable. The best oak is superior to it only for the outside work of a ship. For knees, bends, garlands, &c., of a ship, no wood is better. It is remarkably distinguished from the pines by its deciduous leaves, being bare nearly half the year. It is found up to a very high latitude, even in Hudson's Bay. Specific gravity, 0·6.

52. SASSAFRAS (*Sassafras officinale*).—Found only in the western part of Upper Canada; grows to the height of 50 to 60 feet, and 15 inches in diameter. The timber is of little value, but used for light ornamental purposes on account of the fragrant odour. Every part of the tree has a pleasant fragrance and an aromatic taste, strongest in the bark of the root, from which an essential oil is distilled, highly valued in medicine. Specific gravity, 0·6.

53. SUMAC (*Rhus typhina*).—Common on rocky, poor soils throughout Canada, and readily springs up on neglected lands after the primal forests are cleared off; attains a height of 20 feet, and 8 inches in diameter; the wood is soft, aromatic, of sulphur yellow, makes beautiful veneers, and is used in dyeing. The bark of this and the other varieties is also used in dyeing and tanning.—*Technologist.*

WOOL AND WOOLLEN MANUFACTURE.

BY EDWARD T. STEVENS.

Although wool is but a modification of hair, yet under the microscope it exhibits well marked characteristics. Wool is defined by Professor Owen to be "a peculiar modification of hair characterised by fine transverse lines from 2,000 to 4,000 in the extent of an inch, indicative of a minutely imbricated scaly surface," upon this and upon its curved and twisted form depends its remarkable and valuable felting property.

Wool is not peculiar to the sheep, but it forms an under coat beneath the long hair in very many animals. Articles for clothing have been made from the wool of the musk ox (*Ovibos Moschatus*), from the wool of the skyn, or ibex, of Little Thibet, but in these and in other such instances they have been produced as objects of curiosity rather than for any commercial purpose. In the sheep, judicious management has in the course of years increased the growth of wool, and rendered the occurrence of hair unusual.

From the time of Abel downward, attention has been paid to the breeding of sheep, and particularly so by the races of men inhabiting the Southern parts of Europe, a considerable portion of Southern Asia, and the Northern part of Africa, with a few remarkable exceptions, as in the case of the Medes, the Phœnicians, the Egyptains, and the inhabitants of some of the islands in the Mediterranean. The Egyptians, however, as early as the time of Moses had become sheep-breeders, and about 1,590 years later it is related that the sheep of Egypt throve so well upon the rich alluvial soil of the country that their owners were able to shear them twice in the year.

As an instance that the sheep of antiquity possessed a good fleece, examples may be cited from the Nineveh marbles. But the celebrated breed of sheep of antiquity was the *Milesian*. It was delicate in constitution, but it yielded a peculiarly fine wool, admirably adapted for manufacturing purposes.

This breed, I believe, first appears in history at and near Miletus, in Asia Minor, about 500 B.C.—it was from thence probably introduced into Greece 490 B.C.—and shortly after that into Italy, where it became famous under the name of the *Tarentine Sheep*. By the Romans this breed was carried to their various colonies, and amongst others to Spain. In Spain material improvements were effected in this breed about the commencement of the Christian era,—the fleece, which before was spotted, and frequently dark coloured, was rendered a pure white, and a sounder constitution was given to the delicate Tarentine Sheep. This regenerated race became known as the *Merino Sheep*, and from them have descended those animals which from that time to the present have supplied our clothiers with their best quality of wool.

About 1765 the Merino sheep was introduced into Saxony, and after some years the Saxon fleece was found to be even superior to the Spanish. At the present time but little Spanish wool comes into the English market.

The Merino sheep was introduced into Australia, Tasmania, New Zealand, the Cape of Good Hope, America, and other countries, with marked success, about the commencement of the present century. In Australia, the Merino succeeded the Leicester and South Down, which in their turn had supplanted the gaunt, hairy sheep imported by the early colonists from Bengal.

The fibre of Merino wool exceeds in fineness that which any other breed of sheep produces, and North America Merino wool now surpasses most other wools for its felting properties. Samples have been obtained from American flocks, which contain 2,552 serrations to the inch, while the finest Saxony wool only contain about 2,400 serrations to the inch.

The increase of the sheep in some of our colonies is truly wonderful. In 1788 Australia had no sheep. In 1796 the entire stock of sheep in the colony of New South Wales was 1,531; in 1859 this number had increased to 7,581,762; whilst in 1861 the quantity of sheep's wool imported into the United Kingdom from our Australian colonies amounted to 68,084,202 lbs.

It must have struck every observer that man exercises a wonderful influence over the members of the animal kingdom, no less than over the members of the vegetable kingdom. Wherever attention has been paid to sheep-breeding, there a marked improvement has been manifested in the particular direction in which that improvement has been sought—whether in the carcass or in the fleece. This may account for the superiority or breed of sheep around the ancient seats of civilisatio

Climate greatly affects the quality of wool—in very hot countries scarcely any wool is produced; the animal is clothed with hair only. Variations in the temperature are very injurious—any sudden check of perspiration produces an irregularity in the staple of the wool (distinctly seen under the microscope), and this of course greatly diminishes the value of the fleece.

The sheep produces the finest quality of wool in two of the isothermal zones only—the warmer-temperate and the sub-tropical. Thus the most celebrated breeds of ancient times were the Coraxic, the Milesian, the Greek, the Tarentine, and the Spanish—all the spots upon which these sheep pastured are within the sub-tropical zone; England, the United States, Buenos Ayres, the Cape of Good Hope, and South Australia are in the warmer-temperate zone: whilst Tasmania and New Zealand are in the sub-tropical zone. It must, however, be remembered that elevation above the sea-level reduces the temperature, and that in ascending a mountain range, a few hours will take you from the tropical scenery surrounding its base to the pines which fringe its snow-capped summit, passing through the familiar forms of the temperate zone on your way. For instance, the alpaca is a native of Peru, which is in the tropical zone, yet the alpaca succeeds well in Australia, which is in the sub-tropical; but, then, this animal inhabits the elevated, and consequently cold, table lands of South America, and really finds the temperature of Australia warmer than its native habitat. The wool produced by the alpaca in Australia is stated to be superior to that produced in South America.

Before quitting this part of my subject, I must remind my readers that the sheep did not exist in America, in Australia, or in New Zealand when those countries were first visited by Europeans.

Naturalists and geologists draw some interesting conclusions from this fact. They state that the sheep is the most recent type of animal with which they are acquainted; it is even a question whether it is found in a fossil state at all—it is peculiarly an animal belonging to the human period, and whether viewed as affording man food and clothing, or as imparting fertility to the soil he cultivates, it is scarcely possible to conceive an animal more valuable to him.

Stages of Manufacture.—Wools are divisible into, firstly, those best adapted for carding, and, secondly, those most fit for combing. These two varieties may be classed as (1) short and (2) long wools, although the length of the staple is by no means their only distinction.

(1) Short wool is used for the production of woollen cloth. It is first scoured; next it is scribbled and carded; it is then "slubbed;" and, lastly, it is spun, or drawn finer, and twisted. None of these processes destroy the felting property of the wool.

(2) Long wool for the production of worsted goods is deprived of its felting property by the process of combing, which destroys the imbricated structure of the wool, and approximates it to the nature of smooth fibres, such as silk and cotton. In fact, the process by which combed long wool is made into worsted yarn is analogous to that employed for spinning cotton, and consists in doubling the slivers or slubbings over and over again, until the fibres are laid parallel to each other, after which it is roved and then spun.

As will be seen, the great distinction between woollen cloth and worsted goods is, that the wool in the former retains its felting property, whilst the wool in the latter has been deprived of it. Woollen cloth, as it leaves the loom, looks like a mere flannel, but after it has been submitted to the action of the fulling mill, it becomes compact and uniform—the fibres of the wool cohere, interlock, and conceal the threads beneath. Woollen cloth is then quite different in appearance from any article made from worsted, and which goods it must be remembered are never fulled.

Woollen cloths are either piece-dyed—that is, they are dyed after being woven, felted, and cut—or they are wool-dyed—that is, the scoured wool is dyed before being spun—in this respect again differing from the worsted or cotton manufacture, for cotton and combed wool are never dyed before being spun.

In closing this very brief account of the stages of woollen manufacture, I may add that recently improvements have been made in the preparation of both woollen and worsted yarn. For instance, in the former, one machine now feeds the other; and scoured wool passes through every stage short of being spun, without it being necessary for a human hand to touch. The fulling stocks are likewise supplanted in many mills by a fulling machine, which does the work in a shorter time, and requires less soap.

In the preparation of worsted, the disagreeable and tedious process of hand-combing is superseded by a most exquisite machine, in which the movement of the wooden hands, as they draw the wool through the heated steel combs, and then place it upon a revolving wheel, is as nearly copied from a human action as it is possible.

Three forms under which wool appears in manufactured goods still remain to be described, these three are known as *mungo*, *shoddy*, and *extract*; the former is obtained by tearing up old woollen garments in a machine called the "Devil," and a most formidable looking machine it is with its array of iron teeth, the wheel upon which they bristle making about 600 revolutions in the minute. *Shoddy* is the result of a similar process exercised upon old worsted stockings, blankets, &c. No less than forty millions of pounds of mungo and shoddy are made annually in Yorkshire, the value of which is £800,000 sterling, and yet this branch of manufacture only dates back about fifty years.

The third article reproduced from old material is known as *extract*; it consists of the wool obtained from goods having a cotton or linen warp or mixture, the cotton is destroyed by chemical agency leaving the wool intact. Neither shoddy, mungo, nor extract are used for making new fabrics alone, they are mixed with a varying per-centage of new wool.

Several qualities of wool are usually mixed together and form *blends* from which yarns are spun, both *fleece* wool—*i.e.* that shorn from the live sheep, and *skin* wool—*i.e.* that obtained from the skins of such as are slaughtered are used, the per-centage of the latter and of inferior wools being reduced in spinning the better qualities of worsted yarn.

The threads which extend the long way of any woven material are called the *warp*, those which pass across the width of the article are the *weft*. In the process of weaving there is much greater strain upon the warp than upon the weft threads, and, therefore, the former are more twisted in spinning, and indeed are altogether stronger than the latter. A most striking instance of this difference is displayed in the manufacture of blankets—the warp threads used *are spun*, but the weft threads *are not spun*—they are not carried beyond the stage of slubbing, consequently being scarcely twisted at all, the peculiar woolly surface can be given to the blanket by the subsequent processes.

Worsted yarn is largely employed as a weft with a warp of cotton (in some cases of silk) for the production of fancy dress goods; these frequently have a check stripe, or figure of silk introduced upon the surface; recently also mohair yarn (the hair of the Angora goat spun), has been employed as a weft for stuffs.

Felting.—Wool and hair can be felted, that is made into a dense and compact cloth without the intervention of the processes of spinning, or weaving. So great is this tendency that in a flock bed, the carded wool of which it is made is constantly felting itself into lumps, and from time to time the bed requires to be taken to pieces and the wool has to be carded afresh. With some animals, which possess a fine and soft fur such as Skye terriers and Persian cats, every one must have observed that the hair felts itself into ugly masses.

This felting property of wool and certain kinds of hair is caused by a peculiarity in the structure which may be detected under the microscope, the filaments are notched or jagged at the edges—the teeth invariably pointing upwards, that is from the root to the point. A barley-ear will travel up your coat sleeve by the slight friction between it and your arm, because it possesses the same structure—but it will not move downward—so the fibres of wool moving in one direction only when subjected to gentle friction, mat together and form the kind of cloth called Felt. This felting property of wool is greatly assisted by the peculiar crimp in the fibre which it retains with great pertinacity, and if drawn out straight it immediately contracts again on being released, thus the forward motion of the fibre under friction is partly counteracted or converted into a circular or zig-zag movement, which is precisely that which most completely effects the matting together of the various fibres.

Wool in the yolk, that is with the natural grease adhering to it cannot be felted—the roughness of the fibre being in that case smoothed over by the oil—were it otherwise the wool would felt on the sheep's back and be comparatively useless.

As St. Blaise is the patron saint of wool-combers, for no better reason, so far as I can ascertain, than because the unfortunate martyr before he was beheaded (A.D. 289) was tortured by having his flesh torn with iron combs; so St. Clement is the patron saint of the felting brotherhood, for he is said to have placed carded wool in his sandals to protect his feet during a pilgrimage, and to have found at its close that the wool had felted itself into cloth; thus rendering himself the reputed discoverer of felt.

The process of Felting, however, claims a far earlier origin, and was probably discovered before weaving. Felt was anciently in ordinary use among the Medes, the Persians, and the Bactrians. The Greeks were acquainted with its use as early as the age of Homer, and the Romans seem to have obtained their knowledge of felt from the Greeks.

Among the Romans the felted cap was regarded as an emblem of liberty and freedom—they were on that account worn at the Saturnalia. At the death of Nero, the common people to express their joy went about the city in felt caps. Not to multiply instances, when a Roman slave obtained his freedom he had his hair shaved, and wore instead of his hair the pileus or cap of undyed felt. Felt was used by the Romans as a lining for helmets, and both Greeks and Romans anticipated St. Clement in the use of felt for socks. Just as the Aztecs used thickly quilted cotton garments through which arrows could not penetrate, so the ancients employed garments of felt—for instance when the soldiers under Julius Cæsar were annoyed by Pompey's archers they made shirts and other coverings of felt, and put them on for their defence.

Felt was used for covering the wooden towers and military engines employed in warlike operations, to prevent their being destroyed by fire—and lastly, the Greeks and Romans covered their *molles oves* with felt. The Circassians still use large mantles of felt which the sleep under by night, and wear when required over their other dress by day. The postillions in Phrygia wear a cloak of white Camel's hair felt half an inch thick.

Mr. Naish, of Wilton, has lately turned his attention to the production of felt with considerable success—he has recently patented in this country and in France, a most ingenious combination of partly woven and partly felted wool, to replace the ordinary felted saddle pads used by calvary—this invention is receiving the warm support of our government. Mr. Naish also makes the wedge-shaped sheets of felted cloth used by piano-forte manufacturers—this material is exquisitely compact and fine.

The manufacture of felt is exceedingly simple—the wool is first carded—the loose sheet of wool from the carding engine is then placed in the felting machine, where it is subjected to gentle friction, a current of steam passing through it during the operation—under this friction the loose fibres felt together and form a compact cloth. This cloth is next taken to a bench sloping towards a boiler, where it is worked, I may almost call it *kneaded*, by hand, and from time to time the hot fluid in the boiler is poured over it; after this the mere finishing operations such as pressing and cutting take place.

A pneumatic method of making felt exists. A quantity of flocculent wool is put into an air-tight chamber, these particles are kept floating equally, by a kind of winnowing wheel; on one side of the chamber is a net-work of metal, communicating with another chamber, from which the air can be exhausted by means of an air-pump. When the communication between the two chambers are opened, the air rushes with great force to supply the partial vacuum in the exhausted chamber, carrying the floating wool against the net-work of metal, and so interlacing the fibres, that a felted cloth is at once produced.

The great objection to felt for many purposes is its want of elasticity,—how far this may be obviated remains to be shown. As a surface for printing, felt answers in one respect most admirably—the substance is so firm that it does not shift its position and the successive blocks deposit their colours with extreme regularity and precision; from the close texture of the material, however, the colours do not penetrate deeply into the substance of the cloth, and hence, if subjected to hard wear, the coloured portion is rubbed off, and the appearance of the article is spoilt. By a method yet to be perfected, felt may be made to supersede the thick cloths, (Kerseys), used for overcoats, and by this method a much finer face could be given to the material, than to the present woven goods.

Felt is largely employed as a non-conductor for covering steam-boilers, &c., and thus preventing loss of heat by radiation; it might, also, I imagine, be used with advantage *under* slate, in roofing houses, by which the upper rooms would be rendered cooler in summer, and warmer in winter.—*Technologist.*

Board of Arts and Manufactures

FOR UPPER CANADA.

MEETING OF SUB-COMMITTEE.

The Sub-Committee met at the Board Rooms on Thursday the 26th of February, present:—the President (Dr. Beatty), the Vice-President (Mr. Rice Lewis), Dr. Craigie, Professor Buckland, Professor Hind, P. Freeland, W. H. Sheppard, John Shier, E. A. McNaughton, and W. S. Lee.

The Secretary read the names of office-bearers and committee elected at the Annual Meeting.

The Secretary submitted copies of Memorials to the three branches of the Legislature, praying for amendments to the Act Incorporating this Board, and for such amendments to the Patent Laws of this Province, as shall secure to Canadian Inventors equal privileges with citizens of Great Britain, in the obtaining of Letters Patent in the United States of America; and of a Memorial to the Executive of the Province, praying for such an increase in the amount of the Annual Grant, as shall enable the Board further to improve the character of its Journal, by the more liberal employment of writers and pictorial illustrations upon Engineering and Mechanical subjects; and also copies of correspondence with Messrs. Willis and Sotheran, London, Eng.; Col. Wilson, President of the Mechanics' Institute, Simcoe; Queen's College, Kingston, in acknowledgment of Journal received for 1862; G. W. Watrous, Hartford, Connecticut; Principal Shefford Academy, C.E.; Society of Arts, London, England; J. K. Heaps, Leeds, England; and W. M. Milln, Komoka.

The President reported that he had forwarded the several Memorials to Quebec, which was approved of; and the Secretary was instructed to reply to such of the correspondence as had not already been disposed of.

The Secretary reported that he had communicated to the Hon. the Minister of Agriculture, an Analysed Statement of the Receipts and Expenditure of the Board, and a copy of the Annual Report of the Sub-Committee, for the past year; and that he had forwarded to the Hon. G. W. Allan, a copy of Mr. Sicotte's Bill of last Session, with amendments introduced in accordance with the memorials submitted; and also a letter explaining the necessity or desirability of such amendments being introduced.

A letter was read from Mr. Allan acknowledging the receipt of these documents, and stating that he would take an early opportunity of consulting the Government, and also the Members of the Board of Agriculture now in Quebec, in relation to the Bill, and communicate the results to the Board.

Several accounts were submitted and ordered to be paid.

The Sub-Committee expressed themselves as highly pleased with the Programme of Examination and Prizes, in connection with the well organised system of classes in the Toronto Mechanics' Institute as published in the February number of the Journal.

Moved by Mr. Freeland, seconded by Dr. Craigie, and

Resolved—"That the Examinations of Members of Mechanics' Institutes, in subjects named in the Programme referred to in the Journal for November last, be held on Tuesday, Wednesday, Thursday and Friday evenings, the 2nd, 3rd, 4th and 5th of June next; and that applications from candidates intending to come up for final examinations be received by the Secretary of the Board up to Monday the 20th of April."

Moved by Mr. Lewis, seconded by Mr. McNaughton, and

Resolved—"That Professor Hind, Patrick Freeland, Professor Buckland and the Secretary, do constitute the Journal and Book Committee for the current year."

Moved by Mr. Freeland, seconded by Professor Hind, and

Resolved—"That the Secretary be requested to prepare a paper showing in what manner the present system of affiliation with the Society of Arts in England fails to secure the benefits promised by that Society as inducements to such affiliation, and to submit such paper to the next meeting of the Committee with a view to its being sent to London."

The meeting was then adjourned.

W. Edwards,
Secretary.

INFORMATION WANTED.

The following communication has been received by the Secretary of the Board, who feels himself quite incapable of satisfactorily answering the numerous and important questions propounded by his correspondent; he is, however, fully convinced of the importance to the Province, *and to the City of Toronto in particular*, that every information should be given to his American friend; and therefore requests that gentlemen feeling themselves competent to do so, will assist him by forwarding as full and explicit answers as possible, at their earliest convenience.

Hartford, Conn., *Feb. 15th*, 1863.

Dear Sir,—I take the liberty to address you a few lines to enquire of you as regards the business prospects of Upper Canada. Now I wish to ask you as regards the Silversmith's business, are there any manufactures in Toronto or in that section of country, and if so would you be kind enough to give me their names; or if there is an Electroplater there—if you would be kind enough to enquire of some Jeweller who understands those things: and if there is no such business there, what would be the prospects of starting either one of those kinds of business; if the prospects of either one would be an inducement for a young man with a small capital to emigrate that way. Also, what are the taxes, State, County, Town or City, or licence or licences for doing business of either kind. Do the people speak mostly English, and any other things that I have omitted to speak of that would be interesting for me to know. Is the business done by pounds, shillings and pence, or American currency; which is the shortest route to take to Toronto; what the distance from Buffalo, and what the fare; if you would enquire the wholesale price of pure silver-ware and also of plated ware, and be so kind as to answer the above questions as soon as convenient.

I will remain,
Your ever obliging friend,
Geo. W. Watrous.

To W. Edwards, *Sec. and Treas. B. of A. and M., U. C.*

IMMIGRATION.

We call the particular attention of our readers to the subjoined circular from the Chairman of the Committee of the Legislative Council on Immigration. It is impossible to over estimate the importance at the present time of using strenuous efforts to bring Canada as a field for the investment of capital in manufacturing industry before the British and American public. Never at any preceding period of her history did circumstances so favour the Province as at the present time.

The prosperity of all departments of industry in Britain, with the exception of the cotton trade; the abundance of capital seeking investment, the unhappy difficulties in the American States, and the vast yet scarce occupied field which Canada offers, are singular and suggestive opportunities, which ought to be embraced to the utmost. On another page we have introduced notices of the recent increase and improvement of manufactures in Toronto and Western Canada generally. The last year has witnessed the introduction of new branches of industry—some of them forced upon us, as it were, by the troubles in the States, others the natural result of the wants of the country, and the facilities which exist for supplying those wants. There has been latterly a most decided improvement in manufactures throughout the Province, and it requires but such action as that which is contemplated by the Committee of the Legislative Council to give an extraordinary stimulus to many kinds of industry. What the country most requires is capital and skilled labour. These can be obtained to any extent from Britain, if a reasonable return for outlay appears tolerably certain. There are four new industries, which have recently acquired importance with us, which promise great results, and which are capable of indefinite expansion. These are the distillation of petroleum, the mining for copper and gold, the manufacture of tobacco, and the manufacture of woollen fabrics.

The distillation of petroleum, and the use of the by-products, is but imperfectly understood, and the results are not what they might be with experienced hands, and the best apparatus and machinery. The mining for copper in Lower Canada is a vast open and most remunerative field; the mining for gold promises a rich return, if capital is invested in the construction of hydraulic works to wash the auriferous drift which fills the valley of the Chaudière, the St. Francis, and many other rivers of Lower Canada. In the manufacture of wool and flax, or textile fabrics, we have a splendid opening, both on account of the rapidly increasing demand for the manufactured goods and the supply of the raw material, which may always be relied on.

In order, however, that the Committee of the Legislative Council may be enabled to present a fair and truthful description of the opportunities now existing in Canada for the profitable employment of capital and skilled labour, it is essential that a general response should be given to the circular which they have issued, seeking information. It is probable that manufacturers will think that competition will reduce their profits, and thus be not disposed to reply to the circular; this may be the case, but there are thousands of others who are not personally interested in any particular manufacture, but largely interested in the welfare of the Province, who can afford the required information. It is to them that we commend this circular of the Committee, expressing a hope that many will be found throughout the Province, sufficiently sensible of the importance of the subject to devote both time and trouble towards collecting the necessary facts within their own circle, and submitting them to the Committee for their consideration. We must not forget that it has been by repeatedly putting before the European public, the real or fictitious advantages of immigration to the United States, that the Americans have secured such an immense accession from the Old World; and if Canada, as is now proposed to be done under proper authority, spreads broad-cast over Europe, but particularly Great Britain, Ireland, and Germany, a knowledge of her resources, both capital and labour will soon be attracted. The great art of advertising, as it were, a country on a large scale, is to keep its claims constantly before the public; to renew, month after month, the descriptive details; to distribute them again and again in the same cities and towns; constantly to supply fresh statistics, fresh illustrations and fresh facts. By this means the knowledge of the country will spread, and take root; but if irregular and intermittent efforts are trusted to, in order to secure the object in view, they will fail again, as they have failed heretofore. It takes a long time for such knowledge to find its way to the heart of a nation. It is only the few who deal with the outer world who know what has been done, is doing, or may be done in other countries; and to reach the heart of a nation, it is necessary to be continually supplying facts, until they cannot escape attention.

LEGISLATIVE COUNCIL,
QUEBEC, 3rd March, 1863.

SIR,—The Committee of the Legislative Council appointed to "take into consideration the subject "of Immigration, and especially to report upon the "best means of diffusing a knowledge of the great "resources of the Province, so as to induce the "influx of men of capital and manufacturing en-"terprise," are anxious to obtain your views as to the opportunities now presented of manufacturing in this Province many of those articles which have hitherto been imported from Europe and the United States, begging of you to enumerate such as you think can now be produced here with advantage and profit.

The Committee would be glad to know what manufactures are already established in your district? Whether difficulty has been experienced in obtaining at all times a sufficient number of operatives? What rates of wages are generally paid to men and women? Whether during the last two years sales at remunerative prices have been readily effected in the markets of the Province? And the Committee further desire to receive from you full information in regard to the commercial and manufacturing advantages of your own district of country; and especially as to the extent of water power there to be found? Their object being to publish reliable facts in Europe and elsewhere for the guidance of those disposed to emigrate.

Be pleased to favor the Committee with an early reply, and oblige, Sir,

Your most obedient servant,

(Signed) GEORGE ALEXANDER,
Chairman.

BRITISH PUBLICATIONS FOR JANUARY.

Adams (Edwin) Geography Classified; a Systematic Manual of Geography, cr. 8vo.	0	3	6	*Chapman & H.*
Bees, Silkworms, and Inhabitants of the Aquarium, cr. 8vo	0	1	0	*Bickers & Bush.*
Brookes (R.) General Gazeteer, new edit., revised by A. G. Findlay, 8vo	0	10	6	*Tegg.*
Campin (Francis) Practical Treatise on Mechanical Engineering, illustrated, 8vo	1	7	0	*Atchley.*
Carpenter (William B.) Microscope and its Revelations, 3rd edit., fcap. 8vo	0	12	6	*Churchill.*
Cassell's Illustrated Exhibitor, post 4to	0	7	6	*Cassell.*
Crory (William Glenny) Industry in Ireland; Agricultural Powers, Manufacturing Capabilities, &c., 8vo	0	3	0	*Simpkin.*
Florist and Pomologist (The), 1862, roy., 8vo	0	14	0	*Journ. Hort. Off.*
Ganot (Prof.) Element. Treatise on Physics, Exper. and Applied, transl. p. 8vo	0	12	6	*Baillière.*
Hooper (George) Waterloo: The Downfall of the First Napoleon, 8vo	0	15	0	*Smith & Elder.*
Huxley (Prof.) On our Knowledge of Causes of Phenonema of Organic Na. cr. 8vo	0	2	6	*Harwicke.*
Jackson (J. W.) Ethnology and Phrenology, cr. 8vo	0	4	0	*Trübner.*
Kinglake (Alex. Wm.) Invasion of the Crimea; its Origin, &c., Vols. 1 & 2, 8vo	1	12	0	*Blackwoods.*
Laxton's Builders' Price Book for 1863, 45rd edit., fcap. 8vo	0	4	0	*Simpkin.*
Mining and Smelting Magazine (The), Vol. 2, 8vo	0	7	6	*Office.*
O'Neill (Henry) Fine Arts and Civilisation of Ancient Ireland, imp. 8vo	0	15	0	*Smith & Elder.*
Practical Mechanics' Journal Record of the Great Exhibition, 1862, 4to	1	8	6	*Longman.*
Principles (The) of Harmon. Colouring, as applied to Photographs, 4th edit., 8vo	0	1	0	*Newman.*
Thom's Irish Almanac and Official Directory of the United Kingdom	0	15	0	*Thom.*
Thornton (Robert) Elementary Treatise on Land Surveying and Levelling, 12mo	0	2	6	*Longman.*
Transactions of National Association for Promotion of Social Science, 1862, 8vo	0	12	0	*Parker and Son.*
Young (J. Radford) Science elucidative of Scripture not antagonistic to it, fcap 8vo	0	5	0	*Lockwood.*

AMERICAN PUBLICATIONS FOR FEBRUARY.

Burton (J. H.) The Book Hunter, 8vo	$1 50	*Sheldon & Co.*
Dix (Miss) The Philanthrophist, Private hours, 32mo		*W. H. Hill.*
Holly (H. H.) Country Seats, Designs for Cottages, Villas, &c., 4to	3 50	*Appleton.*
History of France, from the earliest time to establishment of the second empire, 12mo	1 25	*Harper Bros.*
Mather (Rev. Dr.) History of King Philip's War; also history of the same war by Rev. Cotton Mather, with notes, &c., by S. G. Drake, 4to	3 00	*Joel Munsell.*
Miller (John) Description of Province and City of New York, with plans of Forts, &c., as they existed in 1695, 8vo	2 00	*Wm. Gowans.*
Paer (Don Roman) Wild Scenes in South America, illus. 8vo	1 75	*C. Scribner.*
Storer (F. H.) First Outlines of a Dictionary of the Solubilities of Chemical Substances, 1 vol. in 3 parts, part 1, 8vo	2 00	*Sever & Francis.*

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE.

Shelf No.		
G. 2.	Journal of Board of Arts and Manufactures, 8vo., Vol. II, 1862	*B. A. & M.*
G. 24.	Country Seats, containing Lithographic Designs for Cottages, Villas, Mansions, &c., with their accompanying out-buildings; also Country Churches, City Buildings, Railway Stations, &c., 4to, 1863	*H. M. Holly.*
K. 28.	Landscape Gardening, or Parks and Pleasure Grounds; with practical notes on Country Residences, Villas, Public Parks and Gardens. Notes and additions by L. F. Allen, 12mo, 1853	*C. H. J. Smith.*
K. 35.	Application of Chemistry and Geology to Agriculture; with suggestions for experiments in Practical Agriculture, 12mo, 1862	*Prof. Johnston.*
	Reports on the Assinniboine and Saskatchewan Exploring Expedition; made under the instructions of the Provincial Secretary, Canada. Folio, 1860	*Prof. H.Y.Hind*

PERIODICALS REGULARLY RECEIVED.

Athenæum	*London.*
Artizan	"
Art Journal	"
American Publishers' Circular	*New York.*
" Gas Light Journal	"
Bookseller	*London.*
Builder	"
Civil Engineer and Architectural Jour.	"
Commissioners of Patents Journal	"
Canadian Journal	*Toronto.*
" Agriculturist	"
Canada Gazette	*Quebec.*
Journal of Gas Lighting	*London.*
Journal of Education, U. C.	*Toronto.*
" " L. C.	*Montreal.*
Lecturers' Gazette	*London.*
Morgan's Trade Journal	"
Photographic Notes	"
Practical Mechanics' Journal	"
Society of Arts Journal	"
Scientific American	*New York.*
The Engineer	*London.*
The Exchange	"
The Grocer	"
The Technologist	"
Willis' Price Current of Books	"

Notices of Books.

MANUAL OF GEOLOGY, TREATING OF THE PRINCIPLES OF THE SCIENCE, WITH SPECIAL REFERENCE TO AMERICAN GEOLOGICAL HISTORY, FOR THE USE OF COLLEGES, ACADEMIES, AND SCHOOLS OF SCIENCE. By JAMES D. DANA, M. S., LL.D., pp. 798. Philadelphia: Theodore Bliss & Co. Toronto: Rollo & Adam. (Illustrated with a Chart, and more than 1000 Figures.)

The Geological student will find in this excellent Manual all that he requires towards obtaining a very comprehensive and accurate view of American Geology. Dr. Dana's book is without doubt by far the best manual of Geology which has yet appeared in print. It can not be expected, however, that the brief notice to which we are limited can give even an outline of the contents of a closely printed volume containing nearly 800 pages, and over 1000 wood cuts.

The work is divided into Physiographic Geology, which treats of the surface features of the earth, its oceanic movements and temperature, its atmospheric movements and temperature, and the distribution of forest region, prairies and desert.

Part II., or Lithological Geology, examines the constitution of rocks, the structure and arrangement of rock masses, the elements and minerals composing rocks.

Part III., or Historical Geology, treats of the different times or ages of the world, and includes:—the Azoic Age; the Age of Mollusks, or Silurian Age; the Age of Fishes, or Devonian Age; the Carboniferous Age; the Reptilian Age; the Mammalian Age; the Age of Man, or Era of Mind.

Part IV. considers Dynamical Geology, and treats of life, cohesive attraction, the atmosphere, water, heat, and the movements of the Earth's crust.

The entire work is complete in itself. The print and paper are good, the illustrations admirable. Students and teachers will long thank Dr. Dana for this valuable assistant to their labours.

PRE-HISTORIC MAN: RESEARCHES INTO THE ORIGIN OF CIVILIZATION IN THE OLD AND NEW WORLD. By DANIEL WILSON, LL.D. 2 vols., oct., with two Chromolithographs and numerous woodcuts. London: Macmillan and Co.

The shelves of the Library of Reference have received the valuable addition of this beautifully written and well illustrated work. A critical notice of its varied and interesting contents, scarcely lies within the province of this Journal. Dr. Wilson is so well known in Canada that his name on the title-page of a book is sufficient to secure a multitude of readers, and no one will take up these volumes without receiving a considerable addition to his knowledge of "Pre-Historic Man," or experiencing delight at the beautiful language in which the author's thoughts are clothed and the novel ideas which he suggests respecting the races which have peopled the American continent from far distant ages until the present time.

Correspondence.

ON THE IMPORTANCE OF AGRICULTURAL STATISTICS.

To the Editor of the Journal of the Board of Arts and Manufactures.

SIR,—Permit me to correct an error of the press in my letter published in your December number. At page 372, at the conclusion of the letter, 1852 is printed for 1802, when the export of wheat from Lower Canada exceeded that from both Provinces in 1859.

In that useful publication, the Canadian Almanac, I find the export trade of the Province invariably characterized as being of articles of the produce or manufacture of the country, thereby misleading the general public, and confirming the erroneous impression that many of our legislators and merchants had formed, from the Custom-house reports themselves.

It is important to the agriculturists that the report for 1862 should at once be placed before the public in its true light. The export of wheat and flour, and perhaps of other articles comprehended in the table of agricultural products, will exceed in value that of 1861, while it is clear to every one that the export price has greatly fallen off; and it may be anticipated that the last deficient crop will appear in the decrease of the quantity exported; while a gross increase on both the value and quantity exported will appear as the result of the increased trade down the St. Lawrence from the

United States, and irrespective of the quantity of produce raised in Canada.

The working of the Reciprocity Treaty, and its effects on the trade in agricultural products between the United States and Canada, is still imperfectly understood. The statistics of the trade have not been regularly placed before the public of either country in the manner done in my tables Nos. 2 & 3; while the short crops in America in 1857, '58 & '59, when the prices were generally higher in New York than in Liverpool, and the American imports of breadstuffs into England was under 5 per cent. of the gross import of the respective years, led to an exceptional state of things, tending to confuse the general trade, and to conceal the true effects of the treaty.

The Hon. Mr. Merritt, by whose persistent efforts this treaty was mainly brought about, told me of the difficulty he found to bring Mr. Cobden, the apostle of free trade, to his views of the importance of such an arrangement. Mr. Merritt always looked upon the trade in breadstuffs and other agricultural produce between the United States and Canada, as being in some peculiar position, and standing out as an exception to a general commercial law that he readily admitted; while Mr. Cobden could see no peculiarity in the matter: the trade being in articles of which both countries raised a surplus, that surplus would find its way to a foreign market by the cheapest route, whether through Canada or the United States.

The result of the treaty shows that the ideas of both were in some measure correct, and that neither were prepared for the immense trade that arose from the interchange of articles along the extended frontier line. Mr. Merritt admitted as much, when I showed him a set of tables for 1858, similar to those published by you for 1861. Convenience in the supply of temporary wants, and the tastes of the people for certain varieties and qualities of articles, in preference to others of the same general kind, would seem to guide the trade, and to produce the large import and export of an article, with so small an excess of either on the general account.

When the treaty was made, it is now doubtful if Canada made any export under the heading of the table "Animals and their products," which even now amounts to only $1,326,664; while under that of "Agricultural products," she would have a good deal to deduct from her sole surplus of wheat and flour. During 1857, '58 & '59, the small surplus of wheat and flour she had, found its way to the United States in the large trade carried on between the countries, while inferior articles from the Western States were freely used in the Province, to take the place of our own for consumption in the States. The exports of breadstuffs by the St. Lawrence became nearly extinct.

Since 1860 the surplus of wheat in both countries has been large; and though the demands of localities for certain qualities both of wheat and flour may have affected the trade considerably, yet the price has been regulated by the European markets, and the competition between the carrying routes by New York and the St. Lawrence has come fairly into play, the St. Lawrence drawing from the West a quantity equal to what the course of trade and the tastes of the people of the Eastern States may have taken from Canada.

The reports for 1861 show the trade under the Reciprocity Treaty to have been $19,608,038, as entered at the Custom House (both ways), and $4,028,025 as in transitu. For this the Province must only be credited by the commission on purchase and sale, and the profits of the carrying trade. It is by far too large an item to be added to the growth or manufacture of the country, and a continuance in such a practice must soon lead legislators and others into difficulties by an over estimate of the amount of our annual resources. J.

Cobourg, February 8th, 1863.

W. Edwards, Esq.:

Dear Sir,—In an article in the *Scientific American* (Jan. 31st, p. 69), on Storms, by Capt. Morley, of Sodus Point, that gentleman speaks of water spouts, which he has seen on Lakes Ontario and Erie, which brings to mind an occurrence I witnessed in September 1859. We left Oswego in the evening, with the wind about S.S.W., bound to Cobourg; but we had not been out over an hour, when the wind shifted to the west, with heavy squalls, which continued during the night, with fearful thunder and lightning. Not being able to fetch Oswego the next morning, we bore up for the foot of the lake, wind still blowing very heavy. At about ten o'clock in the morning, a dense cloud gathered up to windward, travelling with great velocity. While looking at it I perceived something in the shape of a huge funnel form under the cloud. While watching it I perceived a great commotion on the water, and presently, to my surprise, a column of water formed from the lake up into the funnel, about the size of a man's body; and in less than fifty minutes we counted no less than twenty-two water spouts, some not larger than my arm, while ten or fifteen were as large as my body. The sight to us was fearfully grand. One passed not more than ten or twelve hundred feet astern of us, while another crossed our bows about twice that distance off. They caused a commotion on the water four or five hundred feet in circumference. The lower end appeared to whirl with great velocity from east to south, while the water rushed with frantic haste to join in the ascent. The distance from the water to the cloud I should say was at least fifteen hundred feet. The spouts moved towards the American shore, between Port Ontario and Stony Point, and passed out of sight without any diminution in size or number. We experienced no change in the wind, but some very heavy drops of rain fell on the deck, spreading over as large as my hand.

We saw two more five days afterwards, about twenty miles above Oswego, but they did not last five minutes, having formed close to land, with the wind northerly.

I am, dear Sir, yours truly,
JOHN R. PHILP.

English Patents.

ABRIDGED SPECIFICATIONS OF ENGLISH PATENTS.

1776. R. HICKS. *Improvements in the manufacture or preparation of paints, pigments, and colours.* Dated June 14, 1862.

The object here is for the useful employment of the debris or debritus obtained in slate quarries or slate works, in combination with any one of the known carbons or charcoals, such as lamp black, and such like matters, or of any of the substances containing sufficient carbon. These ingredients or schists or schistose substances, with the addition sometimes of oxide of iron or hematite iron ore, are intimately mixed together and subjected to the action of heat, whereby their chemical constitution becomes modified, so that when subsequently pulverized, they may be advantageously used as a paint, pigment, or colour.

1787. J. HUNT. *An improvement or improvements in bronzing or colouring articles of copper or alloys of copper.* Dated June 17, 1862.

This invention consists in treating articles of copper or alloys of copper with a solution of bichromate of platinum, whereby a film or coating of metallic platinum is deposited on the article, and its surface thereby bronzed or coloured of a bright steel colour, or of a grey colour, the depth and character depending on the state of the surface of the article treated. If the article has been burnished previously to being treated with the solution of bichloride of platinum, it assumes a blue or dark steel tint, which varies with the length of time it is immersed, and the strength and temperature of the solution. The patentee prefers to use a weak solution of bichloride of platinum, and to heat it to the boiling point, but he does not limit himself to any particular temperature, as a cold solution may be employed with good effect.

1953. A. WARNER. *Improvements in preparing materials for, and in purifying coal gas.* Dated July 5, 1862.

Here the patentee employs the cinders, or oxide of iron obtained from puddling, reheating, and refining furnaces used in the manufacture of iron, which cinders or oxide of iron he prepares and uses in place of, or in combination with, other preparations of oxides of iron heretofore employed for like purposes.

2025. F. M. PARKES. *Improvements in the manufacture of gas for lighting and heating, and in apparatus employed in the said manufacture.* Dated July 14, 1862.

This consists in the manufacture of gas by the combination of the gas obtained from petroleum or rock oil (which is also known by various other means) with the gas commonly termed hydro-carbon gas, or water gas. And further, in the peculiar apparatus or retort represented in the drawings.

2059. G. J. YATES and J. W. W. TINDALL. *A process of deodorizing paraffin, coal, pitch rock, and other like oils and hydro-carbons.* Dated July 19, 1862.

Here the patentee subjects the above named oils to he action of sulphuric acid, nitric acid, urine, hydrochloric acid, chloride of lime, and fuller's earth. These various substances are added to the oil to be purified at certain definite periods of the operation, and when the oil is at the requisite temperature.

Canadian Items.

MONTREAL IN 1862.

The statements concerning the trade and commerce of Montreal in 1862 from the *Daily Witness* afford an encouraging prospect of present activity and future progress.

"The fact," says the *Witness*, "that Montreal occupies a most commanding geographical situation on the great commercial highway which connects Lakes Superior and Michigan with all the ports of Europe, has begun to attract attention. The St. Lawrence canals, which form a very small portion of the navigation, are free to vessels of every nation; and the Canadian route to the ocean is superior in this, that the passage of laden boats through the Erie canal not unfrequently occupies thirteen days between Buffalo and the Hudson, while a sailing vessel can pass from the Welland canal to Montreal in less than half that time.

"Another important consideration is that the St. Lawrence route, from the Far West to Europe, is shorter by 430 miles than *via* Oswego and New York city; while Montreal is nearer Liverpool than New York is by 300 miles. The advantages of sending merchandise and passengers, intended for the North-Western States, must be obvious, especially so far as emigrants are concerned, for they can reach their destination in less time, be subject to fewer mishaps and annoyances incident to frequent changes of conveyance, and withal travel much more economically, than those who are landed at other Atlantic ports. To make the St. Lawrence navigation as safe as that of the open sea, and most materially to lessen the expense of voyages inward and outward, the River and Gulf only require to have a sufficient number of lighthouses properly placed. A most competent authority says the River and Gulf of St. Lawrence, to the north of Newfoundland and Gaspé, are much more free from fogs than the coast of Nova Scotia and New Brunswick; and there is no reason why the whole route should not be made as safe as the sailing from Boston or New York. Why should not the requisite improvements be made without delay? But, besides the duty devolving upon the Provincial Government to adopt instant measures to enable mariners to choose the shortest route with perfect safety—viz., by placing lights and buoys at all necessary points of the River and Gulf, including the straits of Belleisle,—there is a very weighty obligation resting upon the commercial community of Montreal to make adequate provision for the increased number of sea-going vessels coming into this port. We look forward to the time when the numerous importers in the North-Western States will bring all their merchandize up the St. Lawrence, instead of having it forwarded by other devious routes, and to that day when the bulk of their surplus grain will find its natural outlet to the ocean by our noble river; but, properly to accommodate that flow of inward and outward commerce, double our present harbour accommodation may before long be needed. It is therefore the dictate of wisdom that the business men of Montreal should unite on some project for increased harbour accommodation, that will be adequate to the wants of commerce, and yield us all the advantages of that position in which Providence has placed us—the key to the North-West, the Red River country and the Hudson's Bay region—while it also forms the gateway of the future route to the Pacific Ocean.

The entire arrivals of Grain (rendering flour into wheat) by canal and railway, during 1862, were equal to 18,041,839 bushels; for 1861 the aggregate was 16,575,765 bushels,—showing an access in favor of last year of 1,466,074 bushels. But there are some arrivals to be added from ports below, which are nearly equal to 200,000 bushels, as shown in the subjoined statement of receipts and shipments by river craft plying between Montreal. Three Rivers, &c.:—

The following recapitulation shows the entire exports on Montreal account in 1862:

	Bushels.
Shipments via St. Lawrence in sea-going vessels	12,206,027
Shipments via St. Lawrence to River ports	1,496,664
Shipments via Portland and Boston	809,210
" via Chambly Canal	1,636,626
" via Montreal and Champlain Railway	614,099
Total export of Breadstuffs	16,762,626

The sea-going vessels which arrived in the port of Montreal in 1852 numbered 182. The increase of shipping in subsequent years is attributable to the deepening of Lake St. Peter, so as to admit of the passing up of vessels of greater draught of water. The number of sea-going vessels in 1862 was 571, with a capacity of 265,243 tons. That important improvement was commenced on 12th June, 1862, and the channel has been deepened from 11 feet at that date, to over 20 feet now at low water. On 8th November, 1851, the ship *City of Manchester* was loaded down to 14 feet; on 24th August, 1853, the ship *California* was loaded down to 16 feet 2 inches. In 1862, the ship *Liverpool Packet*, 992 tons, passed out of the harbor on May 29, drawing 22 feet water; the *Esmeralda*, 1188 tons, June 1, drawing 22 feet; the *Louisa*, 780 tons, Oct. 2, drawing 19 feet; the *Ardmillan*, 987 tons, Oct. 24, drawing 19 feet; and the *Clydesdale*, 1355 tons, Nov. 16, drawing 19 feet 4 inches.

Among the Foreign vessels there were:—

Norwegian vessels,	in 1862		20
German	"	"	10
United States	"	"	5
Russian	"	"	2
Portuguese	"	"	2
Danish	"	"	1

MANUFACTURE OF TOBACCO IN TORONTO.*

The year has been a prosperous one for manufacturing interests in Toronto. Not only have all establishments existing at the commencement of the year made progress and found an increased demand for their products, but several new and important establishments have been commenced, which have so far met with good success. The war tax which our neighbours have imposed upon their manufactures has had the effect—at least for the present, and we hope permanently—of stimulating home productions of several articles in a remarkable degree. This, with the introduction of more capital, the gradual improvement of the country, and the favourable tariff to such enterprises, has increased the number and extent, and greatly improved the facilities of local manufactures. The progress and generally healthy condition of this important interest throughout the Province is extremely gratifying. We are now large producers of tweeds, flannels, hosiery, leather, boots and shoes, cotton yarn and batting, bags, furniture, oils (both lubricating and illuminating) soap, candles, spices, mustard, starch, refined sugars, silent spirits, liquors, agricultural implements of all kinds, stones, castings, machinery, tobacco, &c., &c. Of several of these leading articles, even more than the demand for home use are manufactured, and a market is sought elsewhere. Other articles there are which can be produced with profit, and a still greater extension can be made in those already produced, and there seems no reason to doubt a gradual but very certain increase and growth of this great interest.

The most important contribution to the manufactories of the city, and to the country generally, during the year, is that of the tobacco establishments, which have been commenced here and elsewhere. In Toronto we have five manufactories in constant operation, where a year ago we had only one, and that one but insignificant compared to those now in operation. In Hamilton there are two extensive ones; in Windsor, one; and in Montreal some seven have been put in operation. This makes fifteen establishments, and there may be one or two more of which we are not advised. The products of these establishments are equal, if not superior, to the generality of the ordinary tobacco hitherto imported, and the price at which it can be supplied favors, of course, the consumer.

The tobacco manufacturing establishments in this city are those of S. S. Preston & Co., J. D. King & Co., Withers & Wright, Rossin & Bro., and Lewis & Thompson. The first-named firm

* From the *Globe*.

were large manufacturers in Louisville, Kentucky, and having had long experience, as well as ample means, are giving the experiment of manufucturing in Canada a fair trial, with, we are glad to know, good success. Their establishment on York street, occupying two large tenements, is complete in every respect. They now employ one hundred and twenty-five hands, a number of whom are females. A steam-engine of ten horse-power, complete steam-warming and drying apparatus, by D. S. Keith, keep the temperature to 60° throughout the building. All the latest and best machinery for lessening the manual labour is employed. Two immense hydraulic presses and nine smaller ones, from the establishment of Wm. Hamilton & Son, St. Lawrence Foundry, together with hydraulic pump, compresses, packing apparatus, &c., are all of the best and most complete kind, quite as good, if not superior, to anything that could be got in either St. Louis or Louisville, where the manufacture of this class of machinery is a long established trade. The tobacco is here received in leaf in large hogsheads, passes through one set of hands, who untie the bundles and spread the leaves; from these it goes to the "twisters," who, by the way, have become a class in our city, and who are already holding soirees, balls, &c., having formed themselves into an association for protective purposes. These withdraw the stems from the leaf, fold the leaf in lumps the length of a plug, but round. From this room it is taken to the pressure room, where each lump is put into a mould the exact size of a plug, and where it is subjected to an immense pressure by a hydraulic press. From these moulds it is placed in layers with tin plates between, and put into what is called a compress, where it is subjected to still greater pressure. From the compress it is removed to the packing boxes, where by a series of small hydraulic presses, it is finally compressed into the shape in which it is offered for sale. The process is simple and effective. In connection with the manufacture of plug tobacco the Messrs. Preston combine the production of fine cut chewing tobacco, and cut smoking tobacco. The former, though used here in limited quantity as compared with the consumption in the United States, is still in increasing demand, and by the barrel and in smaller quantities is meeting a fast sale. But it is in the cut smoking tobacco that a considerable trade is anticipated. This is made from the stems and other portions of the tobacco leaf that will not work into the plug, and forms not a small portion of the product. These stems are cut by a machine for the purpose, dried and otherwise prepared, and a very agreeable smoking tobacco is produced. The low price and the facility with which this article can be used, are likely to recommend it largely for use here, as in tobacco growing and manufacturing localities in the United States little else is used by the great body of smokers. This description of tobacco is sold wholesale by the Messrs. Preston at from 8c. to 20c. per lb. in barrels, while the plug is held at 33c. to 40c., and the fine cut at 30c. to 50c.

Factory of J. D. King & Co.

Messrs. J. D. King & Co. are the pioneers of the tobacco manufacturing interest in this city. Commencing on a very small scale, employing some half-dozen hands, and working their presses entirely by the old mode of screws and manual labour, they have gradually increased until now they have the largest and most completely equipped establishment in Canada West. They now employ from 150 to 160 persons, and have a largely increasing trade. The large building on Adelaide street, formerly occupied by Parkes Bros., founders, has been fitted up by Mr. King. The building is heated by a complete system of steam pipes, put in by D. S. Keith, and it contains among other facilities a steam-engine of twelve horse-power, seven hydraulic presses, fourteen retainers, and a number of small presses for packing, &c. Neither time nor money have been spared to complete a first-class establishment, and we are glad to know that its enterprising proprietors are meeting with good success. They are just now introducing a cutting machine, and intend hereafter to make largely of "fine cut chewing" and "fine cut smoking" tobacco, similar to that referred to in the notice of Preston & Co.'s factory.

Factory of Messrs. Rossin & Bro.

The Messrs. Rossin & Bro., having a large amount of means unemployed, assumed the business formerly carried on by Mr. Shack, and have largely increased the manufacture of good grades of tobacco. They employ ninety-five hands, and can produce seventy-five boxes per week, working ten screws night and day. Mr. Shack, who has had considerable experience in the trade, superintends the business, which we are happy to say is rapidly growing.

Messrs. Withers & Wright, formerly of Cincinnati, Ohio, where they were largely engaged in the business, have also fitted up a very complete tobacco factory here. They employ 125 hands, have the best facilities which money could procure and long experience suggest. They make about 400 boxes per month, and are rapidly introducing their tobacco into the best hands in the trade. Their establishment is fitted up in a manner similar to that of Messrs. Preston & Co., the machinery being all new and complete in every respect.

Messrs. W. S. Gillett & Co. continue to be large manufacturers of cigars, and employ a large number of hands.

PETROLEUM TRADE.

The year just passed is the first in which any quantity of Canadian oil was exported, and though every facility had to be provided and every connection made, the result on the whole was satisfactory. Seventeen vessels loaded with Canadian petroleum cleared for Europe through the St. Lawrence, of a total tonnage capacity of 15,016 tons, containing some 35,000 barrels, or 1,279,000 gals. The ports of destination were: Cork, "for orders," 6 cargoes: Liverpool, 3; London, 3; Glasgow, 1; Dundee, 1; Bremerhaven, 1; Demerara, 1; Australia, 1. The total shipment of petroleum from the United States in 1862, amounted to 10,514,090 gallons against 1,800,000 in 1861. Great as this increase is, the bulk of it was shipped during the last four months of the year, and the present enormous movement of the article in the same direction, leads to the belief that the increase in the current year will be even greater in proportion.

The increase in the capacity for refining oil has been very great in Canada during the year, and we are glad to be able to give some valuable figures in relation thereto. We are indebted for them to Mr. Thomas Gordon, of John Fisken & Co., of this city, the well known commission house, largely interested in this trade. Mr. Gordon has visited nearly all these refineries, and is thoroughly posted in the business. The following is a list of the refineries in operation on the first of December, with the capacity per week:—

Proprietors.	Locality.	No. of Stills.	Quan. Brls.
Smith Wood & Co	Sarnia	2	70
J. McKinnon & Co	do.	1	25
Petrolia Oil Co	Petrolia	5	300
Phœnix Oil Co. J. & S. M. Holmes	Oil Springs	3	70
Bradley, Farewell & Co.	do.	4	300
Thompson & Whipple	do.	1	40
James Sisk	do.	2	30
J. McLean	do.	2	50
E. Smith	do.	2	20
M. J. Riddell	do.	2	30
J. & J. Bennet	do.	1	25
Hugh Shaw	do.	6	72
Webster & Co., Mr. Allan, Manager	do.	2	50
Jarvis & Farren	do.	2	50
J. H. Keith & Co	London	2	40
— Driffell	do.	2	50
Clark & Co	Ingersoll	3	100
Woodstock Ref. Co., J. Charles, Manager	Woodstock	3	100
Canada Oil Co., J. W. Williams, Manager	Hamilton	3	70
Hamilton Oil Co	do.	2	60
E. Lumley	Port Credit	1	40
J. W. Esmonde	Toronto	2	50
J. Stead	do.	1	15
J. Arthurs	do.	1	15
Duncan & Clark	do.	2	100
Parson Bros	do.	5	200
Neil Currie	do.	.	..

In addition to these, several small refineries have been put in operation in the vicinity of the Springs—one at Wyoming, another at Brantford—two, in all, estimated at say 10 stills and 200 barrels per week, which, added to the above would make the entire refinery capacity in the Province seventy-three stills, producing 2,400 barrels per week, or 85,000 gallons per week a yearly product of 124,000 barrels, or nearly 5,000,000 gallons.

With respect to the supply of crude oil, the events of the past few weeks have been of the greatest importance. The stoppage of several of the largest flowing wells indicated it was feared, an exhaustion of the sources of the oil. When it was found however, that even more than the usual response was made to the vigorous pumping operations thus induced, the suspense was succeeded by a very general feeling of relief, not only because a good supply was forthcoming, but also that a large number of persons interested in the pumping wells would reap the benefit of their investment, which seemed problematical so long as the flowing wells could supply the demand at a much cheaper rate. The experience in Pennsylvania has proved that the flowing wells in exceptional cases only last from a year to a year and a half. The discovery of new wells, though yielding less abundantly in that country, has been followed by a like discovery in Canada, and there is no reason whatever to augur a cessation of supply because any particular vein of oil in a certain locality is exhausted, indeed the "indications" in the oil regions of Canada are every day more apparent, covering an immense area of country, and promising an abundant return for the investments of capital. In the vicinity of Oil Springs there are over 100 wells, twenty-five of which are in constant operation. The present yield of crude oil in Canada does not fall short of 300 barrels per day, which can be almost indefinitely increased.

The fluctuations in the price have been violent during the year. The exhaustion of a number of flowing wells in Pennsylvania, coupled with a strong speculative demand for export, gave rates an upward tendency in the early fall months, and large sums were made by holders. The impetus which these rates gave to the pumping wells, and the discovery of some additional flows, with the reaction in the speculative demand, caused rates to recede almost as rapidly as they had advanced, and the year closed with very moderate prices. The prices for Canadian oils were influenced in the same degree and in the same causes, and during the year the range has extended all the way from twenty cents to sixty cents, wholesale, per gallon. The partial stoppage of the flowing wells in Enniskillen has recently stiffened prices somewhat, but the continuance of an abundant supply from the pumping wells, and the discovery of other flows, together with the lateness of the season, prevent prices from materially advancing, and, indeed, if they move at all, it will likely be in a downward direction.

The present rate in great Britain, in consequence of the heavy shipments from the United States, hardly affords a margin for Canada oil, as the supplies for the winter have been pretty well secured, and as the consumption, rapid though it has been, has hardly kept pace with the largely increased receipts. There can be no question, however, that an immense trade will be done between Canada and the mother country, especially as soon as the superior oils which are now being produced find their way to a market. The future of the trade is full of promise. Great progress has been made within a very short time, under a great many disadvantages and a total absence of facilities. The experience of the past year will be worth thousands to parties engaged, aud now that the trade is pretty well established, the rapidity and extent of its growth are matters only of time.—*Toronto Globe.*

AN ICE BRIDGE AT NIAGARA.

For the third time in the history of Canada, the Niagara River at its junction with Lake Ontario has been bridged with ice. The first occasion was before the war of 1812, when the floating ice was frozen together one night solid enough to admit of the passage of pedestrians for a few days. In the Spring of 1845 the entire length of the River from its mouth to within a short distance of the Falls, with very rare and insignificant spots, was bridged over, and a very large amount of property was destroyed. At the wharf at Niagara (which was destroyed) the boulders of ice were packed on top of each other to the height of from 40 to 50 feet, completely shutting out the view of the opposite shore. On this occasion some mills and houses on the banks of the river were carried away, and all the floats inundated. The third bridging of the river commenced at 2 o'clock on Monday afternoon, and at 4 some parties crossed. Yesterday morning a party of 17 or 18, half of whom were ladies, came over from Youngstown to Niagara. The river is bridged with ice from its mouth up to the farm of Mr. Carroll, a distance of about 2½ miles. The sight is reported as being one of surpassing beauty and grandeur, and worth a journey to see. The cause of the "jam" was a prevalence of south winds for a few days then a sudden change to the north; the first forcing the ice down the Upper Lakes into the river, which is prevented by the north winds from getting into Lake Ontario. In 1845, we believe, the ice lodged on the bottom of the river and on the banks; whether the same is the case in this instance we are unable to state. Those who have the time, and desire the honor of crossing Niagara River on foot, should avail themselves of the present opportunity, as this will be "the last chance for many years." —*St. Catherines Journal, Feb.* 13.

ARTICLES IMPORTED INTO CANADA DURING THE YEAR 1861.

	Gt. Britain.	U. States.
Carpets and Hearth Rugs	$129,288	$42,599
Chinaware, Earthenw., Crockery	250,448	21,881
Clocks	1,377	27,318
Cordage	42,516	32,118
Cottons	5,110,279	567,701
Glass and Glassware	84,321	239,038
Hats, Caps and Bonnets	72,718	167,252
Hops	3,174	42,602
Hosiery	118,400	4,703
Iron and Hardware	733,433	726,970
Leather	71,431	117,742
Linen	832,433	24,887
MANUFACTURES—India Rubber	....	22,967
Furs	16,895	24,833
Musical Instruments	7,163	120,673
Oils, rectified and prepared	94,996	210,687
Paints and Colours	94,687	44,067
Paper	82,609	24,913
Paper Hangings	82,363	45,348
Parasols and Umbrellas	32,123	6,166
Woollens	3,956,000	268,199
Iron—Bar, Rod or Hoop	686,766	25,798
Starch	....	....
Glue	....	....
Soap	....	....

THE NORTHERN RAILWAY AND THE LUMBER TRADE.

The following is a return of the receipts of lumber and timber by the Northern Railway during the year, showing the contribution of each station:

	LINEAL FEET.
Richmond Hill	270,000
King	3,240,000
Aurora	996,000
Newmarket	360,000
Holland Landing	55,000
Bradford	1,770,000
Lefroy	3,834,000
Bell Ewart	9,555,000
Barrie	5,424,000
Angus	5,979,000
Sunnidale	2,649,000
Nottawasaga	1,920,000
Collingwood	7,326,000
Total	42,550,000

The above might be classified as follows:—

Square timber, 17,988,000; rafting stuff, 1,374,000; cordwood, 5,562,000; sawed lumber, 29,626,000; total, 43,550,000.

Selected Articles.

HUMAN VEGETATION.

The power of vegetation seems to be almost universal and perpetual. The stone taken fresh from the quarry soon becomes covered with grey lichen and green moss, and the very bread that we use becomes covered with vegetable floss, when exposed for a few days in a warm damp atmosphere. Not only the face of the earth, but every object upon its surface, seems instinct with vegetable life. In some situations it springs up so suddenly and unexpectedly that many persons suppose it to be endowed with spontaneity. In its growth and development its domain is not confined to inanimate creation, but it is also extended over animal life. Bees may frequently be seen flying, with plants, nearly as large as themselves, protruding from their heads; silkworms are sometimes affected with a vegetable moldiness called muscardine, and gold fish may oftentimes be seen covered with a white vegetable mold. Insects, reptiles, fowls, fishes, and animals of the higher grades are subject to parasitic vegetation; and man himself is not exempt from the same influences. The scald head, the ring-worm and dandruff are vegetable growths. Some forms of it attack the children of the poor almost exclusively, where sufficient attention is not paid to cleanliness; while other forms of it occur at all ages and are found in all ranks and conditions of society. The vegetable growth of scald head is described in the Bible (13th chapter of Leviticus), and is one of the unclean diseases of the Hebrews. It appears in patches of yellow scales; the hair becomes dry and brittle, and disorganized. Examined with a microscope, the scales are found to contain masses of seeds. A very formidable type of this disease occurs frequently in Poland, and is called *plicapolonica.* The parasitic plant which causes diseases of the human scalp is called *acarion schönleinii,* and is the frequent cause of baldness. It has been noticed that baldness is almost unknown among a barbarous people. American Indians, Africans, Malays, and Chinese have all bushy heads; and it is asserted by the Rev. H. Macmillan, F.R.S., in an essay on this subject in *Macmillan's Magazine,* that baldness was unknown among the primitive inhabitants of the British Isles. Baldness has increased with civilization, but whether owing to increased intellectual activity, or vegetable parasites developed under favorable conditions from modern habits, is not a settled question.

There is also a special hair-plant called the chinwelk, which revels in the beard. It is distinguished by a red eruption of tubercules of various sizes, and it frequently destroys the hair. It was very common among the Jews of old, who according to Levitical law, enforced very arbitrary measures for its extirpation. Where long hair is much prized in the East, the common salutation is, "May your shadow never be less, and the hairs of your head never decrease!"

There is a singular vegetable growth peculiar to the human body which has a predilection for those parts which are habitually covered with clothing. It is called *microsporon furfur*, and consists of an efflorescence of small circular spots, which gradually coalesce and produce irregular patches, accompanied with dry scales, which are constantly renewed. These scales, when examined with a microscope, are found to contain oval seeds, tubes and knots, similar to those of miniature bamboo canes. This vegetable parasite is very common and occurs at all ages and on both sexes.

The diseases called the yaws, which is common in the West Indies; and the elephantiasis, which disfigures the Egyptians, are vegetable growths. It is also well known that in hospitals, especially during warm weather, white flocculent filaments are found on removing the bandages from wounds and sores. These are developed with wonderful rapidity in a very few hours, and are vegetable formations called mycoderms, which are similar to the spawn of mushrooms.

Vegetable growths are sometimes found in several of the internal parts of the human system, such as parasites on the teeth, and the thrush or whitish crust which frequently lines the membrane of the mouth and throat of infant children. The same vegetable growth is common with persons in the advanced stages of pulmonary consumption.

It has been proved that all these vegetable growths are due to seeds, most of which are so minute as to be almost invisible to the naked eye. They float in the atmosphere everywhere; dance in the air currents of every house; and they but await the proper conditions for their development wherever they alight. It is easy to account for parasitic affections of vegetable origin being highly contagious. Malaria fevers may be of cryptogamic origin, due to the diffusion of the seeds of these plants in the atmosphere. Several physicians have entertained such views. Formations closely resembling them have been found in the blood and kidneys of persons affected with typhus, and probably there is some connection between such plants and most epidemic diseases.— *Scientific American.*

SMOKE-CONSUMING APPARATUS.

Judging by the oft-repeated appearance in the metropolitan Police Courts of the Smoke Nuisance Inspector, Mr. Sandison, the numerous fines exacted from manufacturers and others at his instance, and the line of defence almost invariably pursued on behalf of offenders, it might well be imagined that no effective apparatus for destroying opaque smoke had yet been invented. Such a supposition, too, would be amply justified at the east end of London by the long streams of dense and foul black smoke which may be seen in the day time pouring forth from many tall and short chimney stacks, and which darken and pollute the air of the entire neighbourhood. That means of consuming smoke, both effectually and economically, do exist is, nevertheless, a fact, and those who are mulcted of fines for not observing the provisions of the Smoke Nuisance Act, have themselves alone to blame for the annoyance. At one large manufactory, in the immediate vicinity of the unclassical, but bustling region of Whitechapel, where smoke nuisances prevail, there are, to our own knowledge in constant use, no less than seventeen furnaces, each of which completely destroys its own smoke. The manufactory in which they are is the Royal Mint, and the kind of furnace employed is that known as "Jucke's patent."

We have examined these contrivances, and can confidently say that they are of the most satisfactory nature. They are on the endless chain principle, the links of the chain, so to speak, forming the fire-bars. By means of the simplest possible driving gear, the fire-bars are made to travel slowly forward, and, after depositing clinkers, &c., under a water bridge, which passes traversely over them at the inner extremity of the furnace, they turn round a disc, and return round underneath. The thickness of fire on the bars is regulated by an adjustable iron apron in front, and the fuel consists exclusively of coal screenings. Such is briefly a description of the apparatus, the patent for which has long since expired. The fireman in attendance has nothing more to do than to fill a hopper with coal-dust, for it is little else, and then the furnace becomes self-feeding. It will be readily understood, from the above remarks, that that a very small quantity of fresh fuel is continually being conveyed forward from the hopper, and that the smoke caused by its introduction is instantaneously consumed by contact with the living fire within. From the fact that the fire-bars, which are of cast iron, have time to become cool in their lower passage, they last a very long time, and retain their square edges with astonishing precision,

It seems, indeed, to us that no better apparatus for its purpose than Jucke's Smoke-consuming Furnace need be desired. It accomplishes all that is asked for by the Smoke Nuisance Act. It is simple, and yet scientific; and, as the patent right has expired, its principle may be adopted by anybody or everybody.

We have not the slightest doubt that those who wish to see the Mint furnaces in action will be gratified on application to the authorities of that establishment; and we are sure that those who do see them will thank us for directing them to the spot.—*Building News.*

GUN COTTON FOR ARTILLERY.

When gun-cotton was discovered by Schonbein, in 1847, it was hailed as a most valuable invention for war and other purposes in which gunpowder is used, but on repeated trials with it in fire-arms, it was found unsuited. The following defects were attributed to it:—It was very hygrometic, and attracted so much moisture during wet weather as to render it useless. It was also deficient in granular construction. To explain this second defect, it is necessary to state that different kinds of fire-arms require powder of a different grain. Thus for fowling-pieces a fine-grained quick powder, is required; for rifles, a much coarser powder, and for cannon a very large-grained powder. Every variety of fire-arm, whether the variation be as to length, twist of grooves or calibre, involves a special size in the grains of powder to obtain the best results. Gun cotton possesses no such variable qualities. It also explodes so rapidly that it could not be used in common fire-arms, because of its bursting effects; the best steel barrels of rifles having been shattered by common charges.

There are quite a number of fulminating agents, which it would be convenient to use in place of gunpowder, were it not that they are violently explosive, without producing great projectile results; that is, they will shatter strong steel barrels to pieces with a small charge, but they cannot project missiles to such great distances as gunpowder. This is the case with the fulminates of mercury, silver, and gold. The propulsive force of any material, such as gunpowder or the fulminate of mercury, depends on two qualities, namely, the volume of gas which it liberates when it explodes, and the time involved in the liberation of this gas. These are important distinctions. If the substance liberates its gas at once, or in a space of time infinitely short, like the fulminates of mercury and silver, it is not suitable of application for discharging projectiles, because the bursting or shattering effect of those is prodigious, while their projectile effect is small, as the volume of gas liberated by these fulminates is less in volume than the gas of gunpowder, hence the latter is a superior projectile agent. As water expands into 1,700 volumes of steam, it is evident that it must be a superior expansive motive agent to alcohol, which does not expand in vapor to more than 640 of its original volume. Gunpowder and the fulminates are governed by the same law. Gun-cotton, owing to its complete ignition, and leaving very little residue, was held to be superior to gunpowder in projectile effect; but its want of granular construction, its rapidity of combustion and its affinity for moisture were defects which till now have prevented its adaptation to fire-arms and artillery. All these defects have been overcome (it is stated in the *Austrian Gazette*) by Baron Lenk, and it is now used in the Austrian army. The method employed to prevent it from absorbing moisture is by immersing it, when being manufactured and before it is dried, in dilute soluble glass, which acts the part of a varnish, without injuring the igniting qualities of the gun cotton. The same quality as granulation in gunpowder is obtained by forming the cotton into twisted strands of different sizes, and making it into cords, which are cut to form charges for cartridges. Batteries in which gun cotton is used now form part of the Austrian military equipment. The guns are shorter and lighter than those of the same calibre for which gunpowder is employed. A military commission appointed to examine into this subject has reported that the weight of Baron Lenk's gun cotton, to produce effects either in heavy ordnance or in small guns, is to the weight of gunpowder as 1 to 3. In 1860, trials were made with it in a bronze 4-pounder, and after firing 2,000 rounds the gun was not in the least injured. In 1861, fifty tuns of this substance were made without the occurrence of any accident. It leaves but a very slight residuum in firing, and the smoke which results from it is not so disagreeable as that of gunpowder. Some of this gun cotton was sunk under water for six weeks, then it was lifted and dried, and was found to be as powerful in projectile force as before it was submerged. These advantages stated to have been obtained from the improved Austrian gun cotton deserve general attention, for if this explosive agent can be substituted for gunpowder, of course saltpetre may be dispensed with, as the nitrate of soda is used to manufacture the nitric acid that is employed in making gun cotton. Flax will answer as well as cotton, if the latter cannot be obtained.—*Scientific American.*

DESTRUCTIVE EFFECTS OF IRON RUST.

The last published report of the Smithsonian Institution contains a translation from a German publication on the above subject, which affords considerable information of a useful and interesting character, some of which we shall present in a condensed form. It states that it has been frequently observed that in the timber of old ships the wood in the proximity of iron bolts is entirely altered in its character. Around each bolt for a space exceeding one inch, part of the wood is dissolved away, and the remainder is quite brittle and easily broken. The appearance of such wood is such as if it were produced by driving in red-hot iron bolts. This injurious effect of iron rust is one of the principal causes of the want of durability in iron-fastened ships. Rust not only originates where the iron is alternately exposed to water and the air, but also where the iron is permanently submerged under water. It is generally known that rust is an oxide of iron, but as soon as it comes into contact with wood it gives off part of its oxygen, and becomes the protoxide. The latter takes up a new portion of oxygen and transfers it to the wood, and by the uninterrupted repetition of this process, a slow decay of the wood is effected. The protoxide of iron in this case plays a part similar to nitric oxide in the manufacture of sulphuric acid.

In order to demonstrate the fact that oxide of iron is reduced by mere contact with organic substances (such as wood) not yet in a state of putrefaction, M. Kuhlman, of Lille, has instituted different experiments, the results of which confirm the correctness of this assertion. When hydrated oxide of iron, for example, was mixed with cold solutions of logwood, cochineal, corcuma and mahogany, they were decolorized, and the iron was found in a state of protoxide, the oxide having lost a portion of its oxygen by the action of the coloring matter. In every-day life the destructive effects of the oxide of iron have been noticed. For example, linen or cotton cloth containing ink stains becomes tender in its texture in the stained spots after repeated washings, and the spots ultimately fall out, leaving holes in the fabric. When cloth that is colored with copperas to form a black, is submitted to an alkaline ley, the protoxide of iron is changed into an oxide, and the cloth becomes feeble in the texture; and the usual saying in such cases is, "It is burnt in dyeing. According to Kuhlman, the oxide of iron transfers oxygen directly to the cloth producing slow combustion of the fibre. This is useful information for dyers, as it explains the cause of an evil connected with preparing cotton cloth, which has hitherto baffled much scrutiny and experiments to discover. It is also well known to bleachers that when pieces of cotton cloth become stained with iron rust they are liable to drop out, leaving holes, as if they had been sprinkled with sulphuric acid. Every spot of iron rust should therefore, be immediately discharged when noticed by the use of dilute hydrochloric acid and warm water, or oxalic acid and warm water.

In shipbuilding, iron nails and bolts should never be used. In all cases copper or brass fastenings should be employed where first cost is not an essential object. In cases where the expense will not warrant the use of copper bolts, the iron bolts should be galvanized. Recently we have noticed with much satisfaction the extended use of zinc-covered iron bolts by our shipbuilders. This is a step in the right direction; but so far as we are informed, such bolts are confined to the construction of sea-going vessels. All our river-boats and schooners should be fastened with the same kind of bolts, because they are nearly as essential for vessels running on fresh water as those on salt. —*Scientific American.*

NOTES UPON PASSING EVENTS.

The French are acquiring influence in the Algerian Sahara, by introducing some of the useful arts of Europe: amongst others, that of boring for water. There is, beneath certain regions of the Desert, an apparently subterranean lake or river. The native Arab well-sinkers form a numerous corporation, enjoying several privileges and much consideration, due to the dangerous nature of their pursuit. Working constantly under water, many die of consumption, and some are drowned or smothered. The duration of each dive is from two to three minutes, and four dives are considered a day's work. When the well has been sunk about 40 yards, from 30lbs. to 40lbs. of earth are extracted daily. In the south of Algeria, the well-sinkers endeavour to find a subterranean stream, which is sometimes tapped at the depth of "the height of 100 men," which would be about 550 feet. Although the sinking is through dry ground, the danger is not less. Colonel Dammas thus describes the operation:—"The section is in a square form. One workman alone works at it; and, as he advances, he supports the sides with four planks of palm-tree. By certain infallible signs—for instance when the soil becomes black and moist—he knows that he is near the spring. He then fills his ears and nostrils with wax, that he may not be suffocated by the uprising deluge of water, and fastens a rope under his arms, having previously arranged to be drawn up on a given signal. At the last stroke of the pick, the water often rises so rapidly, that the unhappy well-sinker is drawn up insensible. These inexhaustible springs are the common property of the village which has discovered them, and are conveyed to the gardens in conduits of hollowed palm-tree trunks. It is these springs which are the foundation of the greater number of the oases of Sahara." In 1853, when French conquests had extended to the vast and mysterious solitude called the Great Desert, well-boring and sinking apparatus were introduced, and astonished the Arabs by their simplicity and effectiveness. In the five years ending 1859–60, 50 wells have been opened; 30,000 palms and 1000 fruit-trees have been planted; many oases have revived from the ruin caused by a failure of springs; and two villages have been created in the Desert: the total expense not having been much more than £20,000 sterling, which has been repaid by taxes and voluntary contributions from the Arabs. The French author from whom we quote observes:—"Such works give us ten times more influence than our military victories. The waters bubbling up from these borings are generally charged with sulphate of soda, magnesia, and lime, either as a chloride or a sulphate, which makes them bitter and salt; but the Arabs are only too glad to have any kind of water, and the palms and other vegetable products of the Desert thrive on it." The borings of Sidi-Sliman and K'Sour present the curious phenomenon of live fish. A parallel to this case was reported by M. Aymé, governor of the oases of Egypt, to a scientific society in France. In clearing a well 325 feet deep, he said "he had found fish fit for cooking." The French propose to extend these wells into the Desert, so as to unite the rich oases of Touat, on the route to Timbuctoo, with Algeria, and thus direct the stream of overland commerce into its ancient channel by Algeria. This is a legitimate attempt; but not only is the construction of roads and wells needed, but the repeal of those laws of trade and that system of taxation which repels commerce. At present, the customs dues of the port of Algiers are rather more repulsive to traders than those of barbarian Tunis and Morocco.—*The Journal of Gas Lighting.*

Miscellaneous.

The British Navy.

The annual official return of the number, name, tonnage, armament, and horse-power of each vessel, both steamers and sailing ships, composing the British Navy, was published on the 1st of January, under the authority of the Lords of the Admiralty. Including a numerous fleet of gunboats the navy of England, on Jan. 1, numbered 1,014 ships of all classes. Of this number there are 85 line-of-battle ships, mounting from 74 guns to 131 guns each, according to their rating; 39 of from 50 guns to 72 guns each; 69 frigates of from 24 guns to 46 guns each, most of which are of a tonnage and horse-power equal to a line-of-battle ship; 30 screw corvettes, each mounting 21 guns; and upwards of 600 frigates and vessels of all classes mounting less than 20 guns. In addition to the above there is a fleet of 190 gunboats, each mounting two heavy Armstrong guns and of 60 horse power, besides a numerous squadron of iron and wooden mortar vessels built during the Russian war, and now laid up at Chatham. At present there are 43 vessels under construction for the Admiralty at the various public and private dockyards, many of which will be completed and launched during the present year. The iron vessels building are the Achilles (50) 6,079 tons, 1,250 horse-power, at Chatham; the Northumberland (50) 6,621 tuns, 1,250 horse-power, at Millwall; the Minotaur (50) 6,621 tuns, 1,250 horse-power, at Blackwall; the Agincourt (50) 6,621 tuns, 1,250 horse-power, at Birkenhead; the Hector, (32) 4,063 tuns, 800 horse-power, at Glasgow; the Valiant, (32) 4,063 tuns, 800 horse-power, at Millwall; the Tamar (3) 2,812 tuns, 500 horse-power; and the iron-cased frigate Royal Alfred, (34) 3,716 tuns, 800 horse-power, at Portsmouth; the Ocean (34) 4,045 tuns, 1,000 horse-power, at Devonport; the Zealous (34) 3,716 tuns, 800 horse-power, at Pembroke; and the Favourite (22) 2,186 tuns, 400 horse-power, at Deptford. In addition to the above, the Royal Sovereign, 3, 968 tuns, 800 horse-power, is being converted into a cupola ship, and the Enterprise, building at Deptford, for a shield-ship, on the new plan submitted to the Admiralty. During the year 1862, the vessels launched at the several dockyards were the Caledonia (50) 4,045 tuns, 800 horse-power, iron-cased frigate at Woolwich; the Royal Oak (34) 3,716 tuns, 800 horse-power, iron-cased frigate, at Chatham; the Prince Consort (34) 3,716 tuns, 800 horse-power, iron-cased frigate, and 31 wooden vessels of various sizes.—*Mitchell's Steam Shipping Journal.*

Stuffing Leather.

A correspondent of the *Shoe and Leather Reporter* says:—"I am in favor of using a wheel for stuffing leather when weight is desired, and believe that not only is weight added but the quality of the leather improved. I would recommend using stuffing made with a large part tallow, applied hot, the leather put into the wheel as soon the hot stuffing is applied, and run in the wheel from one-half to three quarters of an hour. The stuffing should be applied to both sides of the leather. After the leather is 'wheeled' sufficiently, it is well to put it in a box or keep it from the air for a day or two, and that put out in the usual way, and have as much stuffing applied as the leather will need, using cold stuffing and soften if thought advisable. I have no doubt but upper and kip leather would be much improved in quality by this process, but it would make it more expensive than the usual way, The leather should be semi-dried before the hot stuffing is applied. I do not think my views of stuffing leather are entirely new; but very few tanners, however, use a wheel, and many wholly reject the idea."

The Greens of Ladies' Dresses, Wreaths of Flowers.

We can look with admiration upon the art of applying pigments to cloth when such innocent substances as ultramarine are employed for the purpose of producing the colours desired; but when we see those greens which are produced from arsenic and copper our admiration of the art vanishes altogether. These substances are extremely poisonous,—poisonous to the persons who wear them, and poisonous far more to the persons who make them for the wearer. Those poisonous colors that are applied by topical fixing are merely put on by a sort of glue upon the surface of the cloth. They are stuck on, in fact, by cheese, and if by any friction a portion of them rubs off they form a fine dust, which floats in the air and is readly breathed into the lungs. To give you some idea of the poisonous properties of this substance, I may mention that a lady in the extensive folds of a modern dress made of green tarlatan wears so much arsenic as would poison a hundred and fifty stalwart men. In addition to this, the colour is often put on with much less firm substances than those I have described to you. I have been describing the genuine way of applying it by means of lacterine or albumen but in order to produce these green dresses very cheaply this poisonous pigment is often put on only with starch, and it then rubs off with the greatest freedom. You have lately seen accounts of Coroner's inquests held in this town upon poor flowergirls who have been poisoned by this colour in the making of green flowers. The amount used for that purpose is large. A lady's ordinary wreath of green flowers contains as much arsenic as would poison five men, so that the amount used of these poisonous materials is very great. I may mention to you what Napier says in his "Manual of Dyeing." He says that he had known work-people become invalids for life by having to wind as many yards of arsenic sage yarn—that is to say yarn dyed green with this poison—as gave them in wages only one shilling. We must not avoid a solemn truth for fear of a pun when we allege that this is not the art of *dyeing*, but of *death*. If purchasers will avoid these fatal pigments, manufacrurers will soon abandon their preparation.—*Dr. Lyon Playfair.*

Aluminium Bronze.

In the supplementary number to vol. 24 of the *Philosophical Magazine*, just published, we find a remarkable article, by Lieutenant-Colonel A. Strange, F.R.A.S., on the properties and present value of aluminium bronze, an alloy consisting of ten parts of aluminum bronze, an alloy consisting of ten parts of aluminium and 90 of copper. Its tensile strength is stated at 73,185 lbs. per square inch, being more than double the breaking strain of gun metal, and 1,186lbs. more than the average tenacity of cast steel. Its resistance to compression is 132,416lbs, to the square inch; that of cast iron being 115,542 lbs. As to malleability, this alloy may be drawn out under the hammer almost to a needle point at a red heat. Its rigidity is about three times that of gun-metal, and 44 times that of brass; it is less affected by change of temperature than either of the latter; it may be cast with extraordinary facility into any shape: it does not clog the file, and yields fine elastic shavings on the lathe. It tarnishes much less readily in the air than any other metal or alloy used for astronomical instruments, and will receive the finest graduation possible. It is extremely elastic, can be rolled into sheet metal, or also hammered and drawn, and seems admirably adapted for the tubular parts of astronomical instruments. Its specific gravity is 7·689, nearly the same as wrought iron. To make this alloy extremely pure copper should be used; the best is copper deposited by electricity; but, since that kind is very expensive the best is copper from Lake Superior, which makes an alloy of an excellent quallity. The ordinary coppers of commerce generally fail, owing, it is said, chiefly to the presence of iron, which appears to be specially prejudicial. Another precaution is to remelt the alloy two or three times. The first melting, in the proportions above stated, produces an alloy of extreme brittleness; but each successive melting, up to a certain point determined by the working, and, particularly the forging properties of the metal improves its tenacity and strength. The present price of English made, 10 per cent. Aluminum bronze is 6s. 6d. per lb., or four or five times the price of gun metal; but as a much smaller quantity of the new alloy would give the same strength, the cost of ordnance made of it would not be very considerably increased.—*Galignani's Messenger.*

Woollen and Cotton Yarn.

The manufacturing interests of the country connected with this branch of trade have continued steadily to grow in importance. In woollens, the manufacture of the lighter grades of tweeds has been rather more rapid than the increase in the demand for the home product, which, in connection with the high price of wool, has not made the year's result over profitably to manufacturers. There has, nevertheless, been a large increase in the consumption of these goods, and though this has scarcely been so great as the growth of the manufacture, they are likely to replace imported goods of the same grade. The earnings of the year have only been moderately profitable, but the reputation which these goods have gained, and the certainty of a future demand, have laid the foundation for a good trade hereafter. The following are the principal establishments: Hunt & Elliott, Preston; W. Robertson, Thompson & Co. and Patrick Patton & Co., Galt; Crombie & Co., Plattsville; Matthewson & Ratcliffe, Columbus; Fraser & Co., Ontario Mills, Cobourg; Merrick & Son, Merrickville; Waltho & Jackson, Chippewa; G. P. M. Ball, Grantham; Barber Brothers, Streetsville; W. A. Clark, Thornbury; Norfolk Woollen Mills, Port Dover, and Jacob Hespeler, New Hope.

The manufacture of cotton yarn during the year has been very vigorously prosecuted by Mr. Joseph Wright, of Dundas, whose energy and enterprise are deserving of the greatest success. He has produced an article which meets with great favour wherever used, equalling, if not surpassing any of the imported yarn. He has also been producing a large quantity of bags, which are of the best class, and which we are sure excel any ever brought to us from the United States. During the year he has considerably increased his facilities by the introduction of new machinery, and he contemplates still greater improvements. He has also effected arrangements in Liverpool for the direct importation of India Surat Cotton, and has a contract for the delivery of it at less than one cent per lb. from Liverpool to Dundas direct. He will thus effect a considerable saving over the old mode of buying from second or third hands, in New York or Boston. We are glad to notice the prosperity of this important establishment, and we hope to see it continue.

Messrs. Crossland & Brown have had good success in manufacturing cotton batting, and though in the course of the year their building was destroyed by fire, their machinery was saved, and they are preparing for an extended business hereafter. The earnings of the year have been only moderate, but the reputation the goods have acquired will be certain to make an increased demand for them in future.—*Toronto Globe.*

SUMMARY *of Lives Lost in the Coal Mines of the United Kingdom for the ten years ending* 1860.

Years.	Lives Lost.
1851	1,062
1852	661
1853	755
1854	779
1855	728
1856	1,033
1857	1,119
1858	931
1859	904
1860	1,108
Total lives lost..... ...	9,090

METALS *produced from British Minerals.*

		Quantity.	Value.
Gold	Oz.	2,784	10,816
Tin	Tons.	7,450	910,762
Copper	"	15,331	1,572,480
Lead	"	65,643	1,445,255
Silver	Oz.	569,530	144,161
Zinc	Tons.	4,415	79,101
Iron, Pig	"	3,712,390	9,280,975
Total value of the above			13,443,550
Estimated value of other metals			250,500
Coals			20,908,803
Total val. of the Metals produced & Coals			34,602,853

In Great Britain there are

Coal Mines... ..	3,000	employing	250,000	persons.
Iron Mines......	uncertain	"	27,000	"
Copper Mines..	167	"	22,000	"
Tin Mines	148	"	14,500	"
Lead Mines ...	390	"	21,500	"
Zinc & others..	—	"	1,000	"
Making a total of.....			336,000	persons.

Revenue of Great Britain.

The total revenue of Great Britain for the year 1862, amounts to £70,996,429 sterling. In 1861 it only amounted to £68,603,851; showing an increase of £2,392,578. This increase has not been caused by a higher rate of taxation, but is the *bona fide* result of wealth and trade. In only one department that of the excise, is a diminution shown to the extent of £627,000. The decrease is to be accounted for by the repeal of the duties upon hops; the law enacting which came into effect, we believe, late in 1861. The increase in customs is £262,000 in stamp duties £422,775; in the property tax £1,142,000, and from miscellaneous sources 1,055,761.

Taking the value of a pound at five dollars in gold, the entire British revenue in 1862, amounted to the prodigious sum of $354,982,145. The British entrances and clearances of American vessels in English ports were three-quarters of a million less in 1861, and most of the trade thus lost has passed into British hands.

The Cause of Attraction.

The Rev. Father Secchi, the learned director of the Roman Astronomical Observatory, has just published an essay, in which he discusses from an advanced point of view the theory of attraction. After having shewn, in accordance with the views so ably expounded by Mr. Tyndal in his paper on Force, (published in the *Naturalist*, p. 241,) that all the physical forces or movements of which we are cognizant come to us from the solar centre, the learned Jesuit inquires, "But how does this movement or series of movements return to the sun? Who knows but that part of the heat thus emanating from the sun, which is not lost by radiation into space, is converted into an impulsion of the mass of the earth towards the sun? I do not pretend to give a theory, but only to propose a conjecture, which it will be sufficient for me to shew not to be absurd."

"We see that the intensity of heat, like that of gravity diminishes inversely as the square of the distance. We know also that a prodigious quantity of molecular movements come from the sun by luminous and carlorific radiation, and under the form of vibratory disturbances, remain apparently destroyed, at the earth's surface, instead of being lost by radiation towards the planetary spaces. In fact, heat coming from sources of a very high temperature (that is to say, heat of short undulations) when brought to a lower temperature (or to long undulations,) can no longer traverse the terrestial atmosphere and radiate into space. A certain quantity of motion coming from the sun must thus rest imprisoned in terrestial bodies, by the chemical force to which it gives rise. So that in reality the *vis viva*, and the *quantity of movement* in the terrestial globe, and its surrounding mass of ether, must increase indefinitely, if there were not some way of escape or discharge. Why may not this discharge be the incessant fall of the earth towards the sun, a fall expressed by the linear distance which the earth deviates from the tangent of its orbit; which tangent the earth would follow in virtue of its inertia, did not some cause draw it towards the solar centre?"

Of this brilliant and novel conjecture, the learned editor of *Le Cosmos*, from whom we extract the above, remarks, that it seems to be one of those happy inspirations which belong to truth alone; and he adds, "there is great merit in having originated an idea which has never before presented itself to the human intelligence, and which, in time to come, may bring forth fruitful results."—*Le Cosmos, Nov.* 21, 1862.—*From the Canadian Naturalist.*

The Age of the Pyramids of Egypt.

Mahmoud Bey, astronomer to the Vice-Roy of Egypt, has just published the results of his investigations of the pyramids, undertaken at the request of the Vice-Roy. The measures of the great pyramid he finds to be 231 meters for the sides of the square base, and 146·5 metres for the height; so that the faces form an angle of 54° 54′ with the horizon. This agrees with the known inclinations of the six other pyramids of Memphis; which vary between 51° and 53°, and average 52° 30′. This common inclination; and the fact that the pyramid and the other funeral monuments which surround them, are, as Mahmoud has satisfied himself, always placed exactly facing the cardinal points suggests that these pyramids had some relation to a celestial phenomenon, and to the divinity which presided over that in the Egyptian mythology. Now he has found that Sirius, when it passes the meridian of Gizeh, shines vertically upon the southern face of the pyramids; and in calculating the change in the position of this star for a series of centuries, shows that 3,300 years before the Christian era, the rays of this star, at its culmination, must have been directly perpendicular to the southern face of the pyramids, inclined at an angle of 52° 45′ with the northern horizon. According to the principles of astrology the influences of a star are greatest when its rays fall perpendicularly upon an object. If now we suppose that these pyramids were constructed a little more than 5,000 years ago, it would appear evident that their faces received the angle of 52 degrees, in order to be perpendicular to the rays of Sirius, the brightest star of our northern heaven; which was consecrated to the god Sothis, the celestial dog, and the judge of the dead, and was also said to be the soul of this deity.

This opinion is confirmed in an unexpected manner by the following considerations. The pyramids, being tombs or funereal monuments, would naturally be under the patronage of that divinity who presides more particularly over the dead, that is to say with Sothis, who is no other than the thrice-great Hermes, Cynocephalus, Thoth or Anubis. Now the hieroglyphic designation of Sothis is a pyramid by the side of a star and a crescent. Nothing is therefore more natural than this relation thus descovered by Mahmoud Bey between Sirius and the pyramids. The date of 3,300 B.C., thus assigned to these structures, accords with Bunsen's determination, according to which king Cheops reigned in the thirty-fourth century before our era, It also agrees with the tradition of the Arabs, according to which they were constructed three or four centuries before the deluge; which they assign to the year 3,716 before the Hegira.—(*Le Cosmos, Nov.* 21*st*, 1862).—*Ibid.*

Whitworth Shells.

The new shells of J. Whitworth, of Manchester, England, which penetrated the iron target at Shoeburyness, have been patented and are described as follows:—The shells are made solid in front of the cavity, to give them sufficient strength for penetration. No fuse is employed; the heat generated in the front part of the shell by the impact of the metal is sufficient to ignite the charge inside. The material of which the shell is made, is "homogeneous metal"—a low carbonized steel. It is formed into bars, then cut into lengths, each of which is sufficient to form two shells; these are then carbonized to the depth of half an inch, to render them hard on the surface. They are then divided and bored internally and turned externally to form two shells, and afterwards case-hardened as follows:—Each shell is placed in an iron box and surrounded with animal charcoal, cuttings of horns and hoofs, the box covered, placed in a fire and raised to a red heat. The shell is now withdrawn from the box, set up upon its end, and cooled by allowing several jets of cold salt brine to play upon its outer and inner surfaces, whereby it is made very hard. After this, it is tempered by heating it to a red heat in a bath of molten tin until it has acquired a straw color at the front, and a blue colour at the rear end, then it is cooled and ready to be charged.

Gas Light in Railway Trains.

It is highly to the honour of the Scottish Central Railway, that it has, of all the railways of Scotland, initiated a movement, the first steps of which ought to have been long ago taken. It is somewhat singular that of all the improvements which have been effected by science in the ordinary conveniencies of life, during the last half century, so little has been done to secure comfort in railway travelling. Of these requisites, none is of more importance—as those who are in the habit of making long journeys are well aware—than a system by which a clear and equable light may be obtained. The filthiness, the dimness, and the expense of the ordinary oil lamps cannot be excused in so great a scheme as a railway. The Scottish Central train which left Edinburgh for the north on Monday night, was brilliantly illuminated with gas, and the trial has been so successful that, so far as regards this particular line and train, it may be looked upon as a *fait accompli.* The gas is supplied from a large boiler at the Perth station, which is filled from the gas-works there. The supply for the train is kept in an india-rubber gasometer of about six feet square defended by iron hoops, and kept in a compartment of the break-van. When full it occupies the whole of this compartment, but as the gas passes away it is compressed by a weight on the top. The gas is conveyed into it, from the hold, by a large tube in the bottom of the van, and is conveyed out of it to supply the carriages by a smaller tube, also in the bottom. This tube again passes up through the anterior part of the van to the roof, and the gas is thence conducted along the carriages by metal pipes, connected by india-rubber tubing, and passes down by brackets into large and strong glass globes in the various divisions of the carriages. The supply necessary for the double journey to Perth and back, which occupies somewhat less than eight hours, is about 260 cubic feet; and the expense, after the fittings are completed, is estimated at one-half of that of the ordinary oil apparatus. The only objection to the scheme is that it must be confined, except with great difficulty and expense, to trains which do not require to be taken down, such as those for long journeys, and express trains; but, as it is in these that the light is most required, the objection is not a strong one. The system has been for some time in operation on the Lancashire and Yorkshire, and London and North Western Railways, and was introduced on the former line by Mr. Newall, inventor of the patent break. The honour of introducing this great improvement into the Scottish Railway system, belongs to Mr. Anell. of the Scottish Central line.—*Caledonian Mercury.*

Railway Bridges over the Thames.

The Thames will shortly be crossed by no less than five bridges for railways. The Charing Cross Railway will have two of these bridges, one at Hungerford, and a second at Cannon-street, for the city extension. The London, Chatham, and Dover, will have one near Blackfriars, to bring that line into Farringdon-Street. There is a bridge nearly completed higher up the river for the North and South London junction, which will admit of the trains of the London and North Western and the Great Western Railways, passing to the Surrey side, and these can recross the river by the railway bridge at Battersea, and avail themselves of the west-end station at I imlico.—*Artizan.*

Atmospheric Gas.

The apparatus by which the Atmospheric Gas, as it is termed, is manufactured, is stated to be very simple. A carburater saturates atmospheric air (which may be forced through it by any means, provided a regular supply be kept up) with an inflammable vapour, and the same result would probably ensure benzoine, naphtha, or any similar liquid were used. The apparatus consists of two chambers, the upper containing the principle body of liquid, and the lower a smaller quantity to saturate the air with. The liquid in the lower chamber is kept at a uniform height by a tube and valve, or other means. The lower chamber is completely filled with wicks, which are kept saturated by capillary attraction. The air passes through these wicks, and not through the liquid, and licks up so much of the inflammable vapours as to become capable of ignition.—*Artizan.*

Sir John Walsham's System of Ventilation.

It consists of zinc tubes, 3 inches in diameter, perforated at the sides, towards the bottom, with holes 1-12th of an inch in diameter, which are carried across the ceiling of the room, suspended by hooks. and taken through the walls to the open air, where they terminate in perforated convex ends, provided with caps, hung by a small chain, to cover the end most exposed to the wind in extremely cold weather, Three tubes will suffice for a room 23 feet by 16, or in that proportion for larger apartments, intervals of about 10 feet in the length of the room being ordinarily the just medium.

The atmosphere in sick wards of workhouses has been rendered quite agreeable by this system of ventilation.—*Banner.*

Paper from Different Substances.

Inventors have for many generations tried their skill in making paper from the fibres of plants easily and cheaply obtained. About 1770, one Jacob Christian Schaffer, a pastor at Ratisbon, produced a little volume of sixty leaves, all made of different substances. Among them were the bark of the willow; the beech, the aspen, the hawthorn, the linden, and the mulberry; the down of the catkins of the black poplar; the silky down of the asclepias; the tendrils of the vine; the stocks of the nettle, the mugworts, and the dyer's weed; wood shavings, saw-dust, potatoes, and fir cones; and numerous other varieties of leaves, stalks, reeds, straw, moss, and litchen. On every leaf a portion of description was printed. A copy of this curious book will be found in the British Museum. Later in the century a French marquis printed a small volume of his own poems on paper derived from those unusual sources; and, as it was sarcastically observed, "the paper was worthy of the poetry."

Imposition practised by the Employees of the London Gas Companies.

In the City of London they have endeavoured to increase the illuminating power of the gas by what is called the "carburating process," that is, by passing the gas over naptha contained in a vessel placed just under the burner. The value of this process is unquestionable, since it has been shown that ordinary gas, giving the light of twelve candles, may, by taking up from four to seven grains of the naptha vapour per cubic foot, have its illuminating power increased twenty-five or thirty per cent. But the process applied to the City lamps has not given the satisfactory results which were expected. There have been several reasons for this. The vessels containing the naptha are too large, and obstruct much of the light; the burners have, in many instances, been placed so high in the lamp, that the flame is on a level with the wide iron frame which also cuts off a good deal of light. There are still other reasons why the results have not been so successful as was expected. The gas companies, as a matter of course, did all they could to prevent the success; and the carburating company did not do all they could to ensure it. Dr. Letheby examined eighteen samples of the liquids from the carburators with the following results:—

"1. That in one sixth of the cases *there was no naptha whatever*, but merely water, in the carburator; and

"2. That in no instance was the naptha of the quality necessary to give the desired increase of illuminating power to the gas." The Doctor had "already ascertained that the naptha should give, at least, 6·5 grains of volatile hydrocarbon to each cubic foot of gas to raise the illuminating power to the required standard of 30 per cent. above the ordinary quality." The City authorities are now about to take the matter into their own hands. They intend to place a meter at each street lamp, and supply the carburators themselves; and there cannot be a doubt that, if proper vigilance be exercised, the results will be a considerable saving to the rate-payers in the cost of gas, and a great increase in the illumination of the streets. But it will require great vigilance to prevent the gas companies from playing tricks such as are more than hinted at in this Report.—*Chemical News.*

London Sewage.

A correspondent states that the salts contained in the "bulky fluid" may be solidified by means of plaster of Paris, or a mixture of the same with peat ahes, which contain gypsum. Made into cakes, they would keep a long time without smell; and, when used, should be coarsely powdered, the nitric acid of rain-water being all sufficiently powerful to dissolve any solid manure. London sewage, with it admixture of offal, &c., requires further admixture with a milder substance, like gypsum, which is not only an excellent stimulant to roots and plants to which it adheres, but is a powerful deodorizer. Night soil imparts a biting aud acrimonious taste to radishes and turnips. Cabbage are less sapid and delicate. Potatoes borrow its foul taint. It has been traced to the onion. Millers perceive a strong and disagreeable odour in the meal of their wheat grown on it. It imparts a disagreeable flavour to asparagus and tobacco. It seems as if some portion of the foul matter of the night soil is absorbed by the vegetable *radicles*, and, after passing unassimilated through the sap vessels, is converted by the process of nutrition, to living substances. Ducks owe their offensive taste, at table, to it.—*Mechanics Magazine.*

A New Substance as Food.

All the gums are highly nutritious. A little, frequently dissolved gradually in the mouth, allays thirst and hunger. Soldiers, shut up in a fortress could be kept alive many weeks with no other sustenance than gum-arabic, or cherry-tree gum. It is a powerful remedy in dropsy, from its affinity for water. In epidemic seasons, and as a preventive against ague, it may be used as an antiseptic, as it defends, or sheathes, the coat of the stomach against malaria. It braces up the nerves and lax fibres of the corpulent, and reduces obesity. Dissolved in beef tea cases of debility are soon conquered.

Photography on a large Scale.

Mr. England states that, in producing stereoscopic and card pictures of the interior of the International Exhibition, he has used the following quantities of material:—

Albumen	200 gallons
Paper	70 reams
Nitrate of Silver	2400 grains

Pure metallic gold 35 oz., making of—

Terchloride of gold about	25,000 grains
Hyposulphite of soda, 25 cwt., or	1¼ ton.

The number of stereoscopic pictures produced during the summer has been upwards of two thousand gross, or considerable more than a quarter of a million slides. The card portraits from the same negatives amount to very many thousand.

Voltaic Batteries for Steamers.

The Emperor of the French is now superintending the construction of one of these batteries, intended to replace fuel. In England, it has been proposed to the Admiralty to make a trial of a voltaic battery of 2,000 double plates, each containing 30 square inches, the whole surface being 128,000 square inches. Charcoal points, connected with the two poles, are ignited to whiteness; on withdrawing the points from each other, an arch of light, 4 inches in length, is produced between them. When any substance is introduced into this arch, it instantly ignites. Platinum melts as readily as wax in a common candle. Quartz, the sapphire, &c., with equal facility.

Momentum.

The experiments at Shoeburyness with shot against iron targets have developed some curious results. The appearance of a conical iron shot after having struck the iron target is like that of a birch broom hollowed in the centre. When the point of the cone strikes the target it is stopped, but the surrounding portions of the shot move forward and slide over the centre as a cone, and thus produce the form described.

On a New Chrome Green, by M. Mathieu Plessy.

The following is my method of operating:—

In 10 parts of boiling water I dissolve one part of bichromate of potash: to this I add 3 litres of biphosphate of lime, then 1·250 kilogrammes of brown sugar.

After a little time a tumultuous disengagement of gas takes place, which must be moderated by sprinkling over the froth.

After calcination the whole is left to stand, and by the following day the green is deposited. The supernatant liquid, of the colour of salts of chromium, decant, and wash the precipitate with cold water until the acid reaction ceases: it is then placed on a cloth *essoré*, and taken to the stove.

The above quantities give 2·500 of product.

This green, containing, as we have shown no poisonous substance, is unalterable in the sun; sulphuretted hydrogen has no effect upon it; acids, even though concentrated, do not destroy it, or, at least, act very slowly as solvents. In fixing it by albumen, and printing with it, there is no inconvenience, except a slight paleness of tint.

By the firm of Betremieux it has been used in printing on a plain paper ground, producing an agreeable water-green colour. As a smooth ground it has also been employed as an oil colour at the Louvre, and the tint has remained unaltered since its application a year ago.—*Repertoire de Chimie Pure et Appliquée.*

Oil of Asphaltum for the Preservation of Boilers.

M. Dollfus reports to the *Societe Industrielle* of Mulhouse his success in using the heavy oil extracted by M. Lebal from the asphaltum and bitumen, at Pechelbronn. He says that it is perfectly successful and very economical as an unguent for heavy machinery. He applied it to the inner surface of his boilers and heaters by warming them so as to make the oil more fluid, and then applying it in a thin coat by means of a common broom. The results were very satisfactory; the calcareous crusts were gradually detached and the metal everywhere exposed. "I continue to use the oil whenever I clean a boiler, and I judge that the expense, which is about 10 kilos. (20 lbs.) for a boiler of 45-horse power, is largely compensated for by the economy of fuel in consequence of the metal being clean: repairs are also much less frequent, as the boilers do not burn out so freely."—*Bulletin de la Societe Industrielle de Mulhouse.*

Floating Dock in India

The last mail from India brought intelligence that the great iron floating dock, built at Sourabaya, Java, from the designs of Mr. R. W. Thomson, C.E., was successfully floated into deep water on the 23rd November. It was expected to be ready for lifting the largest ships by the end of the following month. Messrs. Randolph, Elder and Co., of Glasgow, have just completed a similar iron floating dock for the French Government. This structure is capable of lifting out of the water the largest man-of-war in the world, not excepting the "Warrior," with all her guns and armour-plates in their places. This dock is also from the designs of Mr. Thomson.—*Mechanics' Magazine.*

Remedy for Poisoning

We are informed that M. Jas. Bruce has recently discovered a remedy for poisoning by strychnine and by mushrooms. It consists in making the patient eat large quantities of refined sugar, and in desperate cases opening a vein and injecting sugared water. Its effects are to oxygenate the blood and restore the circulation. He recommends its application to all venomous bites, and considers that it may be tried, with much advantage, in "lockjaw and accidents from chloroform." *Le sucre c'est le veritable ami des nerfs.* The effects of most poisons on the circulation are accurately determined microscopically in experiments with frogs, bees, flies, grasshoppers, ladybirds, snails, &c.; the pulsation of the heart being easily perceived.—*Mechanics' Magazine.*

Organic Matter in the Atmosphere.

M. Revial has instituted a series of experiments at the Hôpital Lariboisière, Paris, and has shown the existence of a large amount of organic matter floating in the atmosphere. The dust of a ward was collected, and found to contain 36 per cent. of organic matter, chiefly in the form of epithelial cells. In the air of rooms containing the sufferers from contagious inflammation of the eyeball, small corpuscles were detected analogous to those of the virus thrown off from an inflamed eye. It is probable that infection, therefore, is mechanically conveyed from eye to eye by means of the air.—*Mechauics' Magazine.*

Yellow Spots on Leather.

Yellow spots on leather frequently occur, and these detract from its value. A correspondent of the *Shoe and Leather Reporter* says they are caused by decomposition in the hide, probably in the sweating process. The remedy, he says, is "more care in the manipulation or working of the hides. With good, cold spring water for soaking, and with a sweat-pit kept at the right temperature, with ice or otherwise, and a cool, sweet liquor for the first stages of handling, there is but little danger of being troubled with yellow spots on leather."

A New Telescope.

Among the many new companies that the plethoric state of the money markets is creating, one of a most novel and curious nature is talked of. The object is to construct a gigantic reflecting telescope, of far greater dimensions than Lord Rosse's celebrated 6 feet reflector, with which it is expected wonderful planetary sights will be revealed.

Professor Owen has communicated a paper to the Royal Society on a subjecl which has of late excited some interest among palæontologists, namely, the newly discovered fossil reptile with feathers. The strange specimen here referred to was found in the lithographic slate of Solhofen, and it was described by Prof. Andreas Wagner in a paper published in the "Sitsungsberichte," of the Royal Academy of Sciences at Munich, and named by him griphosaurus. A translation of this paper appeared in the "Annals of Natural History" last April.