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THE PROVINCIAL EXHIBITION.

The history of the Provincial Association in its relation to our annual Provincial Exhibition is full of interest to Canadians. It is the narrative of the rise and progress of a national institution from which immense benefits have sprung, and many more are expected for a long series of years to come.

The Provincial Exhibition is one of the tests of our improvement in all that relates to material wealth and solid progress. It is an annual examination of the state of our industry, intelligence, activity and knowledge. It enables us to compare our condition as a people with that of other nations; to discover in what respect we fail to attain to the standard of excellence at which others have arrived; in what particulars we excel, and how we may best improve the natural advantages by which we are surrounded, and ameliorate the disadvantages which are inseparable from our geographical position.

No event of equal importance to the Provincial Exhibition occurs during the year in Canada, out of the field of politics; for good government stands at the head of all national interests, and the desire to be governed wisely and well is superior to all aspirations towards excellence in agriculture, art or mechanical skill.

Politics cannot be broached within the walls devoted to the objects of the Provincial Exhibition. All allusions in the annual addresses to subjects of a party or political nature are necessarily forbidden by tacit consent. Early in the history of the Provincial Association was the caution given by the Hon. Adam Fergusson, on the 22nd October, 1846, at Toronto, where the first Exhibition was held:—"I feel, gentlemen, far more intensely than I can possibly express, *that our very existence*, as a useful institution, must altogether depend upon a firm and scrupulous exclusion of all such topics from the Board. Thank God, we have a great and magnificent arena, upon which every man in Canada may contend, in honorable and patriotic competition, untainted by party jealousies or strife; and most devoutly should we all pray, that party feeling or party intrigue, may never be known amongst us."

The first Provincial Exhibition was held in Toronto, in October, 1846. It extended over two days. The whole amount offered in prizes reached nearly £400, and the number of entries were 1,150. Ten years later, the amount of prizes was £2,309, and the number of entries 3,791, or more than three times as many. It is curious and instructive to compare the thoughts and opinions of men at that period, based on what they saw around them, with the condition of things at the present day. The Hon. Chief Justice Robinson, now in the progress of events in Canada, where merit paves the way, Sir John Beverley Robinson, Bart., said at the first Exhibition, "There was no country possessing the advantages — advantages almost illimitable — that Canada does. Looking to the great waters at her feet, and the innumerable rivers leading thereto, and the water power afforded—he would ask, where was the country that could boast of like advantages with Upper Canada? Even with London and other towns far removed, the inhabitants had the advantages of good plank roads, by which the produce reached the great waters, on whose surface it was to be borne to Europe."

The Association began its existence boldly—it relied upon the country it was to serve. It has served it well, and well has it been sustained. It commenced its career wholly without funds, relying upon members' fees and on "contributions," particularly from County Societies, to enable it to pay the premiums offered by itself, and the expenses incurred in its own nourishment and growth.

In the second year of its existence, the annual Exhibition was held at Hamilton, when not less than 550 more entries were made than in the previous year, and premiums to the amount of £750 offered; but the Association found itself £300 in debt at the close of the year, but still full of hope. Col. E. W. Thompson, the President of the Association, a household name among farmers in Upper Canada, spoke in the annual address of the near completion of the internal water communications in the Province; but, he continued, "railroads, plank and macadamized roads must follow in every direction." He saw the necessity of progress—manufactures accompanying progress in agriculture—for he warned farmers of "the necessity of cultivating flax and hemp and the finer kinds of wool." Lord Elgin, with eloquence so natural to him, said of our country at that meeting: "Canada springs at once from the cradle into the full possession of the privileges of manhood. Canada, with youth's elasticity in her tread, has the advantage of all the experience of age. She may avail herself, not only of the capital accumulated in older countries, but also of those treasures of knowledge, which have been gathered up, by the labor and research of earnest and thoughtful men, throughout a series of generations."

When three years old, the Association determined to hold their Exhibition at Cobourg, and notwith-

standing their indebtedness, they offered prizes to the amount of £775, and extended the time the Exhibition was to last to four days. In a pecuniary point of view this Exhibition was successful, and the number of persons who visited the grounds was about 6,000.

Great improvement began to be visible at the fourth Exhibition, which was held at Kingston in September, 1849. Evidence of improvement in home manufactures began to be apparent. Agricultural implements were no longer only represented by fancy specimens from Rochester and elsewhere across the boundary line. Although our neighbours held their own, and indeed surpassed Canadian manufacturers, yet still there was great improvement visible, and it was evident to all that the annual Exhibitions were taking hold on the people and producing good results. The tree had only begun to blossom, but the show of fruit was good and promised well.

Mr. Sheriff Ruttan, who is one of the oldest born of this country, and who has seen it rise from a wilderness wherein people starved if the wolves killed too many deer, to a wealthy Province, exporting its sixteen million bushels of wheat, and numbering over a million and a quarter industrious inhabitants, said in his address, which he delivered in 1849, "We must *henceforth* encourage all sorts of manufactories throughout the country, and until we can be thence supplied, set a-going within our own dwellings the old-fashioned spinning wheel and loom. We must, male and female, wear our own manufactures."

The year 1850 ought to have been expressly distinguished by progress—it was the year before the great International Exhibition at London. The Provincial Exhibition was held at Niagara. The prizes offered amounted in value to £1,276, and the results were particularly satisfactory. This year will be celebrated in the agricultural annals of the country by the establishment of the Board of Agriculture, which became a corporate body by act of Parliament on the 10th August, 1850. In 1851 the Board was organized, and the names of the elected members published in the *Canada Gazette*. They were E. W. Thomson, Esq., Hon. Adam Fergusson, Henry Ruttan, Esq., R. L. Denison, Esq., David Christie, Esq., J. B. Marks, Esq., John Harland, Esq., the Hon. Inspector General, and the Professor of Agriculture in the University of Toronto.

Brockville was the next place where it had been decided to hold the Exhibition for the year 1851. T. B. Marks, Esq., the President, saw what many began to see dimly, others more clearly, but did not deem it wise to express their views openly, that "the powerful influence of manufactures in increasing the population and wealth of a country is too certain and obvious to admit of doubt. They not only afford direct subsistence, and the means of attaining to affluence, to an immense number of individuals, but they act powerfully and beneficially on the agricultural and other classes,—supplying them with an infinite variety of useful and necessary accommodations at a low price. A flourishing agriculture greatly depends, in fact, upon flourishing manufacture." The foregoing sentence told much in few words. What would be the use of the most successful agriculture if there was no market for surplus produce? and if foreign markets failed, as they frequently do, what would the farmer do with his grain and stock if all had to sell and there was nobody to buy? The results of this Exhibition were not very favorable. Brockville is not situated in a good farming county of great extent. The entries, as well as the amount of the prizes awarded, were less than those of the preceding year; but the finances, chiefly in consequence of the Government grant, which in 1852 was increased from £500 to £1,000, were prosperous.

The seventh Exhibition was held at Toronto, on the site of the present magnificent building—the Toronto University. Here is another instance of the changes, rapid and most unexpected, which constantly occur in Canada. Where the products of the farm and the manufactures of Canada were exhibited in an open field, ten years ago, is erected the most splendid building in British America and one of the finest on this continent. The writer of this notice had an opportunity of describing the Exhibition at Toronto, in 1852, in the pages of the *Canadian Journal*.* It will not be out of place here to introduce a few brief extracts, to show how the progress of Canada then was considered something extraordinary and marvellous. We may compare it with our impressions of to-day, written at London, nine years since the Exhibition to which the quotations refer:—

"But few, perhaps, among the thirty thousand visitors to the Exhibition ground on Thursday, September 23rd, permitted their thoughts to wander back to the time when the spot, so densely occupied by the 'pale faces,' and crowded with their works of patient industry and skilful art, was a wild and marshy forest, tenanted only by a few wandering Messassaugas; or, at a later date, and in memory of numbers then present, the forest suburbs of a village, which numbered but a few hundred enterprising settlers.

"Sixty years ago, an Indian wigwam stood alone on the spot now occupied by a city containing thirty-two thousand inhabitants, and furnished with nearly all the requirements of modern civilization, and much of the energy and skill which characterizes the age.

* The *Canadian Journal*, first series, October, 1852.

"Sixty years ago, the population of Upper Canada consisted of a few thousand families, dispersed over a territory containing upwards of forty-six thousand square miles, enjoying but a very limited means of communication between themselves, and deriving few advantages from a chequered intercourse with the world beyond their own great lakes.

"At the time we write, this extensive Province [1] peopled with one million freemen, in possession of those civil and religious blessings which can alone be won and enjoyed by an enterprising and vigorous people."

The number of entries at this Exhibition was upwards of 3,000; the number of visitors computed at about 40,000, and the total expenditure amounted to £2,400.

In 1852 another change, greatly affecting the in terestso f agriculture and the mechanical arts in the Province, took place. A new department was added to the Provincial Government, under the designation of the "Bureau of Agriculture."

The object of the new governmental department was "to centralize and perfect, by means of the appointment of a member of the Executive Government specially charged with such duties, the system of organization under which Agricultural Societies, the Provincial Agricultural Association, and Boards of Agriculture, had been for some time in existence; to give these bodies, in both sections of the Province, a more direct means of communication with the Government; to increase the facilities for carrying out their objects, so as to produce more valuable results; and to afford to the Legislature, and to the Province generally, a ready means of ascertaining what those results were." The Hon. Malcolm Cameron was the first incumbent of this new office, under the title of "Minister of Agriculture."*

The eighth Provincial Exhibition was held in Hamilton. The whole amount of prizes offered was £1,602, being an increase of £130 on the previous year; the number of entries was 2,820. This Exhibition was considered as an improvement on that held at Toronto. The general display of mechanical work and of domestic manufactures was very good, showing both progress and confidence in home productions. The number of visitors was about 30,000. In the annual address, the senior Vice-President, Mr. Treadwell, who in the absence of the President, Mr. Matthie, was called upon to perform that duty, said: "Our railways have been located, and are in process of construction." Time and money have finished the work, and we are now reaping the benefits of those gigantic enterprises which at these earlier Exhibitions were only spoken of or slowly progressing.

In 1854 the Board of Agriculture presented a report to the Government, in which they expressed their opinion of the character of the Provincial Exhibitions, and the use they had been to the country in the following words:—

"The last two Exhibitions, held at Toronto and Hamilton, respectively, were attended by a vast concourse of visitors; and not only were the stock and articles for competition much larger in amount than at previous shows, but several new things were introduced, and the general quality of the whole was of a higher character than heretofore. In implements and machinery a very marked improvement was obvious, and in the varied productions, adapted to a northern climate, it is believed that the Exhibitions of the Upper Canada Association are not excelled by any on this continent."

The year 1854 brought the ninth Exhibition to London. The site selected was the old Parade ground, about twenty-eight acres in extent. The influence of railways began now to be felt. The Great Western Railway Company offered to convey articles to and from the Exhibition free of charge. The influx of visitors was very great, and at one time it was stated that 25,000 persons were present,—while the total number of visitors was thought to be not less than at Hamilton and Toronto. The amount offered in prizes was £1,794, and the number of entries 2,933. The pecuniary condition of the Association was rapidly becoming more flourishing, the balance in hand, on the 21st Sept., 1854, being £1,332 14s. 4½d.

The tenth Exhibition was held at Cobourg. The prize list for 1855 amounted to £2,304, or about £520 more than had been offered at any previous Exhibition. In agricultural implements and domestic manufactures it fell short of its predecessors; but in the cattle department it was considered to be equal, if not superior, to any which had taken place on this continent. The President, David Christie, Esq., M.P.P., stated in the annual address that, "We think we can mark in each succeeding Exhibition unmistakable proofs of the rapid progress which Canada is making in the social scale. But such evidence is not confined to our Provincial Exhibitions. At the Industrial Exhibitions of London, New York and Paris, those great milestones in the pathway of the world's progress, the word 'Canada' is broadly marked."

The eleventh Exhibition was held at Kingston in September, 1856. Here the first permanent building for the purposes of the Association was erected. The Government granted a license of occupation for the term of twenty years on a part of the Penitentiary farm lot, of about twenty acres in area. Here the Local Committee erected a building of wood and glass. This structure is of the form of a Greek cross, the transepts being 190 feet long and 56 broad. The height of the cupola is 60 feet, but the general

* Transactions of the Board of Agriculture of Upper Canada, 1856.

height of the building not more than 34 feet. The grounds are enclosed with a permanent board fence. The entire expense of the building, offices, &c., amounted to £3,918. The number of entries at the Exhibition was upwards of 3,790. Agricultural implements, manufactures in metals, carriages, cabinet-ware, woollen goods and manufactures gene rally were well represented, and the entries considerably exceeded those of any former Exhibition. The amount offered in premiums was £2,309, but the amount awarded was only £1,699. This was owing, no doubt, to a large number of articles which were entered for Exhibition not having been sent in time.

The twelfth Exhibition was held at Brantford, on an area of about twenty acres, on which temporary buildings had been erected by the local committee. The amount of prizes was £2,517, and the number of entries reached 4,337. The agricultural implements were very well represented, being nearly double the number of those exhibited ateither of the two previous Exhibitions. In manufactures of leather, furs, metals, &c., the entries were more numerous than in former years, but there was a falling off in woollen and flax goods.

The subject of having permanent buildings erected in suitable localities for the Exhibitions of the Associations was publicly discussed at a general meeting of members of the Association. At a banquet given to Sir William Eyre, the Administrator of the Government, and other distinguished guests, the Hon. P. M. Vankoughnet, Minister of Agriculture, very appropriately remarked that "the mechanical department of the Exhibition has justly attracted great consideration, and an exhibition of those articles is more interesting to many than the mere productions of the earth." "The importance of our agricultural interests could be no better exemplified than by the mixed display here shown, which proves just this, that from what was the first product of the laborer's toil have been built up those arts and manufactures, specimens of which are here exhibited." The Rev. Dr. McCaul thus described the condition of Canada in 1857: "A few years ago, the Chief Justice of Upper Canada stated that there were men then living—and it is possible that they may be still alive—who could remember the time when there was not a single cultivated farm within the limits of the Western Province. And what have we now, within the duration of human life? Millions of acres under cultivation, well-managed, well-stocked farms, rewarding the industry, the enterprise, and skill devoted to them—millions of bushels of wheat exported—our agricultural products worth millions of pounds sterling—some thousands of mills and other manufacturing establishments—large and populous and thriving cities, towns and villages, where formerly there were but tangled woods and dreary swamps—commerce spreading the sail or driving the paddle-wheel alike over the watery highway, that stretches from the far-off gulf of ocean to remote Superior, and over the smaller lakes that gem the interior of the country—and the whistle of the locomotive, heard above the hum of business, as it sweeps through our frontier towns, from the rocky fortress of the St. Lawrence to the grassy banks of the Detroit, or waking the echoes of the primæval forest, as it rushes far back beneath its leafy arches."

The Hon. George Alexander, M.L.C., the President of the Association, adverted in his address to the importance of fostering manufactures, giving due acknowledgment to the prior claim of agriculture:—

"But while Agriculture is and will continue to be our chief and leading interest, there are other objects which must enlist the enterprize of our people. The husbandman raises more than he can consume, while in this age of high civilization, he is the creature of a thousand wants. We must look to commerce and manufactures to supply those wants, and to give a marketable value to all our surplus produce. We must foster in every way those branches of industry which will give populato our towns and cities, secure to us a home market—*diminish the amount of our imports*, and consolidate our wealth. Canada has already been successful with her Foundries, Tanneries, Asheries, Soap, Chair, and Nail Factories, Cloth, Oil and Paper Mills.—Toronto, Hamilton, and Kingston, have produced their Locomotives, and Galt her highly finished edge tools; but she has done more, and it is with pride we chronicle the fact that Galt has exported to Australia during the present season, a steam engine and other manufactures.* There is a marked spirit of enterprise abroad in our country, and when we look at our noble St Lawrence and those great inland seas, which along with our railways afford such facilities for carrying on all our commercial exchanges—when we regard the boundless extent of water power—the certain local demand for all manufactured products—while we have territory that can sustain a dense and teeming population—I say that we cannot behold all this without feeling that our country presents an unlimited field for human enterprise."

The financial position of the Society still continued favorable; the amount received and paid by the Treasurer, R. L. Denison, Esq., reaching the very imposing sum of £13,799 16s. 6d., and the balance at the credit of the Association slightly exceeded £460.

In 1858 the thirteenth Exhibition was held in Toronto. An imposing permanent building was erected on a portion of the military reserve, ceded to the corporation by the Government, comprising

* Messrs. James Crombie & Co., exported a 20 horse-power high pressure engine. Messrs. Wm. Quarry & Co., exported manufactured harness.

an area of about twenty acres. The local contributions towards the building were $20,000 from the City of Toronto, $4,000 from the County of York, and $800 from Agricultural Societies. The amount of prizes offered was about $11,000, and the number of entries reached 5,559, being over 1,200 more than at any previous Exhibition. The following description of the building was given in the local papers, at the time of laying the foundation-stone:—

"The building is situated upon 20 acres of ground suitably enclosed, and will afford exhibition space of 32,000 feet. It is to be built in the style of the English Exhibition of 1851. It will extend 256 feet in length, 144 in breadth, and will be 56 feet in height, the wings being so formed as to admit of subsequent extension if necessary. 2,000 square feet of glass will be fixed upon the roof, and fully 6,000 feet below. The glass will be of the rough-rolled plate description, manufactured expressly in England, being for the sides one-eight of an inch in thickness, and for the roof one-sixteenth of an inch thicker. The gross weight of the glass will be 12 tons. It is worthy of mention that the roof has been adapted to the climate. There are no gutters, as gutters if broken when frozen would have a tendency to burst the framework, and in a year or two destroy the building. The circular portion of the roof will be covered with tin. The castings were all made by the Messrs. Hamilton & Sons, at the St. Lawrence Foundry, in this city. The contractors' cost of the building will amount to £4,878. To assure perfect safety the girders have been tested to a strain of double the pressure to which they can by any possibility be subjected, and are calculated to bear five times the ordinary strain of pressure."

At the ceremony of laying the foundation-stone, Col. Thompson, President of the Board of Agriculture, said: "As to the objects of the Exhibition, they were intended not only to advance the interests of agriculture, but also to encourage arts and manufactures. The Society was anxious that arts and manufactures should advance equally with agriculture. By agriculture alone a country could never become wealthy. It must also have trade and commerce and manufactures combined with agriculture."

The thirteenth Exhibition was inaugurated with unusual ceremonies. The Metropolitan Choral Society, composed of 250 vocal and instrumental performers, officiated with great success. Prayers were offered up by the Lord Bishop of Toronto; and an address was presented to His Excellency Sir Edmund W. Head, Bart., Governor General.

The Rev. John McCaul, LL.D., President of University College, delivered an excellent address in the Exhibition building, which, by the way, has very erroneously been called "The Crystal Palace," on "The state of Agriculture amongst the Romans."

The President of the Association, D. B. Stevenson, Esq., was unfortunately unable to assume the duties of his office on account of continued ill health. His place was supplied by W. Ferguson, Esq., the first Vice-President, who dwelt upon the manufacturing interest of the Province to a greater length than any of his predecessors. The subjoined extracts will explain the views entertained by that gentleman, and we should be glad to see other members of the Board of Agriculture more thoroughly imbued with the spirit they embody:—

"It may be alleged that this country is not sufficiently advanced, to require or maintain manufacturing on an extensive scale; and that the reclaiming of our forests, and a better cultivation of our cleared lands, should for many years be our chief object. This course might be found to answer, if the whole imigration to this country consisted of farming people; but as it does not, and as a very large number of those annually arriving at our ports, consist of artizans in the various mechanical branches, from the principal manufacturing towns, and places of the old world, why should the suicidal course be persisted in, of encouraging or necessitating them to take to farming as the mode of earning their future living, or in the event of their not doing so, oblige them for the want of employment in their own line of business, to seek it in the neighbouring republic, where with their skill and industry they contribute to build up the manufactures of foreign competitors at the expense of our own, and at the same time essentially advance the farming interests of that country by increasing the home consumption of the products of the farm.

"Thousands of the most skilful artizans and workmen from the Old World, are year after year following their friends, and seeking homes on this side of the Atlantic; and for want of suitable employment for them under our national flag, they as regularly leave our shores for the United States, where, with the wealth of their skill and labour, they enrich that country and make happy homes for themselves.

"As a proof of what Canada has done with the little encouragement which the Legislature has afforded her manufactures, we have but to examine within the limits of this Exhibition ground, and we perceive an excellence displayed in almost every department of Arts and Manufactures, in many instances not excelled by the older countries of Europe and America.

"And to what eminence our manufactures might arrive if properly encouraged, seeing the extensiveness of our forests, and the richness and profusion of our mineral productions, not even the most sanguine can predict. Notwithstanding the discouraging circumstances under which some of our infant manufactures are labouring against foreign importations, yet many are still successfully working, not only against want of proper protection, but also against the absence of that patronage to which home manufactures have so just a claim."

It is almost needless to say that this Exhibition was most successful, and illustrated in a very complete and satisfactory manner the remarkable

progress made in the country in agriculture, manufactures and art.

The fourteenth Exhibition was held at Kingston, in the building already described. The prize list amounted to $10,513; the entries to 4,830, being more than one thousand short of the number of entries at Toronto the previous year. Nevertheless the display was regarded as satisfactory, particularly with respect to live stock and agricultural products. Besides the customary annual address of the President, lectures were delivered by Dr. Lawson, Professor of Chemistry and Natural History in the University of Queen's College, and by the Rev. Hannibal Mulkins, on Scientific Agriculture.

It has been remarked, in a preceding paragraph, that the Association began its existence in 1846, wholly without funds. In 1860 the auditors certified that they had examined the accounts, and found that the sum of one hundred and ten thousand nine hundred and eight dollars have been received by the indefatigable Treasurer, R. L. Denison, Esq., and that there remained a balance in his hands of eight thousand and twenty-eight dollars on the 20th Sept., 1859. What further illustration of the pecuniary prosperity of the Association is necessary?

Ten years ago, the fourth Exhibition was held in the City of Kingston. Compare the fourth with the fourteenth Exhibition, and see the progress of the country reflected in the results.

Comparative Table showing the general results of the Exhibitions of 1849 *and* 1859.

	No. of Entries, 1849.	No. of Entries, 1859.
Blood Horses	16	9
Agricultural Horses	97	235
Heavy Draught Horses	...	34
Durham Cattle	54	68
Devon "	10	62
Hereford "	...	7
Ayrshire "	12	62
Galloway "	...	29
Grade "	51	38
Fat and Working Cattle	20	21
Leicester Sheep	79	90
Cotswold Sheep	...	29
Cheviot Sheep	...	12
Long-woolled Sheep	...	55
Southdown Sheep	16	53
Merino and Saxon Sheep	11	17
Fat Sheep	5	9
Yorkshire Pigs	59	11
Large Berkshire Pigs		2
Other large breed Pigs		9
Suffolk Pigs		23
Improved Berkshire Pigs		12
Other small breed Pigs		30
Poultry	22	179
Foreign Stock	39	22
Foreign Implements		2
Grain, Seeds, &c.	224	609
Roots and other Field Crops		368
Fruit		252
Garden Vegetables		349
Plants and Flowers		123
Dairy Products, Honey, &c.	63	156
Agricultural Implements—Power	101	141
Agricultural Implements—Hand		67
Cattle Food—Manures		9
Cabinet-ware	18	85
Carriages and Sleighs	40	54
Leather Manufactures		133
Fine Arts	78	165
Groceries and Provisions	...	185
Hats, Furs, &c.	...	46
Indian Work	3	104
Ladies' Work	165	318
Machinery, Metal Manufactures, &c	29	183
Miscellaneous	...	84
Musical Instruments	...	11
Pottery, Building Stones, &c.	3	16
Paper, Printing, Book-binding, &c.	7	17
Woollen Flax and Cotton Goods	99	170
Foreign Manufactures	...	20

Hamilton had the honor of being the scene of the Fifteenth Exhibition of the Association, one memorable from the circumstance that it was visited by his Royal Highness the Prince of Wales. There is probably no site in the Province finer than that chosen for the Hamilton "Crystal Palace." The building is of wood and glass, upon a permanent foundation. The entire area of the building is about 36,000 feet, the ground plan being octagonal in form, having four transepts. The building is two stories in height; the first story 16 feet in the clear, and the second 15 feet to the line of the eaves, with an arched roof of light appearance. At the intersection of the cross is an octagonal space 76 feet in diameter, and 54 feet to the line of the roof, this portion is also arched in a most substantial manner; the roof is surmounted with a cupola. The extreme height from the ground floor to the top of the dome is 100 feet, which is surmounted by a flag-staff 25 feet in height. The length of the building is 171 feet by 71 in width, and contains about 24,000 feet on the ground floor. There are four galleries, 54 feet wide by about 64 feet long with a corridor running round the centre octagon, connecting all the galleries; these galleries contain about 12,000 square feet; four spacious stairways lead from the ground floor to the galleries. The diagonals which form the octagon are only carried up one story, with flat tin roofs—access to which can be obtained from the galleries—affording a fine place for a promenade, and a beautiful view of the city and bay. One of the galleries is reserved especially for the exhibition of fine arts—three of its sides are close-boarded, and the light admitted through the centre of the roof by a lantern-light extending the whole length, the glass is frosted, or obscured in order to diffuse a mellow light. The whole of the glass throughout the building is frosted.

All the windows have semi-circular heads, with cut trusses under the same. The whole of the wood-work, in the exterior as well as interior,

is planed or wrought, together with the cornices; these cornices are supported at intervals with fine cut brackets. The building is painted outside with a warm light color, or stone tint, in oil, and it is intended to paint the interior in fresco. The dome, covered with tin, renders the building picturesque, and enables it to be seen a distance of several miles around. The gallery flooring is dressed and laid open, and the under side of the galleries lined with dressed boarding, to prevent the dust rising. The cost of the building was about $14,000.

In the address of the agriculturists, artisans, and manufacturers of Upper Canada to His Royal Highness, it was stated, that "This is the Fifteenth Exhibition of the Agricultural Association of Upper Canada, and we think it demonstrates to those who have witnessed the successive exhibitions from year to year, that they have been successful in stimulating the industrial classes in the improvement of all those productions upon which the property of Her Majesty's dominions so mainly depends." His Royal Highness in his reply said, "Blessed with a soil of very remarkable fertility, and a hardy race of industrious and enterprising men, this district must rapidly assume a most important position in the markets of the world."

Of this exhibition an able reporter states,* "The Exhibition of the Agricultural Association of Upper Canada, which has just been brought to a close, will long be regarded as a most brilliant epoch in the records of the Society. Closely connected with the visit of the illustrious personage, who made it the scene of his last public appearance in this part of the dominions of his Royal Mother, it possesses an historical interest which time will not readily efface, while as a memorial of the progress which we have made in those branches of industry most essential to our prosperity, it far outshines all that have preceded it."

We come now to the Sixteenth Annual Exhibition of the Association, that of the present year, when we enjoyed the opportunity of witnessing one of the most complete and successful displays which has yet taken place. In the ordinary course of events in Canada we naturally look for general progress in the staple industries of the country, notwithstanding years of depression and stagnation. One advantage of the periodical return to stated districts for the purposes of the Provincial Exhibition is the evident facility offered for making comparisons between the past and present, and estimating the amount of progress made in different departments near the scene where so much friendly rivalry and competition takes place. Is is not only reasonable to suppose, but it is a supposition well borne out by fact, that the merits of such exhibitions depend to a great extent upon the locality where they may be held. Proximity to the arena where competition takes place induces many to enter the lists who would be otherwise mere spectators of the rivalry of others. London is situated in the centre of one of the finest agricultural districts in the Province, and the expectation that all departments of husbandry would be fully represented, was more than realised.

The same object strikes different observers in many diverse ways. At the late London exhibition one fact could scarcely fail to arrest the attention of any visitor not wholly intent upon special subjects, but free to admire, or condemn, according to his unbiassed opinion.

While examining the workmanship we were not unmindful of the workman. It was a rare sight to witness so vast an assemblage and look in vain among them for a single object seeking compassion or indicating poverty and distress. Within the limits of the exhibition, such would necessarily be vain on account of the admission fee, but outside the gates where a large crowd remained during the days when the exhibition was open, not only was there an absence of any approach to mendicancy, but the appearance of the individuals composing the crowd indicated perfect freedom from privation or indigence. Not less surprising was the appearance of the visitors of all classes and grades, but especially of those who are the bone and sinew of the country. Thousands of strong and healthy looking men, the majority above the average height, spoke a language by their looks not to be misunderstood, and far better than words, described the country of their birth or adoption. Another marked feature of the present exhibition was its truly Canadian character, owing no doubt to the troubles in which the United States are involved, our friends across the border were not present in their usual strength, and though we may regret the cause, yet it shows us that we are now fully able to organize and carry out an unusually successful exhibition among ourselves, without even missing extraneous aid.

We do not propose to enter into a minute description of the London Exhibition, nor indeed is such the province of this *Journal*, but in a succeeding number we shall be able to describe and comment upon such articles in the department of Arts and Manufactures as may appear deserving of special notice. For the present it will be sufficient to give a general sketch, the particulars being so fully and truthfully furnished by the daily papers of London, Toronto and elsewhere, and already no doubt familiar to the readers of this *Journal*.

The building erected by the local committee was described in the last number, but for the sake of uniformity a brief notice is again given.

*Reported by Mr. William O'Brien, *Transactions of the Board of Agriculture*, Oct., 1860.

The exhibition building is erected in the vicinity of the Barracks, and within half a mile of the centre of the city, on a beautiful piece of ground of about twenty-six acres, a portion of which has been purchased from the Government by the Corporation for this purpose.

The ground plan of the building is a regular octagon, its dimensions from opposite angles being 186 feet. The space offered by the ground area is upwards of 24,000 feet, while the galleries give an additional space of 4,000 feet more. The external wall is built of white brick, on a foundation of rubble masonry and concrete, and is twenty-one feet in height. The entrance is through eight doorways, each eight feet wide and fourteen feet high, one at each angle. In the brick wall, on each side of the octagon and between the doorways, are five spacious windows, making on the ground floor forty windows. The roof of this portion of the structure is covered with felting, gravel, &c. The second tier of the building, containing the gallery, rises to the height of thirty-two feet above the ground line, and is 114 feet in diameter from opposite angles, giving a wall accommodation of more than 300 feet, lighted with forty-eight windows, every alternate one being hung on a pivot to admit of ventilation. The ascent and descent to the upper portion of the building is provided for by two stairways, one being intended for the entrance and the other for the exit of the public, and leading in opposite directions so as to divide the crowd. The third tier of the building is a continuation of the inside gallery wall, and runs to the height of forty feet above the ground line. This tier supports the cupola, and is covered with a shingle roof. The interior view is clear, and not interrupted by any timbers to the height of eighty-seven feet. The full height of the building, to the top of the flag-staff, is 114 feet; the dimensions of the cupola, twenty feet diameter by thirty-one in height; area of the ground floor and gallery 28,000 feet, being about the same area as the Hamilton Exhibition building, and 4,000 feet less than the Toronto building. The sheeting of the roof is painted a blue colour, the timbers a drab.

In expressing an opinion upon the manner in which the building served the purposes for which it was designed, we desire to avoid the appearance of criticising without suggesting beneficial alteration which would not be attended by much additional expense. First impressions are always most lasting, and when one enters a building crowded with objects of industry and art with a view to study or enjoy them, it is next to impossible to avoid being impressed more or less by the appearance of the structure in which they are displayed. The feeling produced on first entering the London Exhibition building is not a happy one. The gallery seems to drop like an opaque, dull and heavy screen before the spectator, at once creating disappointment and a disposition to be adversely critical. The massive supports in front of each doorway, obstructing the view across the building, increases the dissatisfaction, and the cold drab colouring of the plain undecorated timbers bring no relief to the eye, but rather confirms impressions just created. Red, white and blue are the natural colours for such a building, and there does not appear to be any valid reason why the gallery, which is painfully visible on entering, should not have been glazed and made instrumental in lighting the lower floor, and if not ornamental at least not an eyesore. Means, easily contrived, might with great advantage have been adopted for displaying a considerable part of the great variety of useful and ornamental ladies work above the gallery, where close inspection is not necessary, general effect being the object aimed at.

Passing now to the objects exhibited in the building, we are at once struck with the number of competing sewing machines; it is not a little remarkable that this invention should have taken such wide spread root throughout the United States and Canada, and, although only a few years old, has already reached such excellence in results. Some of these machines are very ingeniously contrived, and leave little to be wished for as household labour-saving machines. The furniture was substantial and good, but not particularly distinguished for beauty of design, although the materials are excellent and the workmanship superior. A reference to the illustrated catalogue of the Great Exhibition at London would speedily develope a more elegant description of drawing room furniture. The skill to construct is very evident, but the taste to arrange is susceptible of improvement. It is very satisfactory to be able to note the taste for music, and the means of cultivating that delightful art, which appear to grow together in Canada. Piano-fortes of Canadian manufacture were very well represented, a fact which of itself speaks well for the progress of our civilization. The collection of pipes and tiles for draining is another suggestive feature, and shows how the true principles of agriculture are spreading throughout the country. The specimens of pottery and earthenware were good, but this art is as yet in its infancy in Canada, owing to the remarkable cheapness of the imported articles. There was nothing that may be called new in stoves, fire-grates, or apparatus for warming houses. In this climate one would naturally look for various designs for economising fuel and distributing a uniform temperature throughout our dwellings. The German tile stove, in its present elegant forms and excellent adaptations, does not appear to have attracted the attention of Canadian manufacturers. The manufactures in leather were

good and created a favourable impression, they included carriage and team harness, saddles, whips, belt leather, patent leather, leather, in a word, in all its forms and many of its adaptations.. But we were disappointed with the small display of manufactures in wool, flax and cotton. We observed only cloth, winter and summer tweeds, blankets, carpets and counterpanes, woollen garments, flannel kerseys, woollen shawls, shirts, stocking, socks, and an assortment of cordage and twine. Many well known names were not among the exhibitors. Our flax and cotton manufactures had no representation; we know they exist now, but why were they not sent to our Provincial Exhibition.

The display of fruit considering the season, was magnificent. The flowers were indifferent, but the vegetables were good, and showed both improvement and skill. In horticulture immense strides have been made of late years in Canada.

The agricultural implements were very numerous and most of them of Canadian manufacture. Ploughs of many varieties, from the simple wooden implement adapted to the bush, to the drain plough for skilful and scientific husbandry. Subsoil, draining, and double mould ploughs are indicative of progress; where these implements are common, agriculture is in an advanced state. Mowing, reaping and other machines of this class were not so fully represented as might have been expected, but they are generally very ponderous and expensive to transport to great distances. Of cultivators the variety was also not in excess of former exhibitions. One important machine deserved particular notice as indicating progress. An improved liquid manure drill, for drilling two or more rows of liquid with turnips, mangels, carrots, &c., either on the ridge or flat. The use of liquid manures is of the utmost importance, and a machine to distribute them economically and uniformly is a great desideratum. The stump extractors were heavy cumbrous machines, wholly inapplicable for general use, especially when a stump extractor of far more simple character can be rigged by any farmer on his land with an ox chain and a long maple, elm or pine stick to act as a lever. The lever, which should be some fifty feet long, is fastened to the stump with a chain, and to the other extremity a pair of oxen or horses are attached, which rapidly twist the stump out of the ground. The minor implements used in husbandry were very numerous and of good construction, many of them having a finish highly creditable to the manufacturers. Bone manure in different sizes was present, but no superphosphates made from bones by the addition of sulphuric acid. This is one of the most valuable special manures, and should receive careful attention. Too much thought is apparently bestowed upon the multiplication of agricultural machines, to the neglect of those artifices whereby the fertility of the soil is maintained and increased. As we cannot always depend upon rotation of crops to fertilize our fields, we must look to manures, and after properly prepared farm-yard manure, bone dust and the phosphate from bones are the most valuable.

Two portable steam-engines were on the ground. This is another advance promising much for the future. In a report from the committee appointed by the Board of Arts and Manufactures, relative to the Great Exhibition held at London in 1862, particular attention was directed to the products of our forests. We are glad to see that a very excellent beginning has been made by Mr. Saunders of London, who displayed a very good collection of native medicinal plants, all of which were collected in the neighborhood of London. We would suggest that in future displays of the kind, the entire plant, if portable, should be exhibited, and when too large for such a purpose, a portion of the trunk, and specimens of the leaves. The Fine Art department was, on the whole, indifferent. Among a few paintings and drawings of superior merit were some wretched caricatures, for they were nothing better, displayed in painting in oil or water colours. Steps should be taken at future Exhibitions to make some selection before giving space to productions which might decorate the parlour of a remote country inn, but should not be admitted in a Provincial Exhibition as illustrations of provincial art. Of the Ladies' Work we have little to say; the most imposing contributions were the quilts, not differing in any marked particular from former specimens. A little attention to the selection of patterns, and the proper combination of colour, would be attended with advantage, and destroy, perhaps, the uniformity which appears to prevail in those particulars.

The Natural History department received considerable attention, and was represented by Canadian stuffed birds, native fishes, native insects, mammalia, native plants, and specimens of the woods of Canada in section and with the bark; also that delightful source of amusement and instruction, an aquarium, was exhibited.

It does not come within the province of this journal to describe the farming stock; but it would be unfair not to express both gratification and surprise at the display. In every department there was a marked improvement, and all evidently in the right direction. There cannot be a doubt in the mind of any one present at the Exhibition that astonishing progress has been made in Canada in this department of husbandry.

The Address was delivered by the President of the Association, John Barwick, Esq., of Woodstock, who took an enlightened view of the importance of

giving every encouragement to home manufactures. Mr. Barwick said in his Address:—

"Our aim should be to foster Canadian manufactures of those articles that we can advantageously produce. Every Canadian will concede that it is of great importance that our towns should be occupied by thriving mechanics and manufacturers, thereby giving to us a home market. How many of the youthful population of our towns and villages might be advantageously and economically employed in woollen and cotton factories who are now in too many instances, a burthen on their parents, and at the same time it is to be feared are in a course of training to become vicious members of society. The crop of wool for this year has been principally purchased for exportation to Great Britain, heretofore it has been exported to the United States to be there manufactured. Flax and hemp are certain and very productive crops in Canada, and might be advantageously grown for manufacturing purposes."

Mr. Barwick also said that "a very excellent suggestion was made in the September number of '*The Journal of the Board of Arts and Manufactures for Upper Canada*,'—'That a museum of natural products, both mineral, vegetable, and even animal, might rapidly be formed at each permanent Exhibition Building.'"

The amount of prizes given by the Association this year exceeded $12,000; the number of entries was above 6,000. On Thursday, the day on which the public were admitted at a reduced charge, the number of persons who passed through the exhibition building exceeded fifty thousand. We are, probably, within the mark, when we hazard the opinion, that there were between fifty and fifty-five thousand visitors present. It would be premature to institute any comparisons, based upon statistics, between this and preceding Exhibitions. It is sufficient to say, for the present, that it far exceeded general anticipations; that it was well arranged, well sustained, and was a flattering and cheerful exposition of the progress of the country in wealth, industry, and civilization.

Comparative Statement showing the amount of competition at all the Exhibitions held by the Association, between 1846 *and* 1858, *inclusive*:

Exhibitions.	Amount of Prizes Offered.			Tot. No. Entries.	Amount of Pri's Awarded		
	£	s.	d.		£	s.	d.
Toronto, 1846	400	0	0	1,150	275	0	0
Hamilton, 1847	750	0	0	1,600	600	0	0
Cobourg, 1848	775	0	0	1,500	575	0	0
Kingston, 1849	1,400	0	0	1,429	700	0	0
Niagara, 1850	1,276	11	9	1,638	950	0	0
Brockville, 1851	1,254	9	3	1,466	805	18	9
Toronto, 1852	1,479	9	9	3,048	1,228	5	0
Hamilton, 1853	1,602	10	9	2,820	1,323	6	3
London, 1854	1,794	0	6	2,933	1,356	17	6
Cobourg, 1855	2,304	1	6	3,077	1,735	8	6
Kingston, 1856	2,309	12	6	3,791	1,699	17	6
Brantford, 1857	2,517	17	0	4,337	2,046	10	0
Toronto, 1858	2,675	2	6	5,572	2,303	15	0

The Board of Arts & Manufactures

FOR UPPER CANADA.

THE GREAT EXHIBITION OF 1862.

The following letter has been received by Dr. Beatty, the President of the Board of Arts and Manufactures for Upper Canada. The appointment of an honorary Commission without funds to meet the necessary expenses attendant upon its meetings, &c., is of doubtful value.

SECRETARY'S OFFICE,
QUEBEC, 26th September, 1851.

SIR,—I have the honor to inform you that His Excellency the Governor General has had before him in Council petitions from the Boards of Arts and Manufactures of Upper and Lower Canada, and also from the Board of Agriculture of Lower Canada, on the subject of the proper representation of the products of Canada at the great International Exhibition to be held in London in 1862.

It had also been announced to His Excellency that Her Majesty's Commissioners for such International Exhibition will only communicate with Canadian Exhibitors through a Commission appointed by his Excellency for that purpose.

Under these circumstances His Excellency in Council has demed it expedient to appoint a Commission for the purpose above stated.

His Excellency has further been pleased to name the following gentlemen to act on such Commission, namely:—Sir William Logan, The Hon. Louis V. Sicotte, President of the Board of Agriculture, Lower Canada; Edward W. Thomson, Esq., President of the Board of Agriculture, Upper Canada; John Beaty, jun., Esq., M.D., President of the Board of Arts and Manufactures, Upper Canada; Iram C. Taché, Esq., M.D., and Brown Chamberlain, Esq., Secretary of the Board of Arts and Manufactures, Lower Canada.

His Excellency desires me to express his hope that you may find it consistent with your other engagements to act as one of the said Commissioners.

The appointmeut, I should add, is merely honorary.

I have the honor to be, Sir,
Your most obedient servant,
C. ALLEYN, Secretary.

John Beaty, jun., Esq., M.D.,
President Board of Arts and Manufactures, U. C.,
Toronto.

THE AGRICULTURAL STATUTE.

At the Annual Meeting of the Provincial Association held at London on the 27th ult., the following resolution was proposed by Col. Thompson:—

Col. THOMPSON moved—"That notice be given to the several electoral division Societies, to send each one delegate to attend a meeting to be holden in Toronto, the month preceding the meeting of the Legislature, for the purpose of agreeing upon and recommending such alterations as they might deem necessary in the Agricultural Statute."

The motion was seconded by the Hon. Mr. ALEXANDER, M.L.C.

Upon the suggestion of Dr. BEATTY, of Cobourg, the words "and that the Boards of Arts and Manufactures, and Horticultural Societies be invited to attend," were added.

Mr. FERGUSSON moved—"That in order more fully to carry out the spirit of the foregoing resolution a synopsis of the bill introduced at the last meeting be published, and a copy be sent to each county and electorial division Society, and that the travelling expenses of the delegates be paid out of the funds of the Association."

Both resolutions were carried.

BOOKS ADDED TO THE FREE LIBRARY OF REFERENCE DURING THE PAST MONTH.

CLASS III.

Gothic Architecture, an introduction to the study of; 12mo; 1861..... *J. H. Parker.*
Model Architect: A series of Original Designs for Cottages, Villas, Suburban Residences, etc.; accompanied by explanations, specifications, estimates, and elaborate details; 2 Vols., folio; 1860..... *Samuel Sloan.*
Villas and Cottages: A series of Designs prepared for execution in the United States; 8vo; 1857..... *Calvert Vaux.*

CLASS VI.

What Illuminating Was: A Manual of the History of the Art; 12mo; 1861..... *Wyatt & Tymms.*
What Illuminating should be, and how it may be practised: A Technical Manual; 12mo; 1861..... *Wyatt & Tymms.*

CLASS VIII.

Progressive Drawing Book of the Human Figure; folio..... *Julien.*
" " " Human Heads; folio..... *Julien.*

CLASS IX.

Millwright and Miller's Guide, illustrated by 28 descriptive plates, with additions by T. P. Jones; 8vo; 1853..... *Oliver Evans.*
Railroad Construction, a Handbook of, for the use of American Engineers; 8vo; 1857..... *George S. Vose.*
Railway Machinery: A Treatise on the Mechanical Engineering of Railways, embracing the principles and construction of Rolling and Fixed Plant; illustrated by a series of plates on a large scale, and by numerous engravings on wood; 2 Vols., folio; 1855.... *D. R. Clark.*

CLASS XV.

Laws of Shipping and Insurance with an Appendix containing the Merchant Shipping Act, &c.; 12mo; 1859..... *James Lees.*

CLASS XVII.

Marine and Naval Architecture; A Treatise on; or Theory and Practice blended in Ship Building; illustrated with more than fifty engravings; folio..... *J. W. Griffiths.*

CLASS XVIII.

Report of Commissioner of Patents for the United States, on Agriculture; 2 Vols., 1855-6.
Report of Commissioner of Patents for the United States, on Arts and Manufactures; 2 Vols.; 1859.....

CLASS XXI.

Illustrated Horse Doctor; being an accurate and detailed account of the various Diseases to which the Equine Race are subjected; together with the latest mode of treatment, and all the requisite prescriptions, written in plain English; 8vo; 1861..... *Ed. Mayhew.*

The Board of Arts & Manufactures

FOR LOWER CANADA.

ANNUAL COURSE OF FREE LECTURES.

"THE HISTORY AND LAW OF LETTERS PATENT OF INVENTIONS,"

BY DUNBAR BROWNE, M.A., B.C.L.

Society may be sub-divided into numerous sects upon religious, political or philosophical questions, but all men agree to use the improvements that are introduced in our physical life, and endeavour to increase them, inasmuch as each, no matter what opinions he may profess to entertain, loves the welfare of himself and his family and prefers ease and luxury to toil and drudgery. Look at the changes which have taken place within a few years. Are not our dwellings better constructed! better lighted! better ventilated! better heated! and better adapted to resist the attacks of the elements! Are not our vestments better, more comfortable, more durable, and less expensive? Are not our tables better supplied with nourishing and pleasant food? Are not our means of transport multiplied, and our journeys and distances shortened? Is not the very earth made subservient to our wants, and does she not yield her increase under the exercise of man's skill! And yet these are but the conquests of intelligence

over material things—changes which have been wrought by two potent agencies wielded by human intellect—Science and Invention.

Inventions are the offspring of reason, and as man's thoughts are his own, so an invention before being put into use exists only in the mind of its author; but so soon as his secret is disclosed to the public, the latter have a right to make use of it in any manner they please, without incurring any liability to the inventor.

As society is composed of many members, and makes rules and regulations for the protection and guidance of each, so the author of an invention is encouraged to carry on and disclose to the public the manner of constructing such invention on terms of mutual benefit, which it will be my object to explain.

The inducement given to inventors to complete their inventions consists of a species of monopoly, whereby the author of an invention is enabled to reap a reward according to the importance of his product, and when it sometimes happens that inventions are useless, the monopoly granted to the inventor for such invention is valueless, the value of the monopoly being proportionate to the value of the invention.

This monopoly or exclusive right to use an invention is a matter of favor rather than of right, and is a privilege granted by the Crown to the subject.

Although the origin cannot be traced, yet there is little doubt that England first adopted this system of rewarding inventors, and there is reason to believe that this prerogative of the Crown is a very ancient one. Hindmarch, in his treatise on Patent Law, alluding to this, says:—"Thus in a case decided "in the reign of Edward III., it is said that arts "and sciences which are for the public good are "greatly favored in law, and the King, as chief "guardian of the common weal, has power and "authority by his prerogative to grant many privi- "leges for the sake of the public good, although "*prima facie* they appear to be clearly against "common right."

The same author also mentions that during the reign of the same monarch, Edward III., "some "alchymists persuaded the King that a philoso- "pher's stone might be made, and that the King "granted a commission to two friars and two "aldermen to enquire if it was feasible, who cer- "tified that it was, and that the King granted to "the two aldermen a patent of privilege."

Monopolies, therefore, were granted in the early periods of the mother country, consisting of privileges procured by purchase or by favor from the reigning sovereign. These were, to a certain extent, equivalent to our Letters Patent, conferring upon the recipient exclusive privileges, differing, however, from those granted at the present time, in that they included not only manufactures, but even branches of trade.

The power to grant patents and the privileges to which this power gives rise are regulated by the common law, by statute law, and by the decisions of the courts. At first these grants had but little reference to the encouragement of inventive powers, but consisted more of trading privileges granted to a number or numbers of towns confederated together, the first of which was the Hanseatic League, to which England was to a certain degree indebted for her commercial importance, London being the only English town admitted into that great confederacy.

King John was the first to grant privileges and franchises to the metropolis and other English towns, and as far back as that period can be traced the existence of several London companies. Little change occurred in the commercial system of England from the death of King John, which occurred in the year 1216, to the reign of Queen Elizabeth, who succeeded to the throne of England in 1558. Though shackled with monopolies, with which the ignorance and bad faith of successive governments had oppressed it, commerce slowly but continuously gained ground. Monopoly was the great grievance of Elizabeth's reign. When an individual by talent, industry and research, makes a useful discovery, there is every reason for granting him an exclusive right of using it for a limited time as a reward for his ingenuity. This principle was early understood, but Elizabeth perverted it into the granting of patents for ordinary manufactures, or for the importation of foreign articles, either as gifts to her courtiers or as a means for raising money without the necessity of appealing to Parliament. Against this injustice the people cried out so loudly that Elizabeth had the grace or the good policy to admit she had been misled, protesting solemnly, however, that she had never granted one patent which she did not believe to be conducive to the public good. Some of the patents were then remitted to the courts of law, and were by them condemned as illegal. It should, however, be allowed that all the commercial monopolies granted in this reign were not detrimental to the English nation, for by her was the first charter granted to the East India Company, a monopoly which has served in no small degree to raise England in the scale of nations.

During the reign of Elizabeth's successor, James, Sixth of Scotland and First of England, monopolies were carried to such an extent, that instead of being productive of benefit, they, on the contrary, only gave rise to great dissatisfaction, until at length the people called so loudly for redress that the Legislature deemed it expedient to listen to the remon-

strances of the community and directed their attention to the subject, whereupon a committee was appointed to investigate the matter and alleviate the grievances complained of. The committee appointed to examine into these abuses began with three of them, one of which was for licensing all houses, a second for the inspection of inns and hostelries, and the third for the manufacture of gold and silver thread.

The result of this investigation brought to light a scene of fraud and corruption seldom to be met with, even under the most cruel and tyrannical governments. These three monopolies were set aside as being national grievances, and the patentees, Sir Giles Monyresson and Sir Francis Mitchell, were denounced as criminals, and from that time this matter became the subject of legislative enactments, and the "statute of monopolies" was passed, whereby the Crown gave up its right, or rather the right it claimed to grant monopolies, and in lieu thereof ascertained and fixed a limit to be observed in the consideration of all such matters, reserving to itself certain powers, and which exist and are exerted in the present time, extended as they have been by certain statutes passed in the reigns of the late and the present Sovereigns, to meet the exigencies of particular cases, and to render impartial justice between man and man.

The act referred to declared that all monopolies, grants and Letters Patent for the sole buying, selling, making, working or using of anything within the realm were contrary to law and void; but it made an exception of new inventions, still allowing the common right to take effect if the grants even for new inventions were not properly made. By this statute the Crown was deprived of its right to grant patents detrimental to the interests of trade.

Though suited to the age in which it was passed, this enactment was found, however, to restrict too much the enjoyment of patent privileges, and in consequence its signification has been modified by the decisions of the English courts of law and equity.

Nearly one whole century elapsed without any further change, and it was only in the reign of Queen Anne that the next alteration was made in the Patent law, by which the inventor was obliged to fyle within a limited time a written description of his invention, setting it forth in a fully comprehensive manner, otherwise the Letters Patent should become void. This instrument is the specification.

No further legislative enactments were made on this subject until within our own time, when in 1835 a bill, known as Lord Brougham's Act, was successfully carried through Parliament, where it was permitted to the patentee to fyle a disclaimer or renunciation of what was claimed by him as his invention, if such extra claim was made through error, as well as amendments, where doubts existed, and thereby the patentee was protected against the effect of errors which had been overlooked at the time the patent was applied for, errors which might otherwise vitiate the patent. This statute also allowed an extension of patents beyond the original term of 14 years, with consent of the Privy Council.

The most important changes in the Patent Laws of England were only effected, however, by an act passed on the first of July, 1852, containing provisions of a most liberal and beneficial nature, whereby one patent is granted for the United Kingdom of Great Britain and Ireland instead of three as heretofore. The average cost of each of these patents was £100, sterling, making £300 for a patent for the whole kingdom. The system of caveats was done away with as being fraught with injustice, and a system of protection provided for, which affords the inventor time to fully complete his invention without fear of piracy, and to ascertain the value of his invention after having worked out his ideas, before incurring the expense of a patent. A caveat is an instrument by which notice is requested to be given to any person having conceived, but not thoroughly completed an invention, whenever another person shall apply for a patent for such an invention. By this act British patents were restricted to the United Kingdom and to such colonies as had not enacted laws on this subject for themselves. It not only simplified proceedings, but introduced a more moderate scale of fees and a more convenient and equitable distribution of the periods for the payment of them. The patent office is placed under the control of commissioners, and is located in London, there being but one patent office for the United Kingdom. In connection with this office there is a free library which is daily open to the public for reference, and in a portion of the museum at South Kensington which was assigned to the commissioners by the Board of Trade, are daily exhibited, gratuitously to the public, a collection of very valuable and interesting models of patented machines and implements as also portraits of inventors. There are also in Edinburgh and Dublin places of deposit of copies of patents, specifications, disclaimers and other documents connected with patents for public inspection.

The Patent Laws of England, as they now exist, adapted to the decisions of the Courts of Law and Equity, are in my opinion the best in force in any country, for they not only acknowledge the rights of the inventor, no matter to what potentate he pays his allegiance, but they offer encouragement to perseverance and application, and invite the inventor to renewed exertion, fully partaking of that spirit of justice and liberality which has rendered the

reign of our present Gracious Sovereign a blessing not only to her own subjects, but to the age in which we live.

Having thus cursorily reviewed the history of the Patent Laws of the mother country, let us turn to our own Canada and see what has been done here for the protection and encouragement of the inventor, and how the Government of Canada recognizes the validity of the inventor's claims.

The introduction into the Province of grants of this description is of recent date, the first statute having been signed on the 9th March, 1824. It consisted of ten short sections, whereby any British subject residing in Canada could obtain a patent (extending over 14 years) for the invention of any art, machine, manufacture or composition of matter not known or used before in this Province by presenting to the Governor General a petition setting forth these facts, and fyling therewith a specification, drawings and a model in the office of the Provincial Secretary. The fee for a patent was £3 10s. or $14. The first Canadian patent was granted under the provisions of this act on the 8th of June of the same year 1824, three months after this act came into force.

The Government of Canada having published lately the specifications of patents issued in both Provinces, before and after the Union, from the year 1824 to January, 1844, and the specifications and drawings from the latter period to May, 1849, I am enabled to call your attention to some of the patents granted during those periods, that you may see how little attention the applications must have received before being granted. During 1824 but three patents were granted. (*See Patents.*) In 1825 there was but one grant. In 1826 there were three. In 1827 and '28 no grants were made. So that from 1824 to 1828, a period of five years, but seven Canadian patents were granted.

On the first of May, 1828, this statute expired by limitation, and no further action was taken until the following year, when an act was passed reviving and continuing the provisions of the first act until the first of May, 1831, with an additional clause extending its provisions to British subjects, residents of this Province, who, while travelling in foreign countries, discovered any invention not in use in Canada, and allowing them to take out a patent for its introduction, and placing them on the same footing and subject to the same conditions as inventors.

From the 31st October, 1826, to the 3rd October, 1829, not a single patent was issued in Canada.

In March, 1831, an act was passed extending the last act until 1836, and limiting patents of introduction to inventions discovered by Canadians while travelling in countries other than the United States and the British dominions.

In 1836 all acts passed on this subject were repealed and another passed, whereby it was provided that application for Letters Patent should be made by petition to the Governor General; that a specification and drawings and a model should be deposited with the Provincial Secretary, who should make out the patent and submit it to the Attorney General, who should, within fifteen days, certify at its foot the correctness or incorrectness of the grant and return it to the Provincial Secretary, who, if correct, should submit it to the Governor General for signature, and then record it in a book to be kept for that purpose, after which it was to be given to the patentee.

It was further provided that the discoverer of any improvement in the principle of any machine, &c., could patent the improved article, but the two patents were held to be distinct, and neither the original patentee was permitted to use the improvement nor the patentee of the improvement to use the original invention.

With the exception of the fee, which was reduced to $10, the other sections were those of the previous act.

In the spring of 1840, the Special Council, sitting at Montreal, passed an ordinance declaring the provisions of this act to be permanent. In 1849 an act repealing the Patent Laws in force was passed, and another enacted, which was again amended in 1851. From the 9th of March, 1824, to the 11th of May, 1849, inclusive, a period of over 25 years, there were granted in Canada 290 patents, being at the rate of eleven per annum.

The two acts of 1849 and 1851 now merged into the 132nd chapter of the Consolidated Statutes of Canada, form the Patent Laws of this Province, as they exist at the present day, and are common to both sections.

(*To be continued.*)

NOTES ON THE HISTORY OF PETROLEUM OR ROCK OIL.

By T. STERRY HUNT, M.A., F.R.S., of the Geological Survey of Canada.

Abridged from the *Canadian Naturalist*, July, 1861.

Public attention has lately been drawn to the petroleum furnished by the oil wells in Canada and the United States, and we have therefore thought it well to bring some few facts which may serve to explain the origin of this and of similar substances, including naphtha, petroleum or rock oil, and asphalt or mineral pitch, all of which are forms of bitumen, the one being solid and the others fluid at ordinary temperatures. These differences are, in many cases at least, due to subsequent alterations; the more liquid of these substances are mixtures of oils differ-

ing in volatility, and by exposure to the air become less fluid, and partly by evaporation, partly by oxydation from the air, eventually become solid and are changed into mineral pitch. These substances, which are doubtless of organic origin, occur in rocks of all ages, from the Lower Silurian to the tertiary period inclusive, and are generally found impregnating limestones, and more rarely, sandstones and shales. Their presence in the lower palæozoic rocks, which contain no traces of land plants, shows that they have not been in all cases derived from terestial vegetation, but they have been formed from marine plants or animal: the lattter is not surprising when we consider that a considerable portion of the tissues of the lower marine animals is destitute of nitrogen, and very similar in chemical composition to the woody fibre of plants. Besides the rocks which contain true bitumen we have what are called bituminous shales, which when heated burn with flame, and by distillation at a high temperature yield, besides inflamable 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 inflamable 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 readily dissolved from the rocks in which it occurs, while the 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 bituminous 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 imflamable 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.

The sources of petroleum and mineral pitch in Europe and in Asia, are for the most part, like those just named, confined to rocks of newer secondary and tertiary age, though they are not wanting in the palæozoic strata, which in Canada and the United States furnish such abundant supplies of petroleum. In the great palæozoic basin of North America bitumen, either in a liquid or solid state, is found in the strata at several different horizons. The forms in which it now occurs depend in great measure upon the presence or absence of atmospheric oxygen since by oxydation and volatilization the naptha or petroleum, as we have already explained, becomes slowly changed into asphalt or mineral pitch, which is solid at ordinary temperature. It would even appear that by a continuance of the same action the bitumen may lose its fusibility and solubility, and become converted into a coal-like matter.

An evidence of the presence of unaltered petroleum in almost all the Lower Silurian limestones is furnished by the bituminous odor which they generally exhibit when heated, struck or dissolved in acids. In some cases petroleum is found filling cavities in these limestones, as at Riviere à la Rose (Montmorenci,) where it flows in drops from a fossil coral of the Birdseye limestone, and at Pakenham, where it fills the cavities of large orthoceratites in the Trenton; from some specimens nearly a pint of petroleum has been obtained; it is also said to occur in the township of Lancaster in the same formation. The presence of petroleum in the Lower Silurian rocks of New York is shown in the township of Guilderland near Albany, where according to Beck, considerable quantities of petroleum are collected upon the surface of a spring which rises through the Hudson River or Loraine shales. On the Great Manitoulin Island also according to Mr. Murray, a petroleum spring issues from the Utica state, and he has described another at Albion Mills near Hamilton rising through the red shales of the Medina group; these have probably their origin in the Lower Silurian limestones, which may in some localities prove to be valuable sources of petroleum.

In the Upper Silurian and Devonian rocks bitumen is much more abundant; Eaton long since described petroleum as exuding from the Niagara limestone, and this formation throughout Monroe county in western New York is described by Mr. Hall as a granular crystalline dolomite including small laminæ of bitumen, which give it a resinous lustre. When the stone is burned for lime the bitumen is sometimes so abundant as to flow like tar from the kiln. In the Corniferous limestone, at Black Rock on the Niagara River, petroleum is described as occurring in cavities, generally in the cells of fossil corals, from which, when broken, it flows in considerable quantities. It also occurs in similar conditions in the Cliff limestone (Devonian) of Ohio.

Higher still in the series, at the base of the Hamilton group, occur what in New York have been called the Marcellus shales; these enclose septaria or concretionary nodules which contain petroleum, while at the summit of the same group similar concretions holding petroleum are again met with. The sandstones of the Portage and Chemung group in New York are in many places highly bituminous to the smell, and often contain cavities filled with petroleum and in some places seams of indurated bitumen. A calcareous sandstone from this formation at Laona near Fredonia in Chatauque county containing more than two per cent of bituminous matter. At Rockville in Alleghany county, according to Mr. Hall, the same sandstones are highly bituminous and give out a strong odour when handled, and in the counties of Erie, Seneca and Cataraugus abundant oil springs rise from the sandstones and have been known to the Seneca Indians from ancient times.

In the northern part of Ohio, according to Dr. Newberry, petroleum is found to exude in greater or less quantity from these sandstones wherever they are exposed, and the oil wells of Pennsylvania and Ohio are sunk in these Devonian sandstones, often through the overlying carboniferous conglomerate, and in some cases apparently, according to Newberry, through the sandstones themselves, which are supposed by him to be only reservoirs in which the oil accumulates as it rises through fissures from a deeper source, in proof of which he mentions that in boring wells near to each other, the most abundant flow of oil is met with at variable depths. In some instances the petroleum appears to filter slowly into the wells from the porous strata around, which are saturated with it, while at other times the bore seems to strike upon a fissure communicating with a reservoir which furnishes at once great volumes of oil. An interesting fact is mentioned in this connection by Mr. Hall. In the town of Freedom, Catarragus Co., New York, is a spring which had long been known to furnish considerable quantities of petroleum. On making an excavation about six yards distant, to the depth of fourteen feet, a copious spring of petroleum arose, and for some time afforded large quantities of oil, after which the supply diminished in both the oil and new springs, so that it is now less than at the first settlement of the country. Notwithstanding its general distribution throughout a considerable region in the adjacent portions of New York, Pennsylvania and Ohio, it is only in a few districts that it has been found in quantities sufficient to be wrought with profit. The wells of Mecca in Trumbull Co., Ohio, have been sunk from 30 to 200 feet in a sandstone which is saturated with oil; of 200 wells which have been bored, according to Dr. Newberry, a dozen or more are successfully wrought, and yield from five to twenty barrels a day. The wells of Titusville on Oil Creek, Pennsylvania, vary in depth from 70 to 300 feet, and the petroleum is met with throughout. The oil from different localities varies considerably in color and thickness, and in its specific gravity, which ranges from 28° to 40° Baumé, (from ·890 to ·830)

The valley of the little Kenawha in Virginia, which is to be looked upon as an extension of the same oil-bearing region, contains petroleum springs, which so long ago as 1836, according to Dr. Hildreth, yielded from fifty to a hundred barrels yearly. It here rises through the carboniferous strata, and as elsewhere is accompanied by great quantities of inflamable gas.

The black inflamable shales of the Devonian series in western Canada which were formerly referred to the Hamilton group, and are now considered to belong to the base of the overlying Portage and Chemung, appear at Kettle Point on Lake Huron and in portions of the region southward to Lake Erie, but the oil wells sunk in Enniskillen show that the source of the oil is really below the horizon of these shales, inasmuch as the underlying argillaceous shales and limestones of the Hamilton group are there found near the surface, and have been penetrated 120 feet, at which depth oil is still met with, leaving but little doubt that it is derived from the limestones beneath, which both in New York, and in Canada are impregnated with petroleum. A somewhat slaty brownish-black bituminous dolomite belonging to the Corniferous limestone from Kincardine, gave me not less than 12.8 per cent. of bitumen, fusible and readily soluble in benzole, and another from the Grand Manitoulin Island, which was a brown crystalline dolomite, yielded from 7.4 to 8.8 per cent. of similiar bitumen. The solid form of this bitumen at the outcrop of the rocks, is probably due to the action of the air.

The existence of liquid bitumen in the Corniferous limestone in western Canada was pointed out as long ago as 1844 by Mr. Murray, who tells us that this rock is generally bituminous, and that cavities in it are often filled with petroleum; the quarries near Gravelly Bay in Wainfleet are cited as an example, (Report of Geol. Survey, 1846, p. 87). In the Report for 1850 we find a notice of what are called oil springs, in which petroleum rises to the surface of the water near the right bank of the Thames in Mosa, and in two places on Bear Creek in Enniskillen. Subsequently Mr. Murray described a considerable deposit of solid bitumen or mineral tar, which occurs in the same township, extending over about half an acre, and in some places two feet in thickness, doubtless formed by the drying-up of petroleum springs, Report for 1851, p. 90.) I had already in the Report for 1849, p. 99, described this bitumen from specimens in the Museum of the Geological Survey, and called attention to its economic applications, remarking that "the consumption of this material in England and on the continent for the construction of pavements, for paving the bottoms of ships, and for the manufacture of illuminating gas is such that the existence of these deposits in the country is a matter of considerable importance." At this time solid bitumen was thus employed, but in the liquid form of petroleum its use was chiefly confined in Europe to medicinal purposes. Under the names of Seneca oil and Barbadoes tar it had long been known and employed medicinally by the native tribes of America. Its use for burning, as a source of light or heat, in modern time has been chiefly confined to Persia and other parts of Asia, although in former ages the wells of the Island of Zante described by Herodotus, furnished large quantities of it to the Grecian Archipelago, and Pliny and Dioscorides describe the petroleum of Agrigentum in Sicily, which was used in lamps under the name of Sicilian oil. The value of the naptha annually obtained from the springs at Bakoum in Persia on the Caspian sea was some years since estimated by Abich at about 600, 000 dollars, and the petroleum wells of Rangoon in Burmah are said to furnish not less than 400,000 hogsheads yearly. In the last century the petroleum or naphtha obtained from springs in the Duchy of Parma was employed for lighting the streets of Genoa and Amiano. But the thickness, coarseness and unpleasant odor of the petroleum from most sources were such that it had long fallen into disuse in Europe, when in 1847, the attention of Mr. Young, a manufacturing chemist of Glasgow, was called to the petroleum which had just been obtained in considerable quantities from a coal mine at Riddings in Derbyshire, from which by certain refining processes he succeeded in preparing a good lubricating oil. This source however soon becoming exhausted, he turned his attention to the somewhat similar oils which Reichenbach and Selligue had long before showed might be economically obtained by the distillation of coal, lignite, peat and pyroschists. To this new industry Mr. Young gave a great impetus, and in connection with it attention was again turned to the refining of liquid and solid bitumens, it being

found that the latter by distillation gave great quantities of oils identical with those from petroleum.

* * * * *

The (Canadian) wells occur along the line of a low broad anticlinal axis which runs nearly east and west through the western peninsula of Canada, and brings to the surface in Enniskillen the shales and limestones of the Hamilton group, which are there covered with a few feet of clay. The oil doubtless rises from the Corniferous limestone, which as we have seen contains petroleum; this being lighter than the water which permeates at the same time the porous strata, rises to the higher portion of the formation, which is the crest of the anticlinal axis, where the petroleum of a considerable area accumulates and slowly finds its way to the surface through vertical fissures in the overlying Hamilton shales, giving rise to the oil springs of the region. The oil is met with at various depths; in some cases an abundant supply is obtained at forty feet, while near by it is only met with at three or four times that depth, and in sometimes only in small quantities. Everything points to the existence of separate fissures communicating with a deep-seated source. At Kelly's well however, it would appear that a reservoir has been formed much nearer the surface, where in a bed of gravel and boulders, underlying the superficial clays, the oil rising from the rocks beneath has accumulated. The inflamable gas which issues from the wells is not necessarily connected with the petroleum, inasmuch as it is an almost constant product of the decomposition of organic matters, and is copiously evolved from rocks which are destitute of bitumen. It is similar to the gas of marshes and to the fire damp of coal mines. The question of the extent of the supply of petroleum is not easily answered; the oil now being wrought is the accumulated drainings of ages, concentrated along certain lines of elevation, and the experience of other regions has shown that the sources are sooner or later exhausted; but though the springs of Agrigentum, like those of Derbyshire, have nearly ceased to flow, those of Burmah and Persia still furnish, as they have for ages past, immense quantities of oil; nothing but experience can tell us the richness of the subterranean reservoirs. It is not probable that the Devonian limestone is equally rich in petroleum throughout its whole distribution, but the exposures of it in the west are too few to enable us as yet to say in what portions the petroleum predominates; as however this rock underlies more than one-half of the western peninsula, we may look for petroleum springs much farther east than Enniskillen. A well yielding considerable quantities of petroleum is said to occur in the township of Dereham, about a quarter of a mile S. W. of Tilsonburg, we may reasonably expect to find others along the line of the anticlinal, or of the folds which are subordinate to it.*

* [See the June Number of the Journal of the Board of Arts and Manufactures for a description of the Oil Districts in Enniskillen. —Editor, Jour. of Arts and Man.]

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Selected Articles.

THE ORIGIN OF COAL.

By Robert Hunt, Esq., F.R.S.

Before we can enter on the question of the origin of coal, it is necessary to state how we determine it to be of vegetable origin.

It has been said, by some microscopic observers, that a true ligneous structure can be detected in coal; this is, however, denied by our most eminent botanists. Plants, in great abundance, are found preserved in the coal measures; but these are not in the state of coal. However, the chemical constitution of coal clearly indicates it to have originated from plants. The vegetable world consists, essentially, of carbon, combined with the two gaseous bodies which form water—hydrogen and oxygen; and coal is formed of the same elements, differing only in the proportions in which they are combined. The progress of the change, from a living tree growing in the sunshine, to a dead lump of coal lying deep in the earth, is indicated to us, if not exactly determined.

Every one must have observed decayed wood. Whether the decay goes on by the process of *dry* or *wet* rot, it is still a case of slow combustion. The carbon is attacked by the oxygen—that, in every way wonderful gas, which is at once the supporter of life and light, and the destroyer of all things. By this combination a gaseous acid—carbonic acid—is formed and expelled, leaving, relatively, an increased quantity of carbon behind. Thus we have dark and dusty rotten wood in the works of art, and we have *brown coal* or lignite, in which the woody structure is preserved, in the products of nature. Chemistry shows us the kind of change which takes place; and although it does not explain to us the conditions under which the change occurs, it gives us an intelligible result:

	Carbon.	Hydrogen.	Oxygen.
Wood contains.....	49.0	6.0	45.0
Lignite "	60.0	5.9	31.4
Coal "	80.0	5.3	14.7

With this chemical evidence in support of the hppothesis that coal is altered vegetable matter, let us proceed to the examination of the physical conditions under which it was formed.

Geological research indicates a period in the history of our own land when the sea washed around an extensive group of low islands, formed of the older granitic and slaty rocks, from the waste of which the old red sandstone rocks were forming. In the course of ages these almost land-locked seas became shallower, and the deposited matter arose around the margins, towards the surface of the waters. Myriads of strange and beautiful fish sported in the waves which glowed with the reflection of a sun tropical in the intensity of its light and heat. On the slopes of the shores the coral animals were working in those days, as they are now laboring in the Pacific Ocean, forming their calcareous cells, so beautifully preserved in the limestones of Derbyshire and Devonshire.

Thus, by the wearing down of the land, and by the active agencies at work in the waters, vast tracts of low, swampy lands were formed.

These vast morasses, and the shallow waters of widely spread lagoons, became the abodes of a wild, a strange, vegetation. Tree ferns rose high into air and spread their fronds so thickly that deep shadow reigned forever in the groves. Hosts of smaller ferns almost infinite in variety, luxuriated in those shades—succulent plants, like the sigillaria and club mosses abounded; and other mosses and fungi covered the damp ground. Vegetable life was abundant—to a degree which we can scarcely realize. Amongst these teeming organisms, one of the most remarkable is the plant known as the *Siggilaria*. "They are generally," says Dr. Hooker, "but a few feet high, though sometimes two yards broad at their expanded bases; they are truncated at the top. * * * So common are they, that I have, in many South Wales and other collieries, counted five or six in the space of a few fathoms, always suggesting the idea of the erect stumps of trees in a forest." *Stigmaria*—long, serpent-like roots, shooting off from a centre into the mud in which they grew—were once thought to be a peculiar, a distinct, form of vegetable growth. They are now ascertained to be the roots of the *Sigillaria*.

These plants appear to have been of a very lax fibre. They grew, in all probability, to an enormous size with great rapidity, and as speedily decayed—forming and adding to the mass of *humus* which fed the mighty grasses, ferns and mosses, clustered and matted round the larger trees.

Vast swampy plains like those were thickly spread with the *Sigillaria*, sending their vast roots far over the mud, to absorb speedily the water required for their rapid growth. Graceful *Lepidodendrons* grew in abundance—these were gigantic arborescent club mosses, bearing, at the ends of their graceful leaves, their cone-like fruit.

There, again, were vast spaces covered with huge "horse-tails"—the *Esquisetum;* and on the soft, marshy silt of the river's edge and estuary, grew forests of reeds—*Calamites*. Ferns and mosses combined with these, and formed a mat of vegetation wich rapidly filled the shallow water. Floating in the deeper parts were found the *Asterophylites*. There were numerous varieties of this plant, all of them remarkable for their graceful forms, and apparently all growing in water sufficiently deep to float their branches and leaves. Under the influence of strong solar excitation, the vital powers of vegetable nature were stimulated to the highest. This was also quickened by a high terrestial temperature. We have evidences proving to us "that, in the ancient world," to quote the worlds of Humboldt, "exhalations of heat, issuing forth through the many openings of the deeply-fissured crust of the globe, may have favored, perhaps for centuries, the growth of palms and tree ferns, and the existence of animals requiring a high temperature, over entire countries where now a very different climate prevails." There is little doubt that such were the conditions when a teeming vegetable world drew its carbon from the atmosphere, in which it existed in the form of carbonic acid. That, under those conditions—life being at its maximum of power—these plants decomposed the carbonic acid; and, giving back the oxygen to the air, built up with rapidity their woody structures with the carbon thus obtained. These plants died, and decomposed—through the same agencies—as rapidly as they grew, forming dense beds of black matter, which were slowly re-

solved into the state of coal. Contemplate for a moment the length of time required to form a bed of coal such as that which exists in South Staffordshire, having a mean thickness of thirty feet. This is unusual; but even to form a coal bed of but one yard in thickness must have required a long lapse of ages!

It has been somewhat too hastily said that coal is formed directly from wood, and that much of it is found to retain its woody structure. There is, as before stated, great doubt on this point. That wood may be *eventually* converted into coal is admitted—but in changing it entirely loses the form of wood—retains no evidence of fibre. It may, under the influences of heat and moisture, be converted into a bituminous mass, which is eventually consolidated into coal; but we cannot discover any evidence of wood being transmuted directly to coal. The remains of woody trees found fossil in the coal measure strata may be silicified—may become limestone, may be iron ore—certain it is they are never coal. The probability is, that the coal mass itself was produced from cactus-like plants, from club mosses, from peat mosses, or from aquatic plants, either marine or fresh-water.

The vegetable mass, whatever may have been its origin, from which our beds of fossil fuel is derived, may have been formed from plants which grew on the spot where we now find it; and the *under-clay*, as it is called, is supposed to be the soil in which the plants grew; or it may have been removed by the waters in a plastic state, floated out into the deltas or seas, and eventually, in obedience to the law of gravity, have sunk to the beds of the then existing waters.

Knowing that many of these coal beds are several thousand feet below the surface, we have either to suppose—if we adopt the first hypothesis—a gradual subsidence of the earth to the depth at which the coal is now found; or, if we prefer the second, to imagine the filling up of the seas, after the coal has been deposited, by enormous beds of sandstone or of shale. Sir Henry de la Beche describes a section near Swansea having a total thickness of 3,246 feet; in this there are ten principal masses of sandstone, one of these 500 feet thick. They are separated by masses of shale, varying in thickness from ten to fifty feet. The intercalated coal beds sixteen in number, are generally from one to five feet thick—one of them, which has two or three layers of clay interposed, attaining nine feet.—*Memoirs of Geological Survey.*

Taking this instance only, we learn that there have been sixteen different formations of coal; that these have—each one of them—been covered up with hundreds of feet of sandstone and shale. The subsidence of the earth's crust is surrounded with difficulties of no common order—the filling up an ancient sea to the depth of 3,000 feet requires conditions which we can scarcely conceive to have existed — and in either case we seem to require ages of repose, during which a beautiful Flora drank in the sunshine—then cataclysmal action destroying all—followed by ages during which sand was deposited, bearing down with it but little evidence of there being any vegetable life.

Science has advanced far into the secrets of the earth's changes; but let us not deceive ourselves by supposing we have yet heard the voice of Nature proclaiming the true phenomena of our coal formations."—*St. James's (London) Magazine.*

TRANSMISSION OF GOODS ON THE PNEUMATIC PRINCIPLE.

Some experiments on a rather large scale were recently made on the right bank of the Thames, and immediately below the Railway bridge, Battersea, with a view of testing the efficiency of transmitting goods and parcels proposed by the Pneumatic Dispatch Company. The mechanical arrangements in connection with the experimental line of cast-iron tubing—which, like a huge black snake, stretches for more than a quarter of a mile along the river side—are few and simple. Under a temporary shed a high pressure steam engine, of thirty horse power, made by Watt & Co., and having its cylinder placed at an angle of forty-five degrees, is erected, and it gives direct motion through the medium of a crank to a large disc of sheet iron.

The disc runs on tumbler bearings, and narrows from about 2 feet 6 inches in breadth as its centre to 3 inches as its circumference, its diameter being 18 feet. Its interior contains four arms, to which the sheets of iron are fastened, and which serves as fans or exhausters. Through the hollow bearings, upon which the disc is made to rotate at a speed of from 150 to 200 revolutions per minute, a communication exists with a vacuum chamber below, and by the laws of centrifugal action the latter is speedily exhausted, to a certain extent, of air. The speed, in fact, of the disc, determines that extent, and a water Barometer registers it. The air rushes out with considerable force from the periphery of the disc. Between the vacuum chamber and the pneumatic tube, which is 2 feet 9 inches high, by 2 feet 6 inches in breadth, and a transverse section of which resembles that of the Thames Tunnel, there are fitted valves with hand levers for opening and shutting them. These may be said to comprise the whole of the motive and propelling agencies of the pneumatic system.

The tube has been laid down in Battersea Fields, in such a manner as to test severely the practicability of the scheme. It has several very sharp curves and steep gradients throughout its length, and it is socket-jointed, so as to leave its interior, which is just as it came from the sand, free from obstruction. The carriages are five feet in length, of sheet iron, and each turns upon four cast iron wheels of eighteen inches in diameter. The rails—so to speak—are cast in the bottoms of the tubes, and require, therefore, no 'laying' but that which the setting of the tubes themselves give them. A few strips of vulcanized india rubber screwed round the circumference of the face of the carriage constitutes the piston. This, however, by no means closely fills the tube. In fact, there is fully three-eighths of an inch clear between the exterior of the piston and the interior of the tube.

There is no friction, therefore; and, singular to say, the leakage of air does not interfere with the speed of transit. This can only be accounted for by the large end area which the carriages have, in comparison with the small area of leakage space and the comparatively low vacuum required. On Wednesday last the first experiment made was by loading a carriage with one ton of cement in bags, and entering it into the open end of the tube. Upon a given signal the engineer to the company causing the starting valve to be opened, the water barometer showing a column of seven inches in height, and the disc running at the rate of one hundred and fifty revolutions per minute.

In fifty seconds after, the carriage with its contents found its way into the engine house, through a door at the end of the tube, which it forced open, and then ran forward on rails to a butt placed to stop its progress. Next, two tons weight were placed in one of the carriages, and its transit occupied eighty seconds, under similar circumstances. The vacuum was now lowered until the barometer gauge showed two inches of water only, and a living passenger, in the shape of a not very handsome dog, was placed with one ton weight of dead stock, in a carriage. The signal was made by the workmen at the open end of the tube, the communicating valve was opened, and in one minute and a half the carriage and its four-legged guard were in the engine-house, the latter apparently not at all the worse for the exhaustion process to which it had been subjected.—*From the London Mechanic's Magazine.*

A SUBSTITUTE FOR GLUE—VEGETABLE ALBUMINE.

An improved process has been invented by E. Hanon, of Paris, by which he obtains vegetable albumine from gluten, for the purpose of applying it as a cheap agent for fixing printed colors on textile fabrics, and also for uniting pieces of wood, leather, &c. The following is the substance of the specification, as published in *Newton's London Journal of Arts:*—

Gluten is obtained by kneading wheat flour paste with water. During the operation of kneading, the feculent part of the paste is carried off with the water, and the glutinous parts unite and form an elastic substance called gluten, which contains about twice its weight of water; the gluten, in this state, is converted into albumine, by the process of fermentation.

In carrying out the invention, gluten of the best quality, free from fecula, and after having been well washed in warm water, is placed in vessels, in which it is left to ferment until it is completely soft, and has lost its elasticity, and until the greater portion of the water which it has taken up during the operation of kneading is combined with it; when the gluten has undergone the regular fermentation or modification, it offers no resistance to the finger, or to any article which may be passed through the mass, and the modified gluten should also adhere to the object with which it is brought in contact. The gluten, so modified, is then ready for use; but as it has been brought, by the process of fermentation, into a very thin paste, it is necessary to place it in moulds for drying.

The process of fermentation may be performed, either with or without the aid of artificial heat; when artificial heat is applied, the process is considerably expedited, and the heat found most beneficial is about 20° to 30° Fah., above the temperature of the surrounding atmosphere. During the fermentation, it is requisite to stir the gluten frequently, and to remove the water which rises to the surface. With the above temperature, and in operating upon about fifty or sixty pounds of gluten, placed in a vessel, the fermentation will be sufficiently advanced in three or four days, and the fermented gluten or vegetable albumine, will then be in the proper state for being made into thin plates and dried. The greatest care must be taken that the fermentation is stopped at the proper point, for if it is allowed to proceed too far, the gluten is converted into a noxious mass.

When the gluten is converted into vegetable albumine, it is divided, and formed into plates of about one quarter to three-eighths of an inch in thickness; this is effected by spreading the albumine in metal or other molds, by means of a spatula; it is then left to dry, either in the open air, or by the aid of a gentle heat, and the plates, when dry, are about one-eighth of an inch in thickness.

The process of converting gluten into vegetable albumine may be accelerated in the following manner:—The gluten is put into a vessel or boiler, and heated by steam, or in a water bath, but the heat must only be sufficient to soften the gluten, and should vary from about 105° to 140° Fah. The gluten combines and unites with the water which became incorporated with it in the operation of kneading; part of the water is, however, evaporated during the process of fermentation, and thus the time required for drying the modified gluten, in the manner before described, is reduced. The water and gluten, when united, form a perfectly homogeneous mass of a thin pasty consistency, which is removed from the vessel, and dried, as before described; or the drying chamber may be heated by steam, care being taken that the heat is very moderate. When dry, the vegetable albumine takes up the greater part of the water which it has lost through evaporation during the process of desication. In order to dissolve it, it is put to steep, for about forty-eight hours, in cold water, and, by preference, in soft water; during this time it should be frequently stirred. Before being used the liquid should be diluted with water, and well stirred and shaken up, so that the whole mass or solution is perfectly homogeneous. The quantity of water for dilution must be regulated according to the purpose for which the solution is required. One pound of the so-called vegetable albumine to one pound and a half of water will give a solution which may be used as a substitute for the strongest glue or gelatine, and which resists moisture to a great extent, and is not influenced by heat.

The solution may be used cold, and will retain its properties from ten to fifteen days in summer, and twice as long in winter; that is to say, if it is kept cool, and, if possible, in a current of air.

This vegetable albumine is applicable, first, for uniting pieces of wood, in lieu of glue or gelatine; secondly, for uniting pieces of porcelain, earthenware, glass, enamel, and other similar articles; thirdly, for uniting pieces of leather, skin, linen, paper, pasteboard, and other similar substances; fourthly, for rectifying, clarifying, strengthening, preserving, and generally improving malt liquors; fifthly, for sizing paper and warps; sixthly, for sizing, dressing, stiffening, and thickening every description of woven fabrics and silks, instead of, or combined with, animal gelatine, gum, dextrine, fecula, or other substances; seventhly, for fixing all colours, except ultramarine blue, in printing fabrics; it is requisite to add from ten to twenty-five per cent. of acetic acid, of the strength of seven or eight degrees of Beaume's hydrometer, to the vegetable albumine, which is then thickened in the ordinary manner with fine wheat flour, starch, fecula, or dextrine of wheat; care being taken to boil the same from ten to thirty minutes, according to the degree of concentration, and the consistence of the

color required. Before use, the mixture should be allowed to cool sufficiently to avoid coagulation. For ultramarine blue, a little ammonia is used, instead of the acetic acid; the vegetable albumine must then be dissolved in, or combined with, a solution of slacked lime or phosphate of lime or magnesia. Eighthly, as a mordant for fixing colors in dyeing; ninthly, as a means of fixing gold or other metal leaf on to fabrics, leather, or other materials. In this case, the vegetable albumine, in the form of a dry powder, is rubbed or spread on the surface of the fabric or other material; the gold or other metal leaf is then placed over the part to be figured, and it is fixed thereon by the pressure of a heated die or roller, on which the design is made in relief, The metal may be applied in any other form, instead of in leaf.—*Scientific American.*

OCEAN TELEGRAPHS.

The Geographical Society, popular and very prosperous, (for at each of its fortnightly meetings a score of members are added to the 1,400 already enrolled,) met recently. The main subject discussed was the North Atlantic electric cable. We may offer a few observations on this subject. The discussion arose out of papers read at the preceding meeting by the persons who conducted the survey by land and sea from Scotland to Labrador, and when we say that these persons were Sir Leopold McClintock, Captain Allan Young and Dr. Rae, it is the same as saying that it was performed with skill and intrepidity. But the practicability of connecting the Old and New World by an electric cable is a very different matter from a survey. Schemes as feasible, and even a good deal more so, have totally failed; but the reader shall judge for himself when we enumerate a few of them. First, then, the great Atlantic cable has been a great failure, and has cost the subscribers, as far as we can understand, £450,000; the pounds and cable are equally at the bottom of the Atlantic. The next attempt was a greater, because a more costly failure. This was the Red Sea and Indian affair. It was to have brought the Nile and the Indus almost within hail of each other, although the distance between them was little short of 1,700 miles. For this adventure the government has given a guarantee of 4½ per cent. on a million sterling for half a century, or, in other terms, the nation is for that long time to pay an annuity of £45,000 without receiving the smallest consideration in return. It never conveyed even a single message throughout, so that, as far as the nation is concerned, the million sovereigns might as well have been consigned to the sea that swallowed up Pharaoh, his horses, his chariots and his horsemen. In the able debate which took place in the House of Commons, an honorable member naively and drolly ascribed the failure "to certain occult causes at the bottom of the sea, which could not be provided against." Our next speculation was meant to connect England with Spain by Falmouth and Gibraltar, and the government bargained in this case for a first-rate cable at the cost of some £400,000, but the Atlantic being deemed too deep for it, it was transferred to Rangoon and Singapore, a distance of 1,200 miles, embracing the best part of the Bay of Bengal and the whole of the Straits of Malacca, among a hundred isles, islets and coral reefs. The ship bearing it was wrecked in Plymouth harbour, when the cable was discovered to be damaged by the corrosion of the iron and the decomposition of the gutta percha. It was not, therefore, deemed good enough for the Indian Ocean, and it is now destined to connect Malta with Alexandria; all the cables of the Mediterranean, whether English or French, having already failed. If we include the cable which was to have connected Malta with Spezzia, through Sardinia and Corsica, and that which was to have connected Malta with Corfu, both of which have failed, we have spent not less than two millions in experimenting upon oceanic cables. But we are not the only people who have failed in a matter of long cables. The cable that was to have connected Algeria with France will not work, although it embraces but the breadth of the Mediterranean. The Dutch laid down a cable between Batavia and Singapore about six months ago. The distance is 660 miles, and it conveyed, like the great Atlantic cable, a few messages, when it stopped. Ships' achors and coral reefs were fatal to it; it has broken a score of times, and has been finally given up as a hopeless project. Such, then, being the result of our experience of oceanic electric cables, what chance of success can there be with a cable that purposes to bring the Old and New World together by the route of Scotland, the Faroe Islands, Iceland, Greenland and Labrador, over seas infested by icebergs, and along ice-bound coasts? We fear none whatever. The distance is little short of that across the South Atlantic. There are sea-gaps of 800 and of 500 miles, and the inhospitable land is rather an hindrance than an advantage. We are, then, decidedly of opinion that a North Atlantic cable is a hopeless project that will not be, and ought not to be attempted. The government, goaded on by the press and the public, has been already severely bitten, and will assuredly not guarantee a farthing. Without its guarantee there will as assuredly be no subscribers. Until some great discovery is made which no man at present even dreams of, our electric cables must be confined to the narrow sea, and the wafting of "sighs from India to the Pole" must be still an achievement known only in the domain of poetry.—*Examiner.*

THE RUSSIAN TELEGRAPH FROM CHINA TO EUROPE.

It is an established fact that mercantile houses of long standing in the East are very conservative in their ways, and views with little favour, the innovations caused by steam and electricity. Lieutenant Waghorn, the pioneer of the overland route to India, found small acceptance when he visited Canton in 1838, and proposed to British merchants the formation of the line afterwards made by the Peninsular and Oriental Steam Navigation Company; and had Chinese affairs remained as they were—had there been no opium war, no Hong Kong under British rule—it is more than probable that we should not to this hour have had a line of mail between this and Suez. Bearing this conservatism in mind, it seems problematical whether the proposed line of telegraph between China and Russian Europe is not deemed by leading merchants here a nuisance rather than a good. This telegraph way, according to late advices, is making rapid progress and is already complete over some 600 miles to the eastward of Moscow, viz., to Perm, on the border of Siberia, say to long. 55 deg. E. and lat. 58 deg. N. From

Perm the line will cross the Uralian Mountains to Ickaterinberg, and thence to Toumain on the left bank of the Irtysch. From Toumain the line is to run to Omsk, a fortified town, the importance of which may be judged by the circumstance of its having a garrison of 4,000 men. From Omsk the line will proceed to and through Tomsk and on to Krasnoyarsk. This place is only 500 miles north-west of Kiakhta, to reach which, however, the wire will pass through Irkutsk, the capital of Eastern Siberia. From Kiakhta, (Mai-matsin, in China,) it is proposed to carry the line over the Yablanovoi Mountains to Cheta, to which place steamers already run from Nicalouski, on the Amoor. The line will not follow the line of the Amoor River, however, but across to Nestchmisk, and then down the Shilka River to Ourstrelka, a point just 6,000 miles from Moscow. How long it will take to construct the whole line we are not in a position to say; two or three years perhaps. Once constructed, however, the terminus on this side will become a place of note, and prove a leading instrument in the steady march of civilization in the East.—*Friend of China.*

THE BESSEMER PROCESS OF MAKING STEEL.

Hematite pig-iron, smelted with coke and hot-blast, has chiefly been used. The metal is melted in a reverberatory furnace, and is then run into a founder's ladle, and from thence it is transferred to the vessel in which its conversion into steel is to be effected. It is made of stout plate iron, and lined with a powdered argillaceous stone found in this neighbourhood below the coal, and known as ganister. The converting vessel is mounted on axes, which rest on stout iron standards, and by means of a wheel and handle it may be turned into any required position. There is an opening at the top for the inlet and pouring out of the metal, and at the lowest part are inserted seven fire-clay tuyeres, each having five openings in them; these openings communicate at one end with the interior of the ves sel, and at the other end with a box called the tuyere box, into which a current of air from a suitable blast engine is conveyed under a pressure of about 14lb. to the square inch, a pressure more than sufficient to prevent the fluid metal from entering the tuyeres. Before commencing the first operation, the interior of the vessel is heated by coke, a blast through the tuyeres being used to urge the fire. When sufficiently heated, the vessel is turned upside down, and all the unburned coke is shaken out. The molten pig iron is then run in from the ladle before referred to; the vessel, during the pouring in of the iron, is kept in such a position that the orifices of the tuyeres are at a higher level than the surface of the metal. When all the iron has run in, the blast is turned on, and the vessel quickly moved round. The air then rushes upwards into fluid metal from each of the thirty-five small orifices of the tuyeres, producing a most violent agitation of the whole mass. The silicum, always present in greater or less quantities in pig iron, is first attacked. It unites readily with the oxygen of the air, producing silicic acid, at the same time a small portion of the iron undergoes oxydation, hence a fluid silicate of the oxide of iron is formed, a little carbon being simultaneously eliminated. The heat is thus gradually increased until nearly the whole of the silicum is oxydised; this generally takes place in about twelve minutes from the commencement of the process. The carbon now begins to unite more freely with the oxygen of the air, producing at first a small flame, which rapidly increases, and in about three more minutes from its first appearance we have a most intense combustion going on; the metal rises higher and higher in the vessel, sometimes occupying more than double its former space. The frothy liquid now presents an enormous surface to the action of the oxygen of the air, which unites rapidly with the carbon contained in the crude iron, and produces a most intense combustion, the whole, in fact, being a perfect mixture of metal and fire. The carbon is now eliminated so rapidly as to produce a series of harmless explosions, throwing out the fluid slags in great quantities, while the union of the gases is so perfect that a voluminous white flame rushes from the mouth of the vessel, illuminating the whole building, and indicating to the practised eye the precise condition of the metal inside. The workman may thus leave off whenever the number of minutes he has been blowing and the appearance of the flame indicate the required quality of the metal. This is the mode preferred in working the process in Sweden. But here we prefer to blow the metal until the flame suddenly drops, which it does just on the approach of the metal to the condition of malleable iron; a small quantity of charcoal pig iron, containing a known quantity of carbon, is then added, and steel is produced of any desired degree of carburation, the process having occupied about twenty-eight minutes from the commencement. The vessel is then turned, and the fluid steel is run into the casting ladle, which is provided with a plug rod covered with loam: the rod passes over the top of the ladle, and works in guides on the outside of it, so that, by means of a lever handle, the workmen may move it up and down as desired. The lower part of the plug, which occupies the interior of the ladle, has fitted to its lower end a fire-clay cone, which rests in a seating of the same material let into the bottom of the ladle, thus forming a cone valve, by means of which the fluid steel is run into different sized moulds, as may be required, the stream of fluid steel being prevented by the valve plug from flowing during the movement of the casting ladle from one mould to another. By tapping the metal from below, no scoria or other extraneous floating matters are allowed to pass into the mould.—*Chemical News.*

PROPOSED OPENING OF THE BRITISH MUSEUM TO THE PUBLIC BY GAS-LIGHT.

To the great masses of our working population, this Institution, on which millions have been expended, and which is kept up by a large national expenditure, is at present far too little available as a place of recreation and instruction. On the few holidays which occur at Christmas, Easter, and Whitsuntide, we see crowds of workingmen and their families, gladly availing themselves of these rare opportunities, and no doubt some good is effected by those visits; but in these days of advanced intelligence, the British Museum should be devoted during seasonable hours, to the uses of the many thousands of young men and others who are using earnest endeavours for their advancement and improvement. To many of these the opening of this collection in the evenings, up till say 10 o'clock, would be a very

great advantage: besides this, to the public generally, it would afford an opportunity of viewing the rare treasures and curiosities which have been gathered here at so much labor and cost. For these and other important reasons, therefore we regret that the trustees have resolved that they would not be justified in allowing the collections of the Museum to be opened at any hour which would require gas-light.

Upon first considering the resolution which has been come to by the trustees, most persons will experience astonishment and some alarm at the late Mr. Braidwood's account of the inflammable nature of a building which has been erected by so large an outlay in our own days. By that gentleman's report, this museum—which contains priceless treasures of the world's art, objects, which, if destroyed, could never be replaced; the rare manuscripts, the chronicles of history, and the stories of old and new world learning, the real value of which cannot be estimated by any standard of price; the records of the famed cities of antiquity, whose glories have for centuries been laid in the dust; the relics of dynasties which have passed away; and examples of the arts of many ages, which are so useful to the historian and artist; the collection of objects of natural history; the store of prints, drawings, &c.—is, if it would be exposed to danger from gas-lighting, at any time liable, even at present, to risk from neglect, accident, or a spirit of mischief. These are uncomfortable reflections, and cause persons to inquire how it has occurred that a building intended for such purposes, has not been so constructed as to be perfectly safe from the danger of fire. At the present time there are steam-works and fires below for the purpose of heating and ventilating the new reading room, print room, &c.: there are also fire stoves in the manuscript and other departments, and in the private rooms of the officers. We mention this for the purpose of suggesting that if the shadow of risk exists of the burning of the contents of the Museum, no time should be lost in making those alterations which will prevent gas-light, or any other kind of light, from doing damage. The floorings, such as that of the King's library, the bookcases, staircases, (if any such exist,) rafters, or other inflammable parts of the structure, should, without delay, be removed, and others of a more safe description substituted.

While acknowledging the great experience of Mr. Braidwood, in connection with fires, we cannot admit that any great extra amount of danger would result from the lighting of the British Museum with gas, provided that this is carefully and properly managed; and, in fact, unless the electric light should become available, by means of the experiments which are constantly being carried on by men of science in various parts of the world—without the use of gas, the British Museum will not become a means of enlightenment to the artizans and numerous other classes of the metropolis who cannot spare the working hours for the purpose of pursuing those studies which would advance them in skill and intelligence.

At the Kensington Museum, gas-lighting is used with safety and good effect.

It will be impossible to oppose for much longer the strong voice of public opinion on this subject: the intelligence of the people is rapidly improving; and means must be taken to render such establishments as the British Museum accessible at hours convenient to the industrious classes of London.—*London Builder.*

Miscellaneous.

The British Census of April, 1861.

The population of Great Britain was estimated at 7,392,000 in 1751.

The population of Great Britain was then enumerated in 1801, and amounted to 10,917,000, and with that of Ireland united with her, made above 16,000,000. Notwithstanding the war the population increased, as the census showed, at the rate of two to three millions every ten years until 1841. Then immense emigrations took place; there was a depopulating famine in Ireland, which had an imperfect poor law, and cholera was epidemic; yet the population of Great Britain was augmented by 2,308,000, and although the population of Ireland fell off, the people of the United Kingdom amounted to 27,724,000 in 1851. There will be no investigation as to the "religious profession" of any one. That inquiry, when proposed last year, having been met with general disapproval, was abandoned by the government.

Vital Statistics of Scotland.

The Registrar-General for Scotland, who has hitherto issued no detailed annual reports, has just commenced the series, beginning with his first year of office, 1855. Taking first the births, the superintendent of statistics calls attention to the circumstance that the proportion of boys born to girls is greater in the rural districts than in the towns, in which, indeed, in that year, the illegitimate boys born were absolutely fewer in number than the girls. This is attributed to a residence in towns weakening the physical strength of parents, and it is considered a rule so established as to "afford a valuable hint to those who desire male progeny." It would appear from the year's returns, that, though marriages are much fewer in Scotland than in England, yet, when Scotchwomen do marry, they are much more prolific than the English. Some rather curious matrimonial statistics are supplied. It is remarked that widows, marrying bachelors, selected, as a general rule, husbands younger than themselves; "the *status* which the widow had acquired by her former marriage presented inducements to the unsettled bachelor, which gave the widow a great advantage over her unmarried sisters; and, as power is dear to every heart, a younger member of the opposite sex was selected, as more likely to leave that power in her hand than if the chosen second husband had been her senior in years." The Scotch stand the educational test well; 86.6 per cent. of the men who married, and 77.2 of the women signed their names. In England, in the same year, the proportions were 70.5 and 58.8 The deaths in the year (a year of more than average mortality) were only 206 deaths in 10,000 persons, showing Scotland to be one of the very healthiest countries on the face of the globe. The annual per centage of deaths to population is stated thus: Scotland, 2.06; England, 2.21; France, 2.36; Belgium, 2.52; Holland, 2.76; Prussia, 2.83; Spain, 2.85; Sardinia, 2.91. Some points of interest in relation to disease and mortality are noticed. Including the secondary diseases, twice as many women died from childbirth as in England. This is thought not much attributable to distance from medical aid, and the question is raised whether it is not owing to certain anatomical conformations. It

may seem strange to speak of Scotland as a place for the consumptive, but Argyll and the Western Isles enjoy a remarkable immunity from consumption; those islands have a mild winter climate, with a more humid atmosphere than the main land when the arid easterly winds prevail in spring. Of the influence of weather, we learn that in Scotland, with the single exception of diarrhœal complaints, all the ordinary epidemics of the country increase with the increase of cold, and it is the cold that kills. The diseases induced by heat seldom prevail anywhere until the mean monthly temperature rises above 60 degrees, and that is a rare occurrence in Scotland.

Cities in Great Britain.

Liverpool.—The population of Liverpool, in round numbers, is 450,000. The city proper contains but 263,000 persons, the remainder being distributed in the suburbs of Exeter, Kirkdale, West Derby and Toxteth Park. The port of Liverpool has a large floating population of sailors, reckoned in this census at about *fourteen thousand* men. In 1841 the number of sailors was twelve thousand, in 1851 it was thirteen thousand, and in 1861 but one thousand more than ten years ago. The total population of the city and its suburbs, at the census of 1851, was 375,955, so that the increase in ten years has been a little more than twenty per cent.

During the last four years the number of inhabited houses in Liverpool has likewise increased from 54,000 to 66,000. In 1831 the buildings in the town were estimated to cover an area of 6,000,000 square yards, while in 1765 they only covered an area of 1,184,000 square yards.

Manchester.—Manchester has decreased in population, losing 2,000 inhabitants of the city proper by reason of the conversion of dwelling-houses to offices and other business purposes, and alterations in narrow streets. The increase in the townships adjoining that of Manchester is extraordinary, but may be accounted for by the compulsory migration from Manchester arising out of the causes mentioned. The present population of the city and its suburbs is 357,000—a gain of 40,000 in ten years.

The census superintendent in Manchester reports, that while the decrease in the city proper is going on, the conversion of property out of which it arises increases the gross assessment of the township, by better buildings, in a remarkable way. The effect will be to reduce the poundage on the poor and other rates, and eventually to reduce pauperism by the sweeping away of the lower descriptions of dwellings.

Glasgow.—The analysis of the city of Glasgow has been published. The population of the "ancient burg" of Glasgow amounts to 403,142; of whom 189,220 are males and 213,922 are females. The population of the district known as the "ancient burg" and the suburbs is 446,395; of whom 209,999 are males and 236,396 are females. The amount of the population in 1851 was 360,138; thus showing an increase, in 1861, of 86,257. In 1861 the number of inhabited dwellings was 82,600, and of uninhabited, 4,002, compared with 63,153 and 1,547 in the year 1851, being an increase, in 1861, of inhabited dwellings, to the extent of 19,456, and of uninhabited, 2,455. The population is composed of 326,374 Scotch, 10,809 English, 63,574 Irish, 827 foreigners, 1,440 colonists, and 118 not ascertained. The number of males between the ages of five and fifteen, amounts to 40,694, with 40,118 females; and of this number 116,868 males and 16,214 females were not, at the taking of the census, at school. The number of domestic servants within the city was 218 males and 12,856 females; total, 13,074.

Population of the Principal Cities of Europe.

London,	2,950,000
Paris,	1,525,525
St. Petersburg,	494,656
Vienna,	476,222
Berlin,	438,961
Naples,	413,920
Madrid,	301,660
Lisbon,	275,286
Brussels,	263,481
Amsterdam,	248,756
Pesth and Bude	186,945
Rome,	180,359
Turin,	179,655
Hamburg,	171,696
Copenhagen,	113,635
Venice,	118,172
Dresden,	117,750
Munich,	114,734
Stockholm,	101,502

Population of the World.

M. Dietrici, director of the office of Statistics at Berlin, has published in the annals of the academy of that city the result of his researches relative to the present population of the globe. An addition to his calculation of the total number of inhabitants, which he puts down at upwards of 1,288,000,000, M. Dietrici estimates the number of the different human races as follows:—The Caucasian, 369,000,000; the Mongol, 552,000,000; Ethiopian, (negroes) 196,000,000; the American, (Indians,) 1,000,000; the Malays, 200,000,000. The leading religions he divides as follows: Christianity reckons 335,000,000 adherents; Judaism, 5,000,000; the Asiatic religions, 600,000,000; Mahometanism, 160,000,000; and Polytheism, 200,000,000. Of the Christian population, 170,000,000 belong to the Roman Catholic church; 80,000,000 to Protestants, and 76,000,000 to the Greek church.

Curiosities of the English Census.

Relative Population of London and the Provincial Towns—Excess of Females in England.—The Registrar-General estimates the number of English emigrants from the United Kingdom in the ten years between 1851 and 1861 at 640,210, and returns the number of registered births over registered deaths in the same period at 2,260,576. This would leave an increase of 1,620,366, but the actual augmentation enumerated on the 8th of April was 2,134,116, showing that 513,750 births must have passed unregistered in the ten years. It appears that the population of London is nearly equal to that of the twenty leading provincial towns, having a population of 70,000 and upwards—Bolton, Birmingham, Bradford, Brighton, Bristol, Hull, Leeds, Liverpool, Manchester, Newcastle, Norwich, Nottingham, Oldham, Portsmouth, Preston, Salford, Sheffield, Stoke-upon-Trent, Sutherland and Wolverhampton, all put together—the metropolis having 2,803,034 inhabitants, and the great provincial centres, 2,963,945. The population of the latter is, however, increasing more rapidly than that of the metropolis, the aug-

mentation having been 440,798 in London, as compared with 591,058 in the provincial towns, so that Cobbett's "great wen," is not, as some assume, absorbing all the power of the State.

With regard to forty-three secondary towns, the population of which ranges between 20,000 and 50,000, an advance has been made from 1,414,093 in 1851, to 1,653,386 in 1861, showing an augmentation of 239,293; and one hundred and seven still smaller towns, including, as in the case of their larger brethren, the additions made to many of them for parliamentary purposes, having a population of from 5,000 to 20,000, had in 1851, 954,038, and in 1861, 997,389 inhabitants, showing an augmentation of 43,351. The metropolitan district consequently increased in population at the rate of eighteen per cent.; the great centres of manufacturing industry at the rate of twenty-four per cent.; the second class towns at the rate of seventeen per cent.; and the little boroughs at the rate of four per cent. In fourteen still smaller townships, having less than 5,000 inhabitants each, the population remained all but stationary, being 52,108 in 1851, and 52,559 in 1861; so that the lower one gets in the scale the more stagnant one finds the tide of human life.

The excess of the fair sex in England amounts to the alarmingly large total of 544,021; but this disproportion between the sexes is not universal, the rougher section of humanity being in a majority in Derbyshire, Durham, Essex, Herefordshire, Kent, Hampshire, Staffordshire and Westmoreland. In Middlesex there 165,389, and in Lancashire, 86,100 more women than men, and the agricultural counties also reflect the continuous drain of emigration upon their adult male population.—*London Times.*

Canadian Timber for France.

A contributer to the January number of the "*Annales Forestieres et Metallurgiques,*" a Parisian magazine of a semi-official character, writing under the heading of "*Les bois de Canada,*" speaks of the decline of the timber exports of Norway, and of the impossibility of obtaining from thence the wood necessary for manufactures in France, and says:

"Everybody knows that our former colony is, so to say, a vast forest of four thousand leagues square, possessing as means of transit magnificent lakes and rivers, and in which whole armies of wood-cutters, or 'lumberers,' as they are called, cut down every year from eight to ten millions of cubic metres of timber, the greatest part of which is exported to the United States, and more particularly to England."

He goes on to argue in favor of exchanging for Canadian lumber the staple products of France, her wines, her porcelain, her silks, woollens and cottons, and above all, her "*tabac de-caporal,*" which, he remarks, is "the delight of French Canadians."

Basswood.

In the United States, basswood is used to a considerable extent for seats of chairs, insides of drawers, parts of fanning-mills, and many other uses for which it is better adapted than almost any other wood. It is both light and strong, works easily and is not apt to split.

Basswood is one of the most abundant woods in Canada, but it has so far received little or no attention in commerce. The Quebec *Advertiser* urges that efforts be made to promote the export of basswood lumber, and also the manufacture for export of wooden-ware made from basswood.

In England a great business is carried on in the manufacture of white-wood ware, or Tunbridge-ware, and for such purposes, any wood which will "dry white" is used—the principal kinds being 'chestnut' —*i. e.*, horse-chestnut, a very different wood from the common chestnut, (*castanea vesca*)—and lime, or, as we call it, basswood. Referring to this, our Quebec contemporary considers that a good business might be done in exporting this wood to England.

For use in wooden-ware this wood must not be exported in logs, as in that state it can only be employed for the upper timbers of houses, ships, etc. But it must be exported in the shape of boards, inch, half-inch, and even as thin as the eighth of an inch, for veneering. The great object is to get the wood to dry white, and to secure this, it must be sawn quite fresh, and before the sap has had time to ferment, and thus discolor the wood. The boards are taken from the saw-mill or pit as fast as they can be cut, hung up under shelter from the rain, in an open shed, with a free draught of air, (not in piles,) until so thoroughly dry that there is not the least probability of their becoming mildewed. There would be still more profit to Canadians if they themselves should convert their basswood into articles of wooden-ware, with which Canada probably could supply the world.

On White Gunpowder.*

Having lately prepared different samples of white gunpowder (according to the receipt of Dr. J. J. Pohl, given in the *Chemical News*, July 6) for some military engineering experiments, I have tried the process of separately grinding the materials, viz., chlorate of potash, ferrocyanide of potassium, and cane sugar, and then mixing them; also grinding them together with a little water added, and then dried at a temperature of about 150°. I find that those samples which were prepared moist and then dried are more easily exploded than those prepared by the dry process. In fact, one sample exploded in an open porcelain dish by simple friction with a spatula with which one of my assistants was crushing some of the larger pieces. Through the explosion he was laid up for several weeks, and nearly lost his eyesight. No samples prepared dry are as explosive as those prepared moist, the addition of water causing a more perfect mixing of the particles of its chemical constituents than can be effected by the dry grinding process. This accounts for the greater danger attending the use of white gunpowder prepared in the moist way.

A cannon loaded with the white powder goes off on the application of a few drops of sulphuric acid (equally as well as with a light applied) to its touch hole.

This property of the gunpowder may possibly be applied to some advantage in the construction and preparation of bomb shells for long ranges. The shells would not explode (if filled with the white powder and containing a glass vessel with sulphuric acid) until they struck the object. No useless explosion of the shell could take place in the air, as is too often the case with the ordinary fusee shell.

Its expansive or explosive force is also twice that of common gunpowder. In all experiments performed with this white gunpowder care must be

* By F. Hudson, Esq.

taken not to compress it too violently; otherwise accidents may frequently occur. A blow with a hammer upon stone with some of the powder upon it explodes all samples that I have prepared.—*Chemical News.*

Manufacture of Malleable Horn.

A patent has been taken out in France, by Messrs. Boulet, Sarazin & Co., for a new process for making malleable horn. The horn, in chips and shavings, is boiled a long time in a caustic lye of strength of 25° of the alcalimeter, by which it is entirely melted. This liquid is then reduced for evaporation to a plastic paste, which may be rolled into sheets, drawn into rods, or molded in any form.

This paste is rendered more strong and elastic by mixing it with india-rubber or gutta-percha. The substances are mixed together in a cast iron vessel, and passed between fluted revolving rollers, the vessel being heated by steam.

The inventors say that, by covering the fibers of cocoa or of aloes with this paste, they have obtained belts more solid than those of leather, and stronger than those of india-rubber.

Steam Shipping of Great Britain.

Mitchell's Steam Shipping Journal states that the Parliamentary returns have been published, giving the names of all steamships in Great Britain on Jan. 1 1861, with their tunnage.

The total number of steam vessels is 1,945. Gross tonnage, 686,417 tons; exhibiting an increase of 82 ships and 19,904 tons over 1860. Of the ships thus registered, there were—

Paddle wheels	1,342
Screw	601
Screw and paddle	1
Experimental propeller	1
Total	1,945

Again: specifying material there were—

Built of wood	860
Built of iron	1,080
Built of steel	5
Total	1,945

The distribution in some of the principal ports was as follows:—

	Steam vessels.	Tons.
London	525	276,133
Liverpool	214	91,662
Newcastle	116	19,445
Hull	66	26,007
Sunderland	71	13,304
Shields	132	8,830
Southampton	33	8,407
Bristol	66	7,416

Formation of Fumic Acid.

The formation of fumic acid, so important, apparently, to the nutrition of plants, has received a long investigation at the hands of M. Paul Thenard, the discoverer of it (*Bulletin de la Société Chimique de Paris*, No. ii. page 33), who has come to the conclusion that it is a compound of ammonia or certain ammoniacal salts with vegetable principles. He wetted straw, dry leaves and sawdust with ammonia, and the carbonate and sulphate, and found that it was formed in abundance. He found, also, that when glucose, or sugar, was heated in a tube nearly to the temperature at which it decomposes, and a current of ammoniacal gas was passed, a large quantity of the ammonia was absorbed, and substances produced greatly resembling fumic acid. That formed from glucose was of a brown colour, was soluble in water, acids and alkaline solutions, but insoluble in alcohol. That formed from cane sugar was brown, uncrystallizable, soluble in alcohol and insoluble in water. Carbonic and the other acids dissolved it freely, and alkalies precipitated it from the solution. Another body formed with the last had similar properties, but was insoluble in alcohol. The analyses of these three bodies gave the following results:—

	I.	II.	III.
Carbon	52.28	65.66	54.26
Hydrogen	6.38	6.05	5.34
Nitrogen	9.94	19.36	18.78
Oxygen	31.40	8.93	21.61

Similar substances to the above were formed when starch, mannite, cane sugar, or sugar of milk, was heated with liquid ammonia in a sealed tube. When syrup was heated with liquid ammonia to 180° Centigrade, carbonate of ammonia, a black liquid and a black solid substance were formed, the two last of a very complex nature. The author speculates on the constitution of these bodies, admitting that he has but incompletely studied them. We do not, therefore, quote his speculations. He mentions a fact, however, which may be of value to some of our readers. A farmer, near Châlons, sprinkles his dung-heaps with ammoniacal gas liquor, and thereby obtains an excellent manure. The gas liquor used in this way producing a much better effect than when applied directly to the soil. M. Thenard examined the dung-heaps and found an abundance of fumic acid, or rather fumate of lime.—*Chemical News.*

Property of Rock Oil.

At a recent meeting of the American Photographical Society, Mr. Seely mentioned a remarkable property of rock oil, namely, its extraordinary power of penetrating capillary tubes. It surpasses in this respect both water and alcohol, and probably all other liquids. It will flow by the wick over a lamp and cover the outside, it will follow up the side of glass and thus escape from a bottle. If put into a wooden barrel it passes through the staves, covering the barrel upon the outside, and filling the air with its odor.

The Copper and Iron of Lake Superior, U. S. side.

The aggregate value of copper exported from the Lake Superior Mines in 1845 was but $390; in 1850 it was $266,000; in 1855 it was $1,437,000, and in 1860 it had increased to $2,944,000. The product of this region for 1860 may be stated as follows:

Copper shipped	$2,944,000
Iron ore (150,373 tons)	400,000
Pig iron (5,650 tons)	150,000
Whitefish and Mackinaw trout	50,000
Furs	20,000
	$3,564,000

To this may be added the trade in cedar posts, shiptimber, and firewood, which is quite extensive.

The three iron companies in operation at Marquette, quarried in 1860 the following amounts:—Jackson mine, 60,000 tons; Cleveland mine, 50,000 tons; and Lake Superior mine, 40,000—making 150,000 tons. The principal points to which the ore is shipped, are (in about the proportion named) Detroit and Wyandotte, Mich., one-twelfth; Cleveland, Ohio, one-half; Erie, Penn., one-third; and the balance to Buffalo, N.Y. Each of the above companies can quarry, with present facilities, 100,000 tons of ore annually. The capacity of the railroad and docks is also sufficient for transporting and shipping that amount.

The toll collected from the tonnage passing through the Sault Ste. Marie canal, the first year it was opened

(1855), was only $4,374; last year it had increased to $24,660. The aggregate value of articles that passed through the canal in 1860 was $12,158,856 94.

Salt Trade of the United States for the year 1860.

The quantity of salt manufactured in the United States during the year 1860, varies considerably from the quantity made the previous year (14,000,000 bus.), amounting to about three-quarters of a million bushels deficiency. The State of New York produced, in the Onondaga Valley, 1,300,825 bushels of salt *less* in the year 1860 than was produced in the same district during the year 1859, and the production of 1859 was 138,947 bushels less than the production of salt in 1858; while, during the same time, the States of Michigan, California and Texas have considerably *increased* their production of salt during the same periods.

Estimated quantity of Salt manufactured in the United States in the year 1860.

Massachusetts	325,000 bus.
New York	5,593,447 "
Pennsylvania	950,000 "
Virginia	3,650,000 "
Kentucky	290,000 "
Ohio	2,050,000 "
Illinois	60,000 "
Michigan	40,000 "
Texas	50,000 "
Florida	70,000 "
California	250,000 "
Utah	60,000 "
	13,388,447 "

The whole amount of salt inspected on the Onondaga Salt Springs Reservation, in the State of New York, during the year 1860, was 5,593,447 bushels, being equal to 1,118,650 barrels of 280 lbs. each. Of this quantity, 1,462,565 bushels have been the product of the Solar Salt Vats, and 4,130,882 bushels, usually termed fine salt, has been made in kettles by boiling.

An experiment has been made the past summer for producing a superior quality of fine salt for table use, and also for dairy purposes, particularly butter-making, adopted partly from the English method, which has proved very successful, and promises beneficial results. This salt is brought to a finer crystalization and a more thorough separation from the impurities of the brine in the kettles than by the common mode, and is afterwards dried by artificial heat, and passed through rollers and seives to bring it to a state of complete pulverization. It is subsequently "medicated," by a patented application, recently discovered, which finishes the process. Salt produced by this method has a clear, dazzling white appearance, is always pulverulent, and retains scarce a trace of impurity. This description of salt, which has received the denomination of "Factory-filled," is admirably adapted to the curing of butter, and will doubtless prove, upon trial, to be equal to the best brands of English salt, of which a very large proportion is sold in this country.

The legislature of the State of Michigan, in 1859, by law declared that there should be paid a bounty of ten cents per bushel on salt manufactured from water obtained by boring in the State; consequently, eight wells have been sunk upon the Saginaw and five at Grand Rapids; and a quality of water has been found which, for strength and purity, is unsurpassed in the United States, and from which very rapid progress is now making in the manufacture of salt.

Total Exports of Salt from the United States during the year 1860.—Bushels, 475,445.—Value, $129,717.

Composition of Friction Matches.

The exact ingredients, and their proportions, in the phosphorus composition, differ in different countries, but they all consist essentially of emulsions or mixtures of phosphorus in a solution of glue or gum arabic. In England the composition contains a considerable quantity of chlorate of potash, which imparts a snapping quality and noisy projecting flames, and but little phosphorus, on account of the moisture of the climate; other substances are also added to give hardness and power of resisting moisture. The following is about the composition of the best quality:—

Water	4	parts by weight.
Glue	2	" "
Phosphorus	1½ to 2	" "
Chlorate of potash	4 to 5	" "
Powdered glass	3 to 4	" "

In Germany the proportion of phosphorus used is much larger, and gum is used instead of glue, together with nitrate or peroxyd of lead, and no chlorate of potash. In consequence of the presence of so much phosphorus and the absence of chlorate of potash, the German matches light quietly, with a mild, lambent flame, and are injured quickly in a damp place by the oxydation of the phosphorus and the production of phosphoric acid, which attracts moisture. One of their mixtures, given by Bottger, is composed as follows:

Phosphorus	4	parts by weight.
Nitrate of potash	10	" "
Fine glue	6	" "
Red ochre	5	" "
Smalt	2	" "

TO INVENTORS AND PATENTEES IN CANADA.

Inventors and Patentees are requested to transmit to the Secretary of the Board short descriptive accounts of their respective inventions, with illustrative wood cuts, for insertion in this Journal. It is essential that the description should be concise and exact. Attention is invited to the continually increasing value which a descriptive public record of all Canadian inventions can scarcely fail to secure: but it must also be borne in mind, that the Editor will exercise his judgment in curtailing descriptions, if too long or not strictly appropriate; and such notices only will be inserted as are likely to be of value to the public

TO CORRESPONDENTS.

Correspondents sending communications for insertion are particularly requested to write on one side only of half sheets or slips of paper. All communications relating to industry and Manufactures will receive careful attention and reply, and it is confidently hoped that this department will become one of the most valuable in the Journal.

TO MANUFACTURES & MECHANICS IN CANADA.

Statistics, hints, facts, and even theories are respectfully solicited. Manufacturers and Mechanics' can afford useful coöperation by transmitting descriptive accounts of Local Industry, and suggestions as to the introduction of new branches, or the improvement and extension of old, in the localities where they reside.

TO PUBLISHERS AND AUTHORS.

Short reviews and notices of books suitable to Mechanics' institutes will always have a place in the Journal, and the attention of publishers and authors is called to the excellent advertising medium it presents for works suitable to Public Libraries. A copy of a work it is desired should be noticed can be sent to the Secretary of the Board.