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Canadian

Mining Review

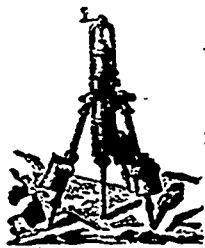


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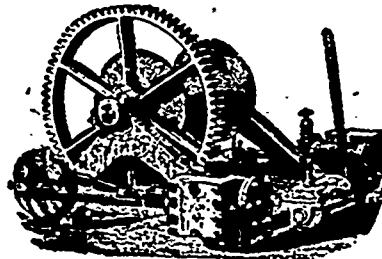
1887.—OTTAWA, MAY.—1887.

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Notice to Contractors.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for Iron Joists, &c., &c., for Government Printing Bureau, Ottawa," will be received at this office until WEDNESDAY, 18th May, for the several works required in providing, erecting and completing of the

IRON JOISTS, &c., &c.,
FOR
Government Printing Bureau,
OTTAWA, ONT.

Plans and specifications can be seen at the Department of Public Works, Ottawa, on and after Wednesday, the 4th May.

Persons tendering are further notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted bank cheque, made payable to the order of the Honourable the Minister of Public Works, equal to five per cent. of the amount of the tender, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department will not be bound to accept the lowest or any tender.

By order,
A. GOBEIL,
Secretary.

Department of Public Works,
Ottawa, 25th April, 1887.



Notice to Contractors.

SEALED TENDERS addressed to the undersigned and endorsed "Tender for Government Printing Bureau, &c., Ottawa, Ont.," will be received until WEDNESDAY, 18th May next, for the several works required in the erection and completion of the

Government Printing Bureau, &c.,
OTTAWA, ONT.

Plans and specifications can be seen at the Department of Public Works, Ottawa, on and after Wednesday, the 4th May next.

Intending contractors should personally visit the site and make themselves fully cognizant of the work to be done, according to the said plans and specifications, before putting in their tenders.

Persons tendering are further notified that tenders will not be considered unless made on the printed forms supplied, and signed with their actual signatures.

Each tender must be accompanied by an accepted bank cheque made payable to the order of the Honourable the Minister of Public Works, equal to five per cent. of the amount of the tender, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

The Department will not be bound to accept the lowest or any tender.

By order,
A. GOBEIL,
Secretary.

Department of Public Works,
Ottawa, 25th April, 1887.

NEW YORK

Metallurgical Works

104 Washington St., N.Y.

E. N. RIOTTE, - - Manager.

Ores Sampled, Working Test by any Process, Assays, Analyses of Ores, Mineral Waters and Products, Mines Examined and Mills Started.



TENDERS.

SEALED TENDERS, marked "For Mounted Police Provisions and Light Supplies," and addressed to the Honourable the President of the Privy Council, Ottawa, will be received up to noon on Monday, May 20th, 1887.

Printed forms of tenders, containing full information as to the articles and approximate quantities required, may be had on application at any of the Mounted Police Posts in the North-West, or at the office of the undersigned.

No tender will be received unless made on such printed forms.

The lowest or any tender not necessarily accepted.

Each tender must be accompanied by an accepted Canadian bank cheque for an amount equal to ten per cent. of the total value of the articles tendered for, which will be forfeited if the party declines to enter into a contract when called upon to do so, or if he fails to complete the service contracted for.

If the tender be not accepted the cheque will be returned.

No payments will be made to newspapers inserting this advertisement without authority having been first obtained.

FRED. WHITE,
Comptroller, N. W. M. Police.
Ottawa, March 25th, 1887.



Department of Inland Revenue.

An Act respecting Agricultural Fertilizers.

The public is hereby notified that the provisions of the Act respecting AGRICULTURAL FERTILIZERS came into force on the 1st of January, 1886 and that all Fertilizers sold thereafter require to be sold subject to the conditions and restrictions therein contained—the main features of which are as follows:

The expression "fertilizer" means and includes all fertilizers which are sold at more than TEN DOLLARS per ton, and which contains ammonia, or its equivalent of nitrogen, or phosphoric acid.

Every manufacturer or importer of fertilizers for sale, shall, in the course of the month of January in each year, and before offering the same fertilizer for sale, transmit to the Minister of Inland Revenue, carriage paid, a sealed glass jar, containing at least two pounds of the fertilizer manufactured or imported by him, with the certificate of analysis of the same, together with an affidavit setting forth that each jar contains a fair average sample of the fertilizer manufactured or imported by him; and such sample shall be preserved by the Minister of Inland Revenue for the purpose of comparison with any sample of fertilizer which is obtained in the course of the twelve months then next ensuing from such manufacturer or importer, and which is transmitted to the chief analyst for analysis.

If the fertilizer is put up in packages, every such package intended for sale or distribution within Canada shall have the manufacturer's certificate of analysis placed upon or securely attached to each package by the manufacturer; if the fertilizer is in bags it shall be distinctly stamped or printed upon each bag; if it is in barrels, it shall be either branded, stamped or printed upon the head of each barrel or distinctly printed upon good paper and securely pasted upon the head of each barrel, or upon a tag securely attached to the head of each barrel; if it is in bulk, the manufacturer's certificate shall be produced and a copy given to each purchaser.

No fertilizer shall be sold or offered or exposed for sale unless a certificate of

The Canada Co.

Will issue Licences to Prospect or to work Minerals on any of their Mining Lands and Mineral Reservations,

Covering nearly a

Quarter of a Million Acres

In Eastern Ontario, and principally within the belts containing

Iron, Phosphate, Gold, Galena, Plumbago, Mica, Marbles, Building Stone, and other valuable Minerals.

For list of lands and terms apply to the Company's Mining Inspector,

H. T. STICKLAND,

PETERBORO, ONT.



SEALED TENDERS, marked "For Mounted Police Clothing Supplies," and addressed to the Honourable the President of the Privy Council, Ottawa, will be received up to noon on Monday, 2nd May, 1887.

Printed forms of tender, containing full information as to the articles and quantities required, may be had on application to the undersigned.

No tenders will be received unless made on such printed forms. Patterns of all articles may be seen at the office of the undersigned.

Each tender must be accompanied by an accepted Canadian bank cheque for an amount equal to ten per cent. of the total value of the articles tendered for, which will be forfeited if the party decline to enter into a contract when called upon to do so, or if he fail to complete the work contracted for. If the tender be not accepted the cheque will be returned.

No payment will be made to newspapers inserting this advertisement without authority having been first obtained.

FRED. WHITE,
Comptroller, N. W. M. Police.
Ottawa, March 25th, 1887.



NOTICE RESPECTING PASSPORTS.

PERSONS requiring passports from the Canadian Government should make application to this Department for the same, such application to be accompanied by the sum of four dollars, in payment of the official fee upon passports as fixed by the Governor-in-Council.

G. POWELL,
Under Secretary of State.
OTTAWA, 19th Feb., 1886.

GRAPHITE

Wanted, fair average samples of about 1lb. each, with prices, F.O.B. Address:

J. S. MERRY, Assay Office,
SWANSEA, WALES.

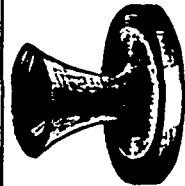
Mica, Minerals, Precious Stones

RICHARD BAKER & Co., General Produce Brokers, 9 Mining Lane, London, Eng. Advances made on consignments.

Reports Gratis on New Products.
Bankers: Agra Bank, London.

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SOLD outright. No renting. Just the thing for use in mines or mining districts. Over 5000 in use. Pat. Nov. 30, 1880. Late improvements. Send for descriptive circular.

EDW. HARBERT & Co.,
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One Mile and a Half from Black Lake Station, Quebec Central Railway.
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E. MIALL,
Commissioner.

The Canadian Mining Review

OTTAWA.

PUBLISHED MONTHLY.

ANNUAL SUBSCRIPTION \$1.00
ADVERTISING RATES 15c. per line (12 lines to 1 inch).

OFFICE:
UNION CHAMBERS, 14 Metcalfe St.

The CANADIAN MINING REVIEW, is devoted to the opening up of the mineral wealth of the Dominion, and its publishers will be thankful for any encouragement they may receive at the hands of those who are interested in its speedy development.

Visitors from the mining districts, as well as others interested in Canadian Mineral Lands, are cordially invited to call at our office.

Mining news and reports of new discoveries of mineral deposits are solicited.

All matter for publication in the REVIEW should be received at the office not later than the 17th of the month.

Address all correspondence, &c., to the Publishers of the CANADIAN MINING REVIEW, Ottawa.

Advertising Space.

The circulation of the CANADIAN MINING REVIEW, which has steadily been going up since its first publication, more than five years ago, has now more than doubled the estimate upon which we had reckoned, and its value as an advertising medium to business men who wish to reach the best classes of mine owners and operators, and the mining centres and camps of every province in the Dominion, is consequently very greatly enhanced. The REVIEW is in the widest sense a Canadian journal belonging to all provinces alike; it is the only journal published in Canada wholly devoted to the interests of her mining industries and mineral resources. We would simply draw the attention of those who have hitherto overlooked it, to this matter, promising our best attention and most reasonable terms on any application for advertising space.

The Nanaimo Disaster.

The announcement and details of the terrible colliery catastrophe at Nanaimo has naturally created throughout the length and breadth of our Dominion a feeling of deep sympathy for the large number of unfortunate families who have thus so suddenly been bereaved. Out of a total of over one hundred white men and nearly seventy-five Chinese, only six have been brought out alive and these are more or less injured. In Victoria and other portions of the Pacific province a fund for the relief of the sufferers has been organized, and we feel sure that our readers in the sister provinces will also come forward and augment it with liberal contributions. Great suffering exists and practical assistance is wanted in the worst way.

Until the result of the enquiry, which has been instituted by the Hon. Mr. Robson, Minister of Mines, has been made known, the cause of the fatal explosion can only be con-

jectured, firedamp, coal dust, insufficient ventilation, carelessness on the part of the unfortunate miners, ineffective machinery and the like, are causes that have been hinted at. In the meantime a searching investigation should be made with a view to adopting preventive measures for the future.

Protection to the Mining Industry.

This can be accomplished in more ways than that which is generally understood to be the most desirable means or by an increased duty on importation to enable our minerals to be mined and smelted in our own country for our own use. That is one only of the measures, and we have no intention of under estimating its value, hence it is mentioned first as being the most important and that most easily adjusted to the requirement of all concerned. At the present time our metallic ores are mined with the object of supplying foreign markets, and little, comparatively, is utilized for local use, which is the more desirable method to pursue in order to receive the full benefit incidental to smelting and manufacturing them into the metallic state. The minerals requiring revision under tariff regulations are coal, iron, copper, lead, zinc, sulphur, and clays.

The other demands for protection are from evils that exist under, and that are incidental to, a wrong system of selling minerals along with the surface soil or agricultural right to Farmers and Speculators, and without regard to Citizenship. In doing so our Local Governments have sold an area of some millions of acres of our best mining lands, and these have passed into the hands of foreigners and non-residents, and no condition or provision is made by the Government so selling them, that these minerals will be developed and worked. But such is not the case with Dominion land homesteads, for provisions as to citizenship, location on the ground by possession, and development, are made compulsory. Are not mining lands worthy of the same protection as Dominion farming lands? Protection is required from an evil in the form of fraudulent schemes started and promoted by parties who are not mining men, but having a local knowledge of a district they may become associated with mining men and thereby gain a mere smattering of the business. Often they are American importations, and at times a combination of local and imported talent, who present a prospectus of a mining company with glowing accounts of "millions of tons of ore in sight that require nothing in outlay to market" "it but the mere blasting of it out of a mountain side!" or words similar to that and with that meaning. On such an untrue picture funds are secured and work and time prove, for it is reported by one of the company, that instead of costing only the actual expenses of mining the ore, it has actually cost \$20,000 to open one of the mines! The large mountains of ore do not roll into the railway cars as plentifully nor as fast as was promised, no

dividends are paid from mining the mountains of ore, or if any are, they are not from profits. Another dying or last attempt is made of still greater things a little further off which requires possibly railway extension and only a few millions of dollars, and such are the means used to bring ruin on what might be a workable scheme if conducted on business principles and with a regard to the true condition of affairs presented.

They may even not scruple at advertising to own a property they have only a half interest in! By such dishonest means some \$2,000,000 to \$5,000,000 of capital is sought to be invested in a manner we call neither legitimate business, honestly represented or a correct way of doing it.

The periodical, and now in Canada, historical mining excitement, is another form of fraud from which no good can result when the conditions for such, or anything to excite about, are wanting. If a large deposit, say of pyrites of low grade, or even several large deposits, are found several hundred miles from market or civilization, and in a country devastated by fire, there is certainly nothing to warrant a mining fever in that, as the conditions for successful treatment of such an ore are not found in the neighbourhood; it has therefore to be shipped to a market where it will mix with other ores and be treated so as to utilize the by products. Such a find or prospect is not a poor man's mine. To develop it is therefore interesting only to a manufacturer who can treat such an ore, and there is no money in it for the poor prospector as it cannot be worked on a small scale as easily as on a large one, and its value even to the manufacturer is a question of properties, freights and value, hence the folly of a mining excitement over such a discovery. It cost only \$500,000 to prove the truth of this in the Province of Quebec with similar ore and better conditions. Hence the ore is only a shipping ore and subject to competition in freight with other ores of a similar kind, which can be obtained nearer a market. We cannot see any reason why such an ore should cause a mining excitement. It is quite different where gold is discovered in alluvial diggings. There is nothing in it to warrant an excitement save only in the fertile brain of a schemer who desires to "sell" somebody in selling claims. It is only a question of freights, quality and price, like any other trade commodity dependent on supply and demand. Thus we have referred to protection by tariff revision; protection to mining lands against foreign or alien owners; protection against the locking up of mining lands; protection against fraudulent prospectuses of "Wild Cat" schemes and schemers; protection against false pretences and fraud; protection to capital from the employment of those who are ignorant or not trained to mining as a business, and the list not being yet exhausted will be continued in our next issue.

A National and Rational Policy.

The Budget Speech of Sir Charles Tupper and the welcome revision of the Tariff, with regard to the interests of the mining section of the community, are matters that must create an expression of pleasure among the readers of the CANADIAN MINING REVIEW. It is a fitting introduction to our appearance this month in a new dress, and is an event long to be remembered in the history of the mining industry of Canada. The law or action of the Government, that is productive of a national feeling of patriotism in preferring the product of the labor of our own country to the imported product of the labor of aliens or foreigners is a national policy. The law that encourages individual energy and the development of the manual and brain power of the community in the direction of producing the necessities of life from the natural products of our own country is a wise enactment. The law that converts our foreign trading importers into "home" manufacturers is the motive power of an incoming tide of national prosperity. The law that makes a foreign sympathising merchant an employer of Canadian labour, helps to build the hive of a national industry bound together by the strong bands of rightly directed capital and labour. The law that stimulates and encourages individual industry or effort in a right direction or cause, and restrains from a ruinous or wrong course is the law desired for the development of our Canadian mining industries. It cannot be expected that the home demand for iron can be supplied from local furnaces and mills until such time as sufficient of these have been constructed, but when that is done and the home industry is established, the iron trade will be supplied with a superior class of ores to work with than those of Great Britain. No business employs so much labour as does iron, for (it cannot be pumped like oil or elevated like grain), it has to be handled whether in the form of ores or metal, and every time that is done it means an expenditure of ten cents a ton on the millions of tons handled over and over again during its manufacture and transportation. In this way the wages earning community are benefited. That Sir Charles has underestimated the value and results to be derived from this new lease of life to an almost extinguished industry would not be so apparent had not the wisdom (!) of Sir Richard Cartwright drawn attention to the idea of exporting Canadian iron. Sir Richard is evidently not aware that Canadian charcoal pig iron has been exported to the United States, and is in demand on account of its superior quality if enough was manufactured during the present time to supply the demand. To all sections of the country the wisdom of the new tariff will become apparent. Probably no other country is more richly endowed by nature with such stores of iron, and in offering these inducements to capitalists to develop our iron resources the Dominion will find it to pay well.

What we want now is the much needed enactment of proper timber and mining regulations by the local legislatures

The Use of Crude Phosphate.

The value of raw phosphate as a fertilizer is a subject that has created much discussion, but without, as yet, obtaining decisive results. The prevailing impression is that the crude phosphate is valuable for "a long pull" and gives out its good effects slowly during two or three years after its application to the soil, whereas the superphosphate, which is phosphate reduced to a soluble condition by admixture with sulphuric acid, produces its full effect during a single season. The preparation of the acid is expensive and agriculturists are suspicious of manufactured fertilizers, for doubtless they are sometimes fraudulently prepared. If the value of the crude phosphate can be established, it would provide a cheap fertilizer in a form that would secure confidence, and the use of it would become greatly extended to the advantage of our miners and the benefit of the farmers.

Prof. N. S. Shaler, of Harvard University, has taken a great interest in the subject and is confident that simple methods may be found by which phosphates may be made available as manures without treatment with sulphuric acid. He proposes that thorough experiments should be made and will arrange for their trial at the Bussey Institution, an Agricultural Department of Harvard University under the care of Prof. Storer. The Bussey Institution would provide the land and the useful laboratory, and a skilled chemist would supervise the tests. The United States Geological Survey will probably contribute something towards the expense, and private firms have expressed a willingness to do likewise. If it was a product of the United States that was under consideration the whole expense could be at once provided for in that country, but as it is a matter of primary concern to Canada, it seems fitting that our Government or our miners should aid in the project.

Dr. A. R. C. Selwyn, Director of our Geological and Natural History Survey, has had his attention occupied by the subject for a considerable time and proposes in conjunction with Prof. Saunders, the Director of the recently established Experimental Farm, to commence and carry out the necessary experiments. It is much to be desired that this should be done as there are few subjects of greater importance to the country than the securing of cheap and effective agricultural fertilizers, and if the utilization of our mineral deposits can be promoted at the same time the matter assumes increased consequence.

Mr. Bowker, of the Bowker Fertilizer Company of Boston, in a recent lecture, while expressing an unfavourable opinion of the value of crude phosphate for quickly growing crops, admits its possible ser-

vico with grass and fruit trees. Prof. Shaler says the superior richness of the blue-grass of Kentucky is due to the phosphoric acid in the soil, and indicates the value of phosphates as a manure. Some recent experiments with flower seeds show a great superiority of growth where crude phosphate was applied, suggesting that it is immediately effective; but such experiments need to be multiplied and the methods and results carefully watched by scientific observers before reliance can be placed upon them.

Our Government cannot do a better service to the country than by promoting this investigation, and as many tests are needed to establish the facts and unusually good facilities are offered in the proposed experiments at Harvard University, it would be well to encourage that effort also. Should any of our miners or agriculturists desire to contribute towards the promotion of the investigation in the United States they should communicate at once with Capt. R. C. Adams, of the Anglo-Canadian Phosphate Company at Montreal.

The National or Geological and Natural History Survey Museum.

Looked at from a Business Standpoint.—Economic Minerals and Mining as a Part of the Wide-Field Covered.

[By a member of the Geological Survey staff.]

Recently it has fallen to my lot to glance over the fields of work occupied by the Geological Survey in the past. What led to this was the need of grouping the reports of the Survey by provinces, and the many different branches of work performed by specialists according to their general subject, in connection with the names of the specialists whose work it was desired to trace—felt as a means of inquiring into certain exhibits in the museum.

With the permission of the Director of the Survey, I have here extracted a small portion of my notes, thus incidentally made, appropriate to the field of the CANADIAN MINING REVIEW. The topic is timely on account of its suggestiveness in connection with the general subject of a national museum.

SCOPE.

I find the contents of the Geological Survey or "National Museum" building in its present state, to be classifiable,—including all that is therein presented by the older to the younger generation,—the reports of the Survey in the book room and library, along with the exhibits in the museum, as follows:—

I. *Physiographic Work*, representing all the provinces; embracing geological and geographical surveys, and field work in various departments, more or less special. Reports, specimens, photographs, &c.

II. *Economic Minerals, mining and mining geology*. Analysis of minerals &c.

III. *Biological Work*, embracing—
(a) ancient and extinct life as a means of under-

standing the past and present world and its inhabitants. (paleontology.)

(b) natural history, including animated nature as far as interesting or important to mankind.

(c) botany, including forestry, agricultural plants, &c.

(d) ethnology, including human inhabitants of the country in the past and present.

IV. *Chartographic* work, embracing everything in all departments capable of being represented in graphic form, such as maps, sections and diagrams.

V. Exhibits in all the above mentioned departments; embraced in the museum and library.

WEALTH ACCUMULATED.

Any one familiar in the slightest degree with the operations of the Geological Survey will recognise at once the wealth of matter that has accumulated in each of these departments.

Omitting the more general and better represented departments (except to remark regarding them that they are all crammed to overflowing in a building not fire-proof) I will append a brief abstract of Sub-division II, the titles regarding minerals and mining since the Survey was organized. It will illustrate the character of the work done in a department not very extensively represented in the industries of Canada, and serve as an index to that industry in each of the provinces so far as represented in the museum and library.

THE WEALTH UNDER THE SURFACE.

The economic minerals form the main feature of the first floor of the museum. The arrangement is according to the uses to which they are adapted. A second feature of the same floor is the Scientific Collection of minerals, in which all the minerals represented in the Dominion are arranged according to their chemical ingredients and natural relationship to each other. A third feature of the floor is that of the Metals and their Ores (arranged in the flat glass cases along the centre of the room), and remarkable for its completeness and general excellence. Though forming Class I of the Economic minerals it is on account of its importance placed separately. The subdivisions of the Economic minerals (the balance arranged along the walls on both sides) are:—

1. Metals and their ores.
2. Fossil fuel.
3. Minerals applicable to certain chemical manufactures and their products (see also under 4).
4. Mineral manures (see also under 3).
5. Mineral pigments and detergents.
6. Salt brines and mineral waters.
7. Materials applicable to common and decorative construction.

The only exhibition beside these mentioned on the first floor is that of the rocks. It is arranged in the centre according to formations; consequently is also important to mining. Mr. Broadbent is constantly adding to the

attractions of this floor, devoting all his time to it; so that every day visitors will find in one or another of its departments something new.

PUBLISHED INFORMATION.

It is proper to remark that the library is an important part of the museum, as containing all the published information extant, and the reports of the Geological Survey describing the contents of the museum. It is open to the public, like the museum itself, and has in attendance a librarian who is always ready to produce any required report. It is only necessary to explain that the years mentioned below are part of the titles of the reports, referring to date of field work, not of publication.

MINERALS GENERALLY RELATING TO ALL THE PROVINCES.

Sir Wm. Logan was a practical mining engineer by education and experience. He never made any geological report without doing full justice to the economic minerals of the country examined. Some of his work was catalogued anonymously.

T. S. Hunt.—Mr. Hunt's catalogued reports began with that on mineral springs, ores, &c., 1845-46 and 1848-49, and embraced Ontario and Quebec minerals promiscuously down to 1869. He reported on various minerals and mineral waters, 1847-48; on mineral springs, ores, &c., 1848-49; on soils, peat, asphaltum, mineral springs, &c., 1849-50; on various mineral waters, 1850-51; minerals, soils, mineral waters, &c., 1851-52 and 1852-53; sundry analyses, manufacture of salts from sea water, metallurgy of iron, 1853-56; on dolomites, limestones, fish manures, &c., 1856-57; on intrusive rocks, minerals from silurian rocks and on the history of magnesia limestones, 1858; on petroleum and salt, 1863-66; on peat and its applications, 1863-66; on mineralogy of gold veins and method of gold working, 1863-66; notes on iron ore, 1866-69; petroleum (separate report) in Gaspé, 1865; Canada: a geographical, agricultural and mineralogical sketch (separate report), 1865. In 1867 (separate report) he published a sketch of the Geology of Canada for the Paris exhibition of that year.

Anonymously catalogued.—As appendices and otherwise, including maps accompanying the reports elsewhere mentioned, some titles occur in the "List of Publications" not connected with any authors names:

Statistics of copper mining and copper smelting in Great Britain, 1846-47; catalogues of some of the economic minerals and deposits of Canada, 1849-50; descriptive catalogue of a collection of economic minerals of Canada and of its crystalline rocks (sent to London exhibition for 1862—separate report), 1862; ditto, including stratigraphic collection sent to Philadelphia, 1876; ditto Paris, 1878; on the Goderich salt region (reprinted from the transaction of American Institute of Mining Engineers vol. V), 1876-77.

J. R. bb.—Mining and mineral statistics, 1871-72.

B. J. Harrington.—Notes on samples of brick clay from Fort Garry, analysis of serpentine, &c., 1872-73; on the iron ores of Canada and their development, 1873-74; notes on a few Canadian minerals and rocks, 1874-75; notes on miscellaneous rocks and minerals, 1876-77.

G. C. Hoffman.—Chemical contributions to the Geology of Canada, 1874-75, 1875-76, 1876-77, 1877-78, 1878-79, 1879-80, 1880-82, 1882-84 and 1885; on Canadian graphite, 1876-77.

L. Smith.—Observations on the history and statistics of trade and manufacture of Canadian salt, 1874-75.

Prof. Dittmar.—Analysis of the waters of Hayes and Nelson rivers, 1879-80.

E. Coste.—Mining laws and mining policy, 1885; in hand (assisted by Mr. Brummel) statistical report of mining operations in all the provinces.

ECONOMIC MINERALS—NOVA SCOTIA.

Logan & Hartley.—On the Pictou coal field, 1866-69.

E. Hartley.—On coal and iron ores of Pictou County, 1866-9. Spring Hill coal field 1886-9. Map in Atlas of 1863.

T. S. Hunt.—On the gold region of Nova Scotia. (Separate publication) 1868.

A. R. C. Selwyn.—Observations on gold fields, 1870-1. Acadian vein deposits, Londonderry and Colchester, 1872-3.

Jas. Robb.—On coal mines of eastern or Sydney coal field of Cape Breton, 1872-3.

Scott Barlow.—On Spring Hill coal field, with map, 1873-4. Survey of coal in fields Cumberland County, 1875-6.

W. McQuat.—On coal in Cumberland County, 1873-4.

Map accompanying reports, map of Acadian iron mines, 1872-3; index map of Spring Hill coal field, 1873-4; map of Sydney coal field, one inch to one mile, 1873-4; ditto same scale, 1875-6.

NEW BRUNSWICK.

R. W. Ellis.—Borings for coal at Newcastle bridge, 1872-3. Second report on same, 1874-5. Iron ore deposits of Carleton County, with map, 1874-5.

Map accompanying reports, map of Grand Lake coal field, with older rocks in Queen's and Sunbury, 1863. Map showing distribution of iron ores in Carleton County, 1874-5.

QUEBEC.

Sir W. Logan.—On the gold of the Chaudiere region, 1850-51; economic minerals from Montreal to Cape Tourment, 1852-53; the Ramsay lead mine and Acton copper mine with miscellaneous economic minerals, 1858.

B. J. Harrington.—On minerals of apatite bearing veins in Ottawa County, 1877-78.

A. Michel.—On the gold region of Lower Canada, 1863-66.

T. S. Hunt.—Mineralogy of gold veins, 1863-66; petroleum in Gaspé (separate publication), 1865.

R. Bell.—Map of Gaspé in connection with the above (separate publication), 1865.

A. R. C. Selwyn.—Observations on gold fields, 1870-71.

J. F. Torrance.—On apatite in Ottawa County, 1882-84.

G. Broome.—On phosphate of lime and mica found in North and South Burgess, 1870-71.

H. G. Vennor.—Plan of Dalhousie iron mine, 1872-73; explorations in Frontenac Leeds and Lanark counties, 1873-74; plumbago and apatite in Templeton, Portland and Ottawa counties, 1873-74; explorations in Renfrew, Pontiac and Ottawa counties, with additional notes on iron, apatite, and plumbago in Ottawa County, 1876-77.

C. W. Willimot.—On mines in Quebec, 1880-82.

Anonymously Catalogued.—Localities of copper ores in the Silurian of Lower Canada, 1858; on copper localities, 1863-66; notes on the gold region of Eastern Canada (reprint of various reports from 1813 to 1863—separate publications), 1864; map of North Burgess showing the positions of apatite openings, 1876-77; map showing phosphate of lime in Ottawa County, 1876-77.

ONTARIO.

Sir W. Logan.—On the geology and economic minerals of Lake Superior, 1846-7; on various economic minerals, and on the Industrial Exhibition of 1851, 1851-2; on the Ramsay lead mine and the Acton copper mine, and miscellaneous economic minerals, 1858.

T. S. Hunt.—On the Goderich salt region, 1866-9; on the gold region of the County of Hastings (jointly with A. Michel—separate publication) 1867; locations of copper ores in the Huronian rocks of Mississagui river, 1858; on the Goderich salt region (reprinted from the Transactions of the Canadian Institute of Mining Engineers, Vol. V) 1876-7.

H. G. Vennor.—On the geology of portions of Hastings, Peterborough and Frontenac counties, Ontario, with geological map, 1866-9. (Vicinity of Belleville).

Marmoré gold mines, 1871-2; notes on economic minerals of Ontario, 1874-5.

T. McFarlane.—On the geology and economic minerals of portions of the County of Hastings, 1863-6; Laurentian, Huronian and upper copper bearing works of Lake Superior; with an appendix on the rocks and copperiferous beds of Portage Lake, Michigan, 1863-6.

HUDSON BAY AND LABRADOR.

R. Bell, Professor Dittmar.—Analysis of waters from Hayes and Nelson rivers, 1878-79.

MANITOBA.

B. J. Harrington.—Brick clay from Fort Garry, 1872-73.

G. C. Hoffman.—On lignites, 1873-74.

NORTH-WEST TERRITORY.

R. W. Ellis.—Borings for coal, 1875-76.

A. R. C. Selwyn.—Borings for coal on Souris R, 1879-80.

G. M. Dawson.—On coal seams of Bow and

Belly river district, 1880-82; general remarks on coals and lignites, 1880-82; geology of Bow and Belly rivers with special reference to coal (separate publication), 1882; map of coals and lignites Bow and Belly river, 1880-82.

G. C. Hoffman.—Analysis of coals and lignites, 1882-84.

BRITISH COLUMBIA.

J. Richardson.—On the coal fields of the east coast of Vancouver Island with map, 1871-72; the same including Queen Charlotte Islands with map, 1872-73; report on the coal fields of Nanaimo, Comox, Cowichan, Burrard Inlet, and Lovke with general map, 1876-77.

T. S. Hunt.—Analysis of Richardson's coals from Vancouver Island, 1871-72.

B. J. Harrington.—On (Richardson's) coals from the west coast, 1872-73; gold, silver, &c., 1874-75 and 1876-77.

G. M. Dawson.—General notes on mines and minerals of economic value in British Columbia, 1876-77; same with additions (separate report), 1883.

C. G. Hoffman.—Gold and silver assays, 1875 to 1885.

A. Bowman.—On Cariboo gold region, with general map; also sundry districts with detail maps (in hand).

MATTER IN GEOLOGICAL REPORTS.

Not catalogued as individual reports but occupying a portion of almost every geological report issued by the survey since its organization, is the consideration of all economic minerals encountered in the area examined. An index to those would be furnished by a similar classification of the physiographical material in subdivision 1; though it is not difficult to check off any desired portion or locality from the general list of publications of the Survey, if one had time to read over the 300 to 400 titles.

POPULAR AND PRACTICAL.

The museum has a wonderful faculty of drawing visitors. Mr. Burke, the doorkeeper, who keeps a visitors record, informs me that the yearly average is not less than 14,000; monthly, 1,000; and daily in fair weather not less than 40.

They seem to find something that interests them. What is it? The museum is not so instructive in some respects as are the magnificent Agassiz and Redpath museums. When one knows how imperfectly the majority comprehend what the Geological Survey Museum really is, or grasp the idea of how it may be utilized in a practical way for useful or business purposes, the curious fact would seem to require explanation.

It is observed that the objects on exhibition are all native, and that the animal, vegetable, and mineral worlds in their several departments are all represented. An inkling at once asserts itself that here is accumulated a wonderful store of facts lying at the foundation of every industry in the land. No one man's travels could have won them. No single fortune could

have done it, for the Geological Survey has cost, in the 25 years preceding confederation, \$375,000, and in the 20 years since confederation, \$1,000,000. Has it not been a good investment? What has been the "idea" of so large an investment? For no one calls it an extravagance.

CONCEPTION OF THE MUSEUM.

An intelligent handling of ones resources is undoubtedly the first consideration in every business.

The Government performs many functions which it is created or called on to perform. It leaves all others to be taken hold of by individuals. It gives attention by preference to those things which enable the people to help themselves. Foremost among these is education—placing in reach of every one the necessary information to handle his resources and powers effectively.

The National Museum is *all the provinces in miniature*. Its object is to place the necessary knowledge and facts regarding the Dominion and its resources, with their surrounding and controlling natural conditions, conveniently within the reach of matured men, and legislators who are commissioned to attend to their interests. Without such knowledge collected and presented conveniently to their hand, they would be compelled to skirmish individually and unaided in search thereof, just as the child would have to do without the advantages of an education.

ITS GROWTH AND "MANIFEST DESTINY."

Here is an institution occupying a three-story stone block at Ottawa (since many years forming a department under the direction of the Minister of Interior) which has had a continuous active existence since A.D. 1843. Is it possible that what I have written in regard to it, and the matter it covers, should be read in these columns by many intelligent people not strangers to the museum with something like the freshness of news? The publications here referred to in the briefest manner possible, are more fully described in the price list of publications of the Geological Survey (to be had gratis on application), and are sold approximately at cost, a nominal figure when the publication is separate. This is now the case with all reports and maps issued, though they are annually bound together into volumes, for libraries and reference.

Has the generation of Wm. E. Logan, of John A. McDonald and of J. W. Dawson, whose energies have been those of the Dominion in its youth, done well in presenting this foundation to the active men who are to pilot the destinies of the Dominion henceforward?

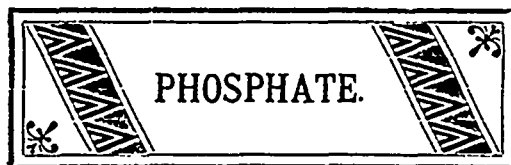
The mining exhibit only faintly indicates the far greater wealth of the museum in physiographic and biological material tributary to agriculture, and sundry arts and industries too numerous to mention. Now as it is the busi-

ness of every one to look out for himself, and presumably of the statesman also in his public not less than in his individual capacity, is it worth his while, on behalf of his constituents, to consider well for a moment any thought which, looking forward to the proper destinies of the Canada of the next generation, can build up within our means the noble conception of a national museum!

One of the functions that has been acceptably performed by the Geological Survey for years has been the supplying and aiding in building up of local and provincial museums. Subterranean regions in charge of Mr. Willimot, devoted to this requirement, are seldom seen or heard of by the visitor. Several of the provinces, having special local interests, have inaugurated provincial geological surveys, supplementary to those of the Dominion, and commenced local museums of their own; the good policy of which is apparent.

Canada has its *central* mineral belt, the copper, silver, gold and iron belts of the Lake Superior region extending northward, and Drs. Selwyn and Bell think repeating itself along the coast of Hudson's Bay. It has the *cordilleran* belt with all the mineral wealth that term implies in North and South America. It has also its *appalachian* gold belt, which is interesting on account of the reported richness of some of its ledges; and *sundry coal and iron regions*, which justify us in saying her capabilities of sustaining even large populations in unthought of "deserts," may be far better than we have imagined. If so her rigorous climate, during a portion of the year, may turn out to be an advantage rather than a drawback; and the aspect of probable national developments is materially improved.

A. B.



Latest English Quotations.

The latest quotation for Canadian phosphate is eleven pence three farthings to one shilling per unit, with a rise. At the latter figures it will net to shippers over \$19 per ton in Montreal, on a basis of a dollar and a half for ocean freight.

MINERAL PHOSPHATES.—English buyers have been enquiring for Canadian, but no large sales have been made since our last. Owing to low steam freights the price of South Carolina Phosphate has fallen still further, and it is reported that 7½d. has been accepted for some large cargoes. Ground Somme Phosphate has been in active request, and Raisers are as yet not prepared for the demand. The lower qualities, 65 to 70 per cent., and 60 to 65 per cent., are also in request, but principally to Continental consumers. Belgian.—The higher qualities of this material are suffering from the competition of Somme, and are offering relatively cheaply. 40 to 45 per cent. can still be bought

for forward delivery at tempting prices, and a fair business has been done. Cambridge and Bedford Coprolites are quoted respectively at 42s. f.o.r., or Ground at 50s. in buyer's bags, or 52s. in lent bags, f.o.r., and the latter at 26s., f.o.r., or 31s. 6d., f.o.b., Thames.

OTTY LAKE MINES.—This property lies mainly in the 7th and 8th concessions of North Burgess, Ont., and extends for upwards of two miles along the north shore of Otty Lake. It is one of the few properties in Ontario where any considerable amount of phosphate has been profitably mined by hand labor, and upon its acquisition last fall by the Anglo-Canadian Phosphate Company, (Limited) it was determined to try the experiment of working it with machinery. During the winter, in spite of the inclement weather and heavy snow falls, quite a mining village has been created and plant has been erected, consisting of an eighty horse-power Return Tubular boiler, a seven drill Ingersoll air compressor, rock drills, double cylinder hoists, Knowles and Worthington pumps, and all needed accessories. Work was fully started on one seam in the latter part of March, and in nine days 117 tons of high class phosphate were mined from one pit, the total number of men employed on the property being 33, only two-thirds of these being engaged in mining. The April thaw caused a discontinuance of the work to some extent, but two pits are now in operation with the machine drills, and a third is being fitted with one of the Montreal Steam Crane Company's steam cranes and a Knowles pump. This seam contains a body of pure phosphate six feet wide and is increasing in width as it deepens. The seams in this district are not often as wide as some of the deposits found in the Lievres river district, but they are more continuous. One of the seams now being worked has been opened on the surface at intervals for half a mile, and another has been proved to extend fully a mile. The seams vary in width from one foot to seven feet. One difficulty in the past in the prosecution of this industry has been that persons, working one seam by hand with insufficient capital, abandoned the work whenever the inevitable pinches of the seam occurred, although an expansion might be considered certain to occur at a little distance. It is believed that by working several seams in a large way an average result will be obtained that will yield good returns. The company owns its own teams and is hauling the phosphate over six miles of good roads to the Canadian Pacific Railway at Perth, whence it is brought to the ships side at Montreal. In winter the hauling is only three miles across the lake to the Rideau Canal where barges can load for Montreal.

The Otty Lake Mines are in charge of R. A. F. Penrose, jr., Ph.D., (Harvard) a highly educated chemist and mineralogist, who has devoted some years to the special study of phosphates. The result of his researches is now being published by the United States Government, and will be of much interest to Canadian miners. Dr. Penrose is making experiments upon the separation of the impurities from the apatite, and the company expect to erect grinding mills and supply the phosphate in a pulverized condition.

On account of the very high water there has been very little ore shipped from the Ottawa district as yet. The river has risen three feet higher than ever before known at Buckingham, and most of the phosphate piled upon the bank has been submerged.

The output from the various districts continues to be most satisfactory.

A meeting of the directors of the North Star Mining Company was held at Montreal on 17th inst. It has been decided to continue the sinking of their main shaft, which, at present, has attained a depth of some 550 feet, and is showing very good ore at the bottom. It is calculated that not less than 3,000 tons of 80% ore is now in sight. Mr. Charles Kyte, of New York, Secretary of the Company says that he is much pleased with the general outlook for the season.

The High Rock output for last month figures close in the vicinity of 750 tons. The management expect to forward from seven to eight thousand tons of high grade ore. Their steamer and scows have been newly painted and present a very pleasing appearance on the river.

At the Little Rapids mines work is being pushed vigorously forward, the usual excellent output of high grade ore at comparatively small cost to the management continues, and a brisk season is anticipated. The new tramway which has been constructed as far as the river is rapidly nearing completion. The locomotive and cars have arrived and await the laying down of the rails which have been delayed in shipment on account of the increase in the tariff. The Superintendent, however, reports that everything will be ship-shape and in complete running order by 15th of next month, at the latest.

At the Emerald mines a very fine body of ore is in sight and operations are being conducted smoothly and vigorously. Shipments have been delayed by high water, but about 150 tons have been forwarded to Montreal. The management expect to ship close on 6,000 tons before the season terminates.

Although we have had no report this month from the Union Company's mines, the output is believed to be fully up to that of last month.

Everywhere throughout the Ottawa district much activity prevails and everyday the richness of the vast deposits becomes the more apparent. Even the most skeptical now admit that the phosphate industry has a great future in store for it and that at the present rate of progression it must soon equal that of lumbering. Under existing management the large majority of the mines are being most profitably conducted, while with the new and improved mining machinery which has been generally adopted and the increased facilities that have been made and are daily being added, managers will be enabled this summer to deliver the mineral at point of shipment to the best possible advantage.

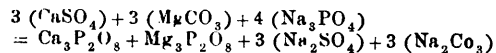
As is well known, very large deposits of clear green and otherwise colored apatite occur in Canada from which very large quantities are annually taken to be crushed and manufactured in superphosphates for agricultural purposes. Such deposits also occur in Norway, where they have been studied by Professors Brogger and Reusch, who declared them to be of eruptive origin. Dr. Harrington, after showing that they occur in rocks of a similar nature, though unlike in detail, shows that there is abundant reason for considering that they are not eruptive rocks, and thinks that they were gathered by and crystallized from solutions. It may be recalled in this connec-

tion that M. Daubree made apatite in a closed tube by causing a volatile phosphorous compound to act upon hot limestone, and he thinks that some such deposits may have been formed by sublimation. The opinion of Dr. Harrington is sustained by the previously formed opinion of Dr. Hunt, and it will be seen that every possible mode of origin has to-day weighty opinion in its favor. But argument of such questions is progress, and is a long step toward conclusion, and these studies have contributed much to our knowledge of these deposits. Dr. Harrington describes immense crystals of apatite a foot or more in diameter and several feet long.

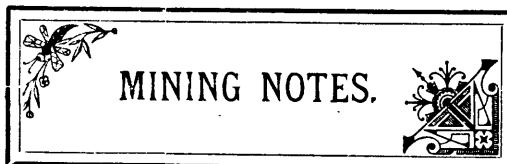
A process has been patented in Germany for the manufacture of precipitated phosphates from any kind of the ordinary crude rock. It is described as follows:—

"The rough material being first reduced to a very fine powder, is treated with just sufficient sulphuric acid to transform the carbonate and any free lime into sulphate. The mass is then subjected to the action of aqueous sulphurous acid, which dissolves only the tri-calcium phosphate and leaves the other constituents as a sediment. The clear liquid is decanted and subjected to a gentle heat; sulphurous acid is given off and reabsorbed in water—by means of a simple mechanical device—the phosphate itself being precipitated, washed, dried, and passed through a disintegrator. The preliminary treatment prevents the combination of the carbonate or free lime which would otherwise take place with the sulphurous acid, and averts the formation of a mixture of calcium sulphite in the final product."

"Tri-sodium phosphate" writes our esteemed contemporary, the *Engineering and Mining Journal*, "is being extensively brought to notice by the Keystone Chemical Company of Philadelphia, as a scale preventative. As is well known, the scale-forming matter in water, consists chiefly of lime sulphate, and carbonate, and magnesia carbonate, and hydrate, which are thrown out of solution by evaporation, and, falling as a dense crystalline precipitate, burn on to the iron in thick hard scales. These scales are very bad conductors of heat: a scale $\frac{1}{8}$ of an inch thick requires the use of 15 per cent. more fuel, $\frac{1}{4}$ of an inch, of 60 per cent more, while if it reaches a thickness of $\frac{1}{2}$ inch, the fuel must be increased by 150 per cent., and so on. It is hence apparent that to all manufacturers and all users of steam, any method of preventing this incrustation is a great desideratum. The use of tri-sodium phosphate for this purpose, has hitherto given the most undoubted proofs of its value. Nearly all the other scale removers in the market depend on their power of dissolving these lime and magnesia salts, and it is reasonable to conclude that if they will dissolve such a refractory substance as boiler scale, they will also attack boiler iron. This attack may be, and often is, gradual and slow; but it is none the less certain, though insidious. That tannic acid is destructive to boilers we have a practical proof in such peaty waters as are found in Florida, where the tannic acid formed in the water from the decayed vegetable matter actually corrodes the boilers to such an extent that in many cases copper tubes have been substituted for iron. Caustic soda is certainly effective in some cases, though the seams, rivets, and boiler shell, suffer badly from its solvent power, its affinity for sulphur causing it to eat out minute pin holes in the metal. Unlike any of these agents, the efficacy of tri-sodium phosphate is due to its faculty of decomposing the sulphates, and carbonates of lime, and magnesia, and forming in their stead, lime and magnesia phosphates, and soluble sulphate, and carbonate of soda. The following equation will give a general idea of the reaction induced:



The solid lime and magnesia phosphates are not dense, crystalline precipitates like the sulphates and carbonates, of which they take the place, but are light and flocculent, remaining equally distributed throughout the water as long as it is in ebullition and only settling down when the water is perfectly quiescent. Even when this precipitate does settle, it is in such soft, gelatinous condition that it can not burn on to the iron unless the water is first evaporated quite away; an impossible condition. Tri-sodium phosphate reacts equally well on metallic salts, such as copper and iron sulphates and carbonates, precipitating the copper and iron as phosphates, and leaving sulphate and carbonate of soda in solution. In cases where free acid is present in the water, as tannic acid in Florida, or sulphuric acid in the drainage of many mines, it will be neutralized by the alkaline tri-sodium phosphate, and the water thus be rendered harmless. Lastly, as tri-sodium phosphate does not itself act deleteriously upon iron, no ill effects beyond the waste of the substance will follow its excessive use.



Nova Scotia.

The latest brick brought in from the Moose River Gold Mines weighs 76.8 $\frac{1}{4}$ ozs., and is the result of crushing 58 tons of quartz.

During last year Mr. Tonquoy worked several leads on his property, among which might be mentioned the North, Little North, and Copper Lead. The South Lead was opened for about 60 feet. On the Copper Lead a new shaft was sunk, and about 70 feet opened. At present about 12 men find employment at the mine.

The following comparative statement showing the mineral production of the Province for the year 1886 is given in the annual report of the Inspector of Mines:—

| | 1885. | 1886. |
|------------------------|-------------------|-----------|
| Gold.....Ounces..... | 22,203 | 23,362 |
| Iron Ore.....Tons..... | 48,129 | 44,388 |
| Manganese Ore..... | 353 $\frac{1}{2}$ | 427 |
| Barytes....." | 300 | 230 |
| *Antimony....." | 758 | 645 |
| Coal raised....." | 1,352,205 | 1,502,611 |
| *Gypsum....." | 87,644 | 123,753 |
| Building Stone....." | 3,827 | 8,000 |
| Coke made....." | 30,185 | 31,604 |
| Limestone....." | 16,429 | 20,265 |
| Grindstones, &c....." | 2,208 | 1,600 |
| *Moulding Sand....." | ..... | 200 |
| *Amount exported. | ..... | ..... |

Mr. J. E. Hardman, of Oldham, has recently sunk a shaft on his property to the depth of 230 feet, and is now working on a lead which, in some places, is 5 feet in width. So far the quartz is said to have yielded gold at the rate of 10 penny-weights to the ton, and constant employment is given to 28 men.

Quebec.

Prospectors in the Rocher Fendu District have brought in some capital specimens of gold quartz, galena, and white marble. The height of the water, however, prevented these parties from prosecuting their researches sufficiently to ascertain whether these minerals can be obtained in paying quantities or not.

It is reported that a half-breed made a discovery of gold deposit in the vicinity of Golden Lake, Black River, last winter, and has shown many varied and rich specimens of gold rock, but he will not show the location of his find without being paid a large sum of money. The specimens have been submitted to an analysis, and have been found to contain gold in large quantities.

The discovery of a valuable deposit of lead is announced in the Township of Waltham, Pontiac County.

The Asbestos Mines are in active operation and the present prospects indicate an increased output for the year. The late dry weather has been suitable for this class of work and operations have been pushed ahead vigorously.

About 50 hands are presently employed at the Anglo-Canadian Company's Mine, and the management are taking out between three and four tons of asbestos per day. They are at present sinking on what is called the Emelie pit from the bottom of which ore of a very superior quality is being taken out.

The Scottish Canadian Company are still constructing buildings and adding machinery, but we understand that at present they are not taking out much asbestos.

The Thetford Mines are all in operation and running about as usual.

At Danville the Jeffrey Mine is being operated upon a small scale, but with what results has not been ascertained.

Ontario.

The Queen Gold and Silver Mining and Milling Company has been formed at St. Paul with a capital stock of \$1,500,000. One hundred thousand shares of the capital stock, amounting to \$500,000, is to be sold, and the proceeds used in developing the property of the corporation at Whitefish Lake, Thunder Bay District. Incorporators:—Henry S. Sibley, J. A. Boak, C. G. Kimball, J. H. Hullsiek, J. Q. Hass, A. C. Ramsden, St. Paul; A. H. Truax, Hastings. Officers:—Henry S. Sibley, President; C. G. Kimball, Vice-President; J. A. Boak, Secretary; J. Q. Hass, Treasurer.

A meeting of the directors of the Kingston and Pembroke Mining Company was held at Kingston, on Monday, 23rd inst. The company estimate that 100,000 tons of ore will be shipped this year from the various mines along the line of the Kingston & Pembroke Railway.

The *Nipissing Times* announces that a valuable deposit of gold has been made in the neighbourhood of Lake Tomogaming, about 16 miles south of the Ottawa River. An assay of some of the specimens taken from the holes uncovered is said to average about \$70 in gold to the ton. The deposit is owned by Mr. P. A. Ferguson, of Mattawa, and Mr. John Caverhill, of Montreal, who propose developing it next month.

PORT ARTHUR DISTRICT.

Reduction works are to be put in at the Crown Point Mine.

Arrangements have been made for the further development of the Zenith zinc mine some 10 miles north of Nipigon Bay.

It is expected that during the summer efforts will be made to open up some of the iron and galena deposits in the neighbourhood.

Messrs McKellar Bros. have announced their intention of developing the vein at 5 B. Silver Prospect, near Trout Bay.

The *Miner* states that McKellar's Island will again be worked this spring for the spar which the American market requires to "improve" paints. Men have already gone out to Pie Island to fix up the houses of the men, as it is considered cheaper to fix the houses up there and take the men back and forth to McKellar's Island than either remove the houses or build new.

A meeting of the Kewatin Mining Company was held recently in the office of the Secretary, Mr. L. McMeans. Mr. J. W. Harris occupied the chair. The object of the meeting was to consider offers submitted regarding the purchase of the mine. Several well known mining men are preparing to develop the mine, and more activity than has characterized mining operations lately is anticipated in the Lake of the Woods region.

Mr. O. Dounais, the discoverer of the Silver Mountain and Rabbit Mountain mines near Port Arthur, is reported to have purchased a mining claim in this district for \$10,000.

British Columbia.

Mr. G. Henderson, Superintendent of the Foster M. & M. Co.'s mines, has purchased one half of W. D. Pattern's claim at Nicola. A ten stamp mill has been ordered and arrangements are being made to actively push the working of the new concern.

A gentleman writing to Mr. H. B. Cameron, of Messrs. A. B. Gray & Co., from Granite Creek, says that an old Frenchman, named Pardee, has struck quartz about a mile from Granite city, on the east side of the Tullameen River. Pardee is an old prospector and has been working since last summer, feeling that rich quartz existed in the hills near the river. He was put down as a "crank" and no one would take notice of his statements. After he had satisfied his curiosity and made up his mind that his supposition was correct he induced two men to go with him, with the above result. The people in and about the creek are much excited and the country is staked off in claims nearly to Allison's. The Frenchman says that he is likely to make his fortune now, and as he has got the people worked up to his way of thinking he feels jubilant.

A sample of quartz recently taken from the Hixon Creek mines has assayed \$585 to the ton.

The Ashcroft correspondent to the *Calgary Tribune* says: "The developments of the Hixon Creek Mine reveal an immense body of ore, the west wall of which was reached 23 feet from the shaft. Forty-seven feet of a cross-cut failed so far to locate the east wall and the ore looks good the entire width. Stock in this property has advanced three hundred per cent. and is still eagerly sought after. Some difficulty is being experienced in getting men, as most men coming to this country go straight to the coast instead of looking about in the interior.

The Island Mountain, the B. C. M. & M. and the Hixon Creek, all quartz companies, have made application to participate in the assistance provided by the guarantee clauses of the Act of last session.

The stamps at the Foster Milling and Mining Company's mines have commenced crushing.

The latest strike at the Foster Company's Mine is reported to be an exceedingly rich deposit of black sulphurets assaying \$136 in gold and \$29 in silver to the ton.

The machinery for the S Kirk Mining and Smelting Company, under the management of Mr. G. B. Wright, is being placed in position and will soon be in active operation. The engine is one of Ame's celebrated 30 horsepower, manufactured at Oswego, N. Y.

A local exchange announces that "two mining superintendents from California and Nevada, who have just visited the Nicola mines, report very favourably on the prospects of the leads examined. The gentlemen are Messrs. Henderson and Probert, and the former has bought an interest in the Patterson mine; the latter will have an interest in an English syndicate that is expected to purchase the Nicola Mining Company's claim. A ton of low grade ore will be forwarded immediately from the mines to San Francisco to be further tested, and to supply the means of deciding what kind of machinery is most suitable for reducing the ores and working the mines. The machinery will be on the ground at an early date, and it is expected that it will be at work during the latter part of the summer. Two years work has been already done on these claims, and there are 600 tons of good ore now on the surface, but no ore has yet been realized on or reduced. It is probable that when the machinery at these mines is once in full swing that a considerable population will be attracted to the locality of Nicola; and as gold, silver, copper and other metals abound in the neighbourhood the prospects are bright in variety as well as richness. The Nicola mines, thirty miles by waggon-road from Kamloops, are situated near the Nicola River, which gives abundant water for continuous working and washing."

United States.

The quarterly report of the Plymouth Consolidated Gold Mining Company, ending 1st April, 1887, shews Gold Bullion produced as follows:—

| | |
|---------------------|-------------|
| January, 1887..... | \$62,350.49 |
| February, 1887..... | 60,683.76 |
| March, 1887..... | 59,296.45 |

| | |
|---|--------------|
| Total product for three months, 1887..... | \$182,330.70 |
| Operating expenses for same period..... | 66,962.59 |

| | |
|-------------------------------------|--------------|
| Profit..... | \$115,368.11 |
| Cash on hand, January 1st, 1887.... | 81,079.89 |

| | |
|--|--------------|
| Amount applicable to Dividends.... | \$196,448.00 |
| Paid dividends for quarter, No. 44 to 46, \$25,000 each..... | 75,000.00 |

Surplus, April 1st, 1887....\$121,448.00

The Canadian Anthracite Coal Co.
LIMITED.
Miners & Shippers of Coal.

McLEOD STEWART, Prest., J. G. THORP, Vice-Prest.
OTTAWA, CANADA. EAU CLAIRE, WIS.
A. PUGH, General Manager, W. B. SCARTH, Secretary,
ST. PAUL, MINN. WINNIPEG, MAN.
O. H. INGRAM, Treasurer,
EAU CLAIRE, WIS.

Mines at Anthracite,
N. W. T., CANADA. v-1-1y

Mineralogy, Geology & Science.

All correspondence under this head, and scientific exchanges, must be addressed to the Science Editor, Canadian Mining Review.

The Royal Society of Canada.

Through the courtesy of Dr. Robert Bell we are enabled to furnish the following list of papers on geology, mineralogy, and other subjects of interest to the readers of the *REVIEW*, to be submitted at the meetings of the Royal Society of Canada, presently in session at Ottawa. Judging from abstracts of the various subjects made by Dr. Bell, all these are full of scientific interest, and when published in the *Transactions of the Society* many of them will be of much practical value to the general public. The Session will close on Saturday, 25th instant. Mayor Stewart will entertain the members at a garden party to be given at his residence on Friday afternoon, the 27th inst. The number of papers promised and already submitted is greatly in excess of that of former years.

A Comparison of the Flora of Hudson's Straits and the Arctic Regions of America. By Prof. George Lawson, Ph.D., L.L.D.

Additional Notes on the Geology of Aroostook County, Maine. By Prof. L. M. Bailey, M.A., Ph.D.

(A Geological Subject.) By Rev. J. C. K. Laffamme, D.D., M.A.

The Erosive Power of Glaciers, as seen in Norway. By Prof. J. W. Spencer, M.A., Ph.D., F.G.S., Professor of Geology in the State University of Missouri (formerly of the Geological Survey of Canada.)

The Correlation of the Animikie and Huronian Series of Rocks. By Peter Mackellar, Esq., (formerly of the Geological Survey of Canada.)

The Classification of the Trilobides. By Prof. E. J. Chapman, Ph.D., L.L.D.

The Diurnal Motion of the Earth in its Relation to Geological Phenomena. By W. A. Asher, D.T.S. (meteorological observer, Quebec, and delegate from the Literary and Historical Society of Quebec.)

The Economic Minerals of Nova Scotia. By Edwin Gilpin, M.A., F.G.S.

The Gold Bearing Rocks of British Columbia. By Amos Bowman, Esq., (of the Geological Survey of Canada.)

The Utica Formation in Canada. By Henry M. Ami, M.A., F.G.S.

The Classification of Rocks. By Thomas Macfarlane, M.E.

The Geography and Geology of Baffin Land. By Dr. Franz Boas (arctic explorer and editor of *Science*).

Theory of the Movement of Land Ice. By J. W. Spencer, M.A. Ph.D., Professor of Geology in the State University of Missouri.

Petrography of the Drift of Central Ontario. By Dr. Coleman, Victoria University.

Papers of unusual interest on kindred subjects will be submitted by Dr. Bell and others. In our next issue we hope to be able to publish abstracts from such papers as are of more immediate concern to the mining public.

A new publication on Algoma West will be submitted to the public early next month. The mines, scenery and industrial resources of the district are said to be special features of the work which is edited by Mr. W. Roland, C.E.

The Great Ice Age and Subsequent Formations at Ottawa, Ontario.

By H. M. Ami.

Of the Ottawa Field Naturalists' Club.

This portion of the American Continent, which, during the earlier paleozoic period had alternatively been submerged and elevated, remained in this latter state a long period of time, during which denuding agencies, such as atmospheric erosion, rain and other solvents carried away a great deal of material. This is a lapse of time, which, in other parts of Canada and elsewhere, is marked by a regular ascending series of newer formations deposited for the most part beneath the level of the then existing oceans, a period embracing within itself the whole of the Silurian and Devonian systems together with the Carboniferous age of the coal measures: the Paleozoic age thus ended, Mesozoic times came in and the Triassic, Jurassic and Cretaceous systems followed, overlying which all the Laramie and Tertiaries were laid, all of which are entirely absent in our district marking a great unconformity between the Glacial deposits and the Hudson River rocks about Ottawa.

The Glacial Epoch or the Great Ice Age, then, is the first of the series of Post Tertiary times with which we have to deal, as it rests immediately upon, though with discordance of stratification (if that term may be employed here), and overlies the Cambro-Silurian and older formations in this district. Just previous to this period of glaciation, and whilst it lasted, there must have taken place a great elevation in this part of the North American continent, so that an extreme Alpine or Arctic climate was the natural result. Nor was this part of America the only one which enjoyed this particular state of affairs, but throughout the greater portion of North America as far west as the Great Missouri Coteau, in Europe and other continents, evidence of extreme cold, the result of great elevation, has, through the labours of leading geologists, been ascertained beyond doubt. Prof. Favre, of Geneva, whose admirable researches in Alpine geology have made him so famous the world over, in the "Résumé" of his "Geological Researches in Savoie and the neighbourhood of Mt. Blanc"—points out clearly what was the origin of the glacial epoch in that part of Europe. "The amount of moisture or humidity," he says, "with which the atmosphere of Europe was filled on account of the elevation of land subsequent to the deposition of the tertiary deposits—the cooling effect of the neighbouring mountains, then more elevated than now-a-days—together with many other causes, led to a reduction in the temperature of the atmosphere resulting in an abundant precipitation of snow on the leading peaks of the region." So in Canada, and in the Ottawa district: a great reduction in the temperature followed the great elevation, and immense quantities of snow, ice and water followed and glaciers were formed all over the district—a vast *mer-de-glace* covered this portion of Canada whose height above the ocean level of that period was very great. These glaciers, like modern ones, were characterized by many interesting particulars which a study of the latter can afford. The number, direction, movements, thickness, erosive or denuding power and the constituent parts of a glacier or a system of glaciers are questions full of interest. It has been ascertained that over four hundred glaciers can be seen in the central portion of the Alps, from Mount Blanc to the Tyrol, some of which are only three miles in length, whilst others exceed twenty miles from head to foot or from the point of origin to

the snout. There is abundant evidence to show that the number of glaciers which must have existed here about Ottawa is very considerable indeed, whilst the number of them in the whole of Canada and the United States must have been very great. Many of them, and perhaps the greater number, were subordinate or smaller ones and may, at length, have been absorbed in and formed part of "a great glacier." The direction in which they moved depended of course on the nature of the district, its physical or orographical character. The general trend of the great *mer-de-glace* in Canada during this epoch has been ascertained to be approximately N. E. and S. W. The direction of some of the glaciers as obtained from the striations or grooves on the rocks about Ottawa show that in some cases they travelled almost due east and west, as may be seen along Park Avenue, on Nicholas street and in other parts of the city, at other times they appear at a considerable angle to this direction, bearing almost due north and south, as at Buckingham on the Lièvre River. Regarding their movements, the speed with which glaciers travel, we consult Agassiz and find that he obtained the following results in 1841 and 1842 on some of the Aar glaciers:—

| | ANNUAL MOTION. |
|---|----------------|
| I. FINSTER AAR— | |
| { Stake near centre of glacier... 269 feet. | |
| { " " side " 160 " | |
| II. LAUTER AAR— | |
| { Stake nearest centre of glacier... 245 " | |
| { " " side " 124 " | |

whilst at Chamonic the ice near the shore of the *mer-de-glace* was found to move as follows, from June 29th to June 8th of the following year:

| | |
|------------------------------|-----------|
| From June 29 to Sept. 28.... | 132 feet. |
| " Sept. 28 " Dec. 28.... | 70 " |
| " Dec. 12 " Feb. 17.... | 75 " |
| " Feb. 17 " April 4.... | 66 " |
| " April 4 " June 8.... | 88 " |

Total (in less than one year), 432 feet

This would average over five hundred feet or about one-tenth of a mile in twelve months. The rapidity in the motion of a glacier, of course, depends upon the nature of the obstacles to be surmounted, as well as to a great extent upon the time or month of the year, whilst different portions of the same glacier move at a different rate. A glacier which descends into a valley below or discharges itself into a sea or arm of an ocean does not necessarily lose any of its length, for whilst its snout is being melted and carried away to warmer portions, the head or initial point is ever receiving additional snow and ice to supply it constantly, and only a subsidence of the continent could produce a change in the climate of such an ice bound district.

We have no data existing here or traces left by means of which we can calculate the rate of motion of the glaciers about Ottawa during the great ice age, suffice it to say that as in the case of modern glaciers so it must have been in the case of the old Ottawa glaciers, their rate of travelling varied at different times in different circumstances. Then as to the thickness of the great ice-mass which had then invaded this district, that is a problem which to a great extent, has yet to be solved with us, nevertheless, let us examine the data at our disposal in reference to this interesting phenomenon. Taking the Ottawa Valley, in and around the city, as a very typical example of a valley of erosion with subordinate branches, we see that facing the river, there occurs a series of high "bluffs" or cliffs where the strata are clearly seen along

their sides to be throughout, nearly horizontal.* That these beds could not have been deposited in such a position is beyond question and goes without saying, so that the prolongation of them northward must at one time have existed. What was it then, which removed all these and to such a depth? This very question gives us a clue to one factor at least in the estimate of the powerful ice-mass which, coming from the West or W. N. W. struck down upon the shales and limestones of the formations here to be found. It also gives us data to estimate its thickness. The occurrence of striated rocks at the top of old Barrack Hill, where the Parliament Buildings now stand, show that as that cliff is one hundred and eighty-seven feet above the level of the river, and over two hundred feet above the level of the bed of the river, the mass must have been much over two hundred feet. Further, in order that a mass of ice or a glacier carrying boulders and detritus—*moraine profonde*—can groove and polish the rocks of a district to such an extent as was the case here, the superincumbent weight and attending pressures must have been enormous, and from what is known of present glaciers, whether in alpine or arctic regions, their thickness is very great. A fair estimate, we believe, of the thickness of the glacier or *mer-de-glace* extending over our city and its environs during the glacial epoch must have been very little short of one thousand feet, if indeed that number is not too small. The erosive or denuding force of glaciers has just been touched upon whilst a great deal might be said on the subject; for, when we take into consideration the millions of tons of material which has been transported away from even the small area about our city and examine the amount of cutting, abrading and ploughing which must have occurred, it is simply marvelous to know where it all went. You can hardly pick up a loose rock or boulder in the fields without seeing written upon it indubitable marks of scratching and grooving, which, along with millions of others were held firm in a mixture of cementing clay and sand (to a small extent) carried forward upon the floor of the glacier and one against the other, at times, to such an extent that all angularities and rough points are removed and the boulders left smooth and polished. The striations, grooves and polished surfaces of rocks which up to this date attest clearly to the fact of the existence of those glaciers, besides the boulders themselves, may be seen not only in the places already mentioned, but in numerous other localities, and they only await the student of Post Pliocene geology to afford the information they can readily give at the corner of Sussex and Rideau streets, where an interesting spot occurs.

The effect of these glaciers upon the softer shaly strata of our neighbourhood is clearly shown in such a deposit of the Utica shales as is met at Cumming's Bridge, on the Rideau River or at the corner of Maria and O'Connor streets, some 12 feet below the surface of the roadway. At these two places, whilst the shales of the Utica formation also occur *in situ* and undisturbed at a greater depth than is visible in either section, the uppermost measures of the section exposed and examined cannot certainly be said to be strictly *in situ* as the beds are tilted at every conceivable angle, crushed and broken. In the overlying glacial deposits are to be found some of the boulders which assisting in tilting and disturbing these once horizontal measures.

*There are but few exceptions to this, due to dislocations, faults and folds in the strata of purely local origin, but not of general significance in this problem.

There occur a vast number of faults and dislocations in the measures of the Trenton and other formations about Ottawa, great breaks, which at times, run more or less parallel to each other and were the result of great pressure brought to bear upon the beds in question. Whether these faults and breaks are due to disturbances which took place about the close of the Silurian Age, or at the introduction of the Devonian, when *Rigaul* and *Montreal* mountains and other similar volcanic or intrusive masses were ejected amidst great perturbation; or whether some of these faults were not in part due to the enormous pressure which the great ice-mass exerted upon the strata in later glacial times are questions which, though readily suggested by the phenomena examined, do not find so ready a solution. Having now examined the number, direction, movements, thickness and the erosive power of the glaciers during this Great Ice Age, having very cursorily glanced at the results which were effected in giving the country the general appearance which it possesses at the present day, there remains to find out what are the materials which were deposited and under what conditions they were deposited.

The masses of boulders, also termed "boulder clay," "*moraine profonde*," &c., unlike both the underlying older and overlying newer deposits are *not stratified*, i. e. they have no divisional planes of stratification or true bedding. Pebbles of various sizes and of every kind of rock in the district, usually rounded and smooth, held together or cemented by an argillaceous paste or clay with a certain admixture of arenaceous material derived from the more finely crushed *detritus* and *debris* at the bottom of the glacier, form the lowest division of our Post-Tertiary deposits. These "boulder clays," as they are appropriately termed, have a very large percentage of boulders in them, the finer material being scanty and in a finely-divided or comminuted state.

Such a deposit is one which "land ice" alone produces and one which resembles wonderfully the "*moraines profondes*" of the ancient Rhône glacier as they may be seen near the Western extremity of Lake Geneva (a mile and a-half below) and in the adjoining districts. In further corroboration of these boulder clays being due to land ice is the fact that none of the organisms which would be expected to characterize marine clays are present therein. The total absence of organic remains (so far as ascertained) in these glacial clays, coupled with the fact of their occurrence in abundance in the Leda clays above point clearly to a wide difference in the mode and condition of deposition of both, the one being laid at a great elevation above the sea level, the other below the level of an ocean or arm of a sea.

In examining the surface geology of Ottawa, one is struck with the diversity in the distribution and extent of this "boulder clay formation." In some places, the only indexes present which point to its existence at one time, are the striæ and grooves over the bare rocks, such as they are exposed principally about Hull and Ottawa in the vicinity of the Grand River, whilst there are also numerous fields and tracts of country which exhibit that formation very clearly. In such *glacial* and *post-glacial* valleys and districts, from which the "*Leda clay*" and *Saxicava sand* and *overlying strata* have been removed by denudation, there occurs a large quantity of these boulders. Amongst these are no doubt included, at the present day, the erratics of all which were dropped by ice-bergs at a period subsequent to the great ice age, nevertheless the character of the fields where this formation is met is well known, and especially to the agriculturist. The Rideau River Valley,

of post-Tertiary Age, and very recent geologically speaking, presents numerous points of interest from its mouth at the falls in New Edinburgh to the Hog's Back. Nearly the whole of the Post-Tertiary formations were carried away by the once wide stream which flowed in that vicinity, and even the glacial clays suffered not a little, as the materials cementing the pebbles are to a great extent entirely wanting. The Rideau Rifle Range extends, for the most part, over this formation, whilst the southern portion of the range, as well as its northern limit (at the 600 yard buttes) are on the outskirts of the newer overlying marine clays. We have already spoken of *moraines*. These vary very much in extent and distribution just as the "boulder clay" or "till," as it is also sometime called, varies from next to nothing to twenty feet or more in thickness in different places, and are extensively developed about Ashburnham Hill, Gilmour's Mills, near the Hog's Back, etc., occupying its lower and regular position at the bottom of the Post-Tertiary series in Upper Town, Centre Town and Stewarton, cropping out in the rear of the City Hall, on the east side of the canal, ever keeping its normal position. It is very generally distributed thence in beds varying in thickness in the area included in a curve drawn from the New Militia Stores on the canal along Sussex street up to St. Patrick street then produced on to the bridges over the Rideau river, pretty nearly in a line with the curve which Sussex street there describes, and across to New Edinburgh through the Rideau Hall grounds to a small extent where these deposits thin out markedly, and continuing the line through Beechwood, in Gloucester, on in a south-easterly direction, we have a horse-shoe curve, in which are included vast accumulations of material left us by this Ice Period. But to come back to the *moraines*:—There are, besides these hard, coherent masses of "boulder clay," large aggregations of more or less uniform-sized boulders held very loosely together which form a prominent feature of the county. At Gilmour's Mills there is a good example of one of these whilst there has already been pointed in the "Geology of Canada," 1863—already cited—that a number of zones or belts of boulders cross the Ottawa at different places near the city, one of which a few miles below Ottawa produces a shoal on account of which the navigability of the river at this point became dangerous and obliged the Government to erect a lighthouse. These are what are termed "*morainic belts*," and are prominent features to consider.

There are a number of other particulars respecting which the detailed notes obtained from the excavations that have been carried on in our streets, though bearing immediately on this subject, cannot be included for the present.

Following this period of *great elevation* and of extreme cold there came a period of *submergence*. Nor must it be surmised that the subsidence which took place in this part of the country was necessarily effected in a short time; on the contrary, it must indeed have taken ages for the country to have come down even to the level to which it is at present—a height of some 215 feet above sea level at Ottawa. As the elevated ice-bound country was gradually subsiding, there came an amelioration in its climatic condition, and more temperate seasons ensued. The glaciers which at one time discharged their materials in valleys and on land—feeders to a regular system of glacial rivers both in the lowlands and in the mountain districts—now discharged these along the coast, and *coast-ice* and *icebergs* were soon at work as the sea was encroaching upon the land and depositing over the old beds of the

glaciers a series of sedimentary strata, with which there came also the life and organisms common to such *habitat*, so that the next period or formation with which we have to deal is one of marine origin, deposited in the still depths of an ocean or sea and containing the remains of animals common to that period in the earth's history. Meanwhile innumerable quantities of ice-bergs, carrying with them large blocks of rock and detritus—themselves portions of glaciers—were scattering their burden over the bed of this ocean or sea, as the warmer regions were reached, as at the present day, along the coasts of Labrador, Newfoundland, and adjacent districts, the icebergs detached from their northern fortresses sweep down towards the centre of the earth—no doubt to a great extent due to that transporting force developed in the rotation of the earth.

There are certain geologists, I believe, who would account for the *grooves*, *striations* and *furrows* in the hard rock masses below being formed, through the agency of *coast-ice* and *icebergs*. Whilst admitting the possibility of certain local and limited areas as capable of being effected by the agencies above mentioned, there is little doubt that they are together wholly inadequate to explain the phenomena of striated surfaces (see Prestvich) over such vast areas, as it is known that these surfaces extend, in some cases, for hundreds of miles.

But, of the sedimentary strata which, during this period of submergence, were being laid down over the remains of the glacial epoch the lowermost series consists of bluish gray clays of more or less plasticity and varying greatly in thickness in different parts of this region. There are a number of sections both *natural* and *artificial* which this district has afforded. Amongst the latter may be mentioned the Rideau Canal, which from the "*Basin*" to the "*Deep Cut*" "gives a very good idea of the thickness of these clays there. Then the hundreds of sections which the recent excavations carried on by the City Engineer have exhibited where in almost every instance, the clays may be seen in their normal position though in some cases they are totally absent. Then comes the brick-yards owned by the Messrs. O'Dell, Clark, Nicholson, Graham and others. In the first mentioned of these—Mr. O'Dell's—have been found remains of a fossil sponge, the *Tethea Logani* of Dawson, together with *shells* and *foraminifera* and a bone sent to Prof. Cope for identification, all of which were communicated and presented to the writer through Mr. A. P. Low, B. App. Sc., of the Geological Survey of Canada. But whilst *artificial sections* are often more convenient in ascertaining the relative thickness of the different kinds of strata, nevertheless, the *natural sections* which are met with everywhere, enable us to obtain the geographical distributions, extent and thickness, sometimes with greater facility, as these sections are very numerous indeed. Along the left bank of the Rideau River, e. g. from the Hog's Back to the Falls, down the Ottawa as far as Green's Creek, and farther across the river in Hull Township as far as Ironsides, and above that towards New Chelsea. In Nepean and Gloucester Townships there are hosts of *natural sections*, where the "*Leda clay*" formation is well exposed—antrolitics the name implies, so-called on account of the prevalence of a small bivalve shell,—*Leda (Portlandia) arctica*, Gray which is, in its measures, quite commonly and it occurs everywhere exceedingly characteristic.

An interesting point about these clays and accompanying strata is the fact that they occur in many instances in the shape of "*terraces*" or

small plateaus following one another at different levels. Standing on Parliament Hill some of the more prominent 'terraces' may be clearly seen to the N. forming for a considerable distance an almost unbroken line of level stretching from east to west in the general trend of the Ottawa River. One of these occurs just above Ironsides, as many members of the Club have had occasion to notice, forming a general plateau of clay covered by a thin stratum of sand. These terraces point indubitably to a period of subsequent elevation which was characterized by oscillatory movements i. e. a period elevation which is not constant, during which periods of quiescence intervene. Such an elevation predicated the next period with which we are to deal; but before entering upon this latter, there are important results which must be noted with regard to the "Leda clay" formation. Imbedded within its measures are found a goodly number of interesting organic remains. Nearly all of them are of marine origin and consist in the remains of shells, insects, animals and even plants which will together, when all examined and determined, make not far from thirty distinct species.

With scarcely a single exception all of these species of shells and animals can be dredged up alive now-a-days either in the Gulf of St. Lawrence or along the Coasts of Labrador or Newfoundland, and even as far as Norway. Their mode of preservation is not an uninteresting fact to record, as it is peculiar even in different portions of the same formation. At Green's Creek, for example, on the Lièvre River, and in other localities likewise, both above and below our city, these places are noted for the peculiar nodules which are found included in the clays. By some such process as concretionary action can the agglomeration of finely divided particles of argillaceous rock be best accounted for organism, principally around some nucleus whatever it be—a pebble perhaps as in some instances. Numerous remains of the *Nautal*, *Mallotus villosus* (Cuvier) occur in this manner whilst it more often happens that the nucleus is so small as to be invisible. These nodules have also yielded two other kinds of fish, the lump sucker and a sculpin found by Mr. Stewart recently, all these still living in the Gulf of St. Lawrence. Sir William Dawson has a beautiful collection of these nodules from Green's Creek, from which he has identified a large number of species of fossil plants, among which are twigs and bunches of the white cedar which is met with not unfrequently. Another mode of preservation of these fossils at Green's Creek is through the infiltration of a siliceous solution, so that shells are as the remains thoroughly silicified in this deposit as they are in the Black River formation at Paquette's Rapids, or in the Corniferous formation of Western Ontario, muriatic acid not affecting the shell in the least. Others are preserved with but little change from the character in which they were entombed whilst others appear as if they were live shells with the *epidermis* on and nicely preserved.

Of the other fossils which characterize this formation a great deal might be said, but passing over the important discoveries of seal remains made by Dr. Grant of Ottawa years ago, and noticing the feather or remains of birds which Lord Lorne obtained when on a collecting tour at Green's Creek, during the term of his administration in Canada, and merely mentioning the fact that a number of insects have been found there on different occasions by various persons, it will also suffice to mention that during the past season a large number of *Feraminifera* were collected. These are minute

microscopic, shell-like protozoa of very simple organization internally, but the shell itself or place of habitation of the animal is very elaborate, and in many cases beautifully ornamented. These organisms are flourishing in the abyssal depths of the ocean and thrive also along our shores whilst they abound in the Gulf of St. Lawrence, and to such extent that as the sounding lead of a steamer touches the bottom, it often brings up a number of these alive. Dr. G. M. Dawson, whose extensive researches in Post-Tertiary Geology have enabled him to give valuable information regarding the best mode of obtaining these very minute organisms from the clays and of working out the microscopic character of the deposits in question, has very kindly given the writer such hints as have proved of utmost value in this connection, so that by a series of percolations of a solution of clay and water, on sheets of blotting-paper or filter paper, a large number of specimens were obtained. The largest of these, and a common species in nearly all the collections from the Gulf and elsewhere, is *Polystomella cripta*, L. It also occurs here at Ottawa. Besides these forms there remains a great deal of material ready to be worked up and awaiting identification.

It has already been hinted that the "Leda clay" formation, laid down beneath the level of an ocean or sea which extended in this region as far west as the Bonnehère River (*loc. cit.*), was followed by a period of elevation. Whilst these clays were thus being deposited along the bottom of the sea, i. e., at some distance from the shores, the sands and gravels which usually mark the littoral deposits of an ocean were being deposited in this vicinity in regular order. They are arenaceous deposits in which distinct lines of stratification occur where both the sands and gravels overlie the clays everywhere, but their thickness varies considerably in different places. This uprising of the continent which exposed to view the former depths of the ocean, once begun has continued on, and there is no index to point out whether this elevation has, up to the present day, ceased. The sands and clays which were laid along the shores and bottom of the old Ottawa Sea, up as far as the Bonnehère River, are now some 500 feet above the mean tide level at Three Rivers, so that there must have been, at least, an elevation of 500 feet in this part of the American Continent in later Post-Tertiary times. These sands, to which the term "Saxicava Sand" has been applied by Sir W. Dawson and others, are very generally distributed over the gravels, clays and older boulder glacial clays in this district. Sandy Hill received its name no doubt on account of the prevalence of this rock about that part of the city, although there is perhaps 15 or 20 times more clay on Sandy Hill than sand. Near the junction of the sands with the clays below and in places when the the gravels are not coarse, there are found several species of fossils, some of which have already been recorded in the Club's transactions. *Macoma Calourei*, Chemist, *M. fragilis*, Fabr., *Natica affinis*, Guélin and others occur in these deposits, but as a rule they are nearly always destitute of fossils. As there must certainly have been many at one time their remains must have been decomposed and become obliterated. A peculiar seam one inch in thickness occurs near the corner of Waller and Rideau streets, and divides the Saxicava sand into two parts. This bed consists for the most part of leaves of poplar and other trees, bits of grasses and sedges held together, but it is continuous only over a limited area. The upper portion of these sands is that with

which we have last to deal, and is included in that period which we call here the Human period, for in it do we find for the first time traces of the existence of human beings. The loam or surface soil, cultivated or no, that soil in which implements of stone are found associated with fragments of pottery, bones of deer, bear, beaver and other animals, points clearly to the fact that man of two distinct types has left his mark in these newer overlying beds. Previous to this, however, no records exist which show, that here in Canada, man came in these times except subsequent to the Glacial Epoch in the newer and present Historical age.

Nor is the economic aspect of the question, in reference to the use to which the materials which compose the Post-Tertiary deposits of this district can be put one of trifling importance whether in furnishing useful materials to railroad, commercial, agricultural, or other interests. For ballasting, road metal and the like, the Saxicava Sands, gravels and Boulder Clay formations have been extensively used by the Canada Atlantic and Canadian Pacific Railway authorities throughout this district along their roads at Ottawa and its environs, whilst the sands themselves afford splendid material in the manufacture of mortar for building purposes and to such an extent it is that a good sand quarry is more remunerative than a gold mine. But whilst these substances are of incalculable value to man, the marine clays of the "Leda Clay" formation supply the brick and tile manufacturers with the material wherewith to turn out these useful building and other requisites and likewise afford an inexhaustible supply of the argillaceous substance necessary in the manufacture of Hydraulic cements, of which the Hull cement of this locality well-known to be a good slow-setting cement.

There are many good brick-yards in the vicinity which derive their material from the clays in question, and whilst, it is not deemed necessary to signal out any particular one, nevertheless, that of Mr. T. M. Clarke, of New Edinburgh is worthy of note, as from it, that gentleman turned out a large quantity of white brick of superior quality, by carefully inserting a certain percentage of the white earth taken from the marls overlying the saxicava sands at Hemlock Lake, in McKay's Grove, and submitting it to successful process. Brick manufacturing is a most remunerative occupation, especially in such a growing place as Ottawa, where the supply can scarcely equal the demand and the materials are ready and at hand. Mr. Wright, the manufacturer of the Hull Cement, informs me that the marine clays which he uses are very well adapted indeed for the purpose intended, being almost equal to the mud or clays dug out of the Thames in England, for the manufacture of the "Portland and Roman Cements," so famous everywhere.

The manufacture of pottery is likewise an industry or art which flourished at Ottawa, but as the place where the works were situated was in as bad a position as possible for the purpose, the enterprise has ceased to be carried on. It cannot be denied however that there is 'money in it' for whomsoever undertakes this industry and takes up a proper location.

The plastic nature of certain strata in the lower portion of the Leda clays afford good substance for modelling purposes and has already been used to a certain extent in this direction.

There is a large percentage of *alumina* in these clay deposits, and when we think of the vast advantages which the metal *aluminium* presents over such substance as iron, copper, lead and zinc, it may not be amiss to look for-

ward to the time when a process will have been discovered which will enable its being manufactured from clays such as we have at our very doors. Nay, if I am rightly informed, a series of very successful experiments have been carried on by French chemists and others of late by means of which that metal can be produced, but at a cost which, at the present time, is too great so that this aluminium industry cannot compete with that of iron. Those who are familiar with the properties of this metal will clearly see what advantages the community would reap if aluminium could be manufactured cheaply and from the clays which are so abundantly distributed with us.

And to sum up the results thus obtained in the examination of the Post-Tertiary deposits of Ottawa and vicinity, an ideal vertical section, made to include the various measures which compose them is here given:—It is taken from an actual section in the excavations on Waller street, near the corner of Rideau with that street. The lowest beds met are those beds of 'Boulder clay' or 'till' forest on which overlie the glaciated surface of the Trenton formation (Cambro-Silurian) below. Their thickness does not exceed five feet and are immediately overlaid by marine clay with fossils, and at times present a loose boulder or erratic "Leda clay" which some floating iceberg dropped on its way to warmer climes. The 'boulder clay' points to a period of considerable elevation of this part of the American Continent, when land ice covered the whole of this region. These "Leda clay" deposits point to times of submergence when the Atlantic Ocean extended as far inland as here, and when the shores of this sea were the Laurentide Hills, to the north and to the south the Adirondacks—shores which would have presented to an observer had he been there in those days, a similar scene which the barren coast of Labrador does now-a-days. The thickness of the clays varies very much in different places, at this particular spot it is only one and a-half feet thick and is overlaid by a thin bed of gravel, in turn overlaid by two strata of dark and light coloured sand respectively, which are separated by the bed of plant-remains, one inch thick, already referred to. These sandy or arenaceous strata though deposited on the shore or margin of an ocean or sea, point clearly to a period of elevation, which period has been going on ever since, so that this part of the American Continent may safely be said to be rising yet, at least in Eastern Canada, and until we have actual proofs of a submergence going on, a depression along the coast or an encroachment of tidal and other oceanic phenomena on the land, we may rest safely with the happy thought that we are on the upward move.

[There is a vast deal upon which it has been impossible to touch in a paper of this kind. I have only skirted the shores of the captivating subject before us. I have only glanced at some of the problems which press themselves upon us in examining the parts in question, I have barely touched and just stepped upon the threshold of Post-Tertiary Geology, which, *par excellence*, will form one of the most important subjects for geologists in the future.]

Geological Surveys.

In our last issue we drew attention to the importance and great value of this branch of Government work, but limited space prevented us from going so far into the subject as we desired. Comparing the last eight years of the amount of this work done in Canada with that done by the United States Government, and in addition to that the work done by the separate

States in former years and at present. The areas of Canada and the United States to be examined with the means thus appropriated. In area, Canada is larger, while the expenditure is very much smaller, and is done wholly by the Dominion Government, the several provinces spending nothing under this branch of the service. The Dominion, therefore, has reason to be complimented on the good results of so small an expenditure when the field is so wide in area and object, embracing, as it does, Natural History, and a Museum which does Canada honour and is well worthy of being enlarged to provide for the growing importance and necessities of this branch, altogether an institution of the highest educational and economic value. It must be remembered that in the United States amount, a museum has not to be included. The knowledge and good which has resulted from Geological discovery, in a general sense, expanding, as it does, our knowledge of the true order and condition of the earth, increasing human happiness and therefore lessening misery, in aiding the thinkers among mankind to the true system of creation or progression in nature, in liberating and enlightening the race from "the darkness of dream-land." When such good results have followed this system of discovery it is incumbent on our legislators to enact the best laws in order to receive its full educational and economic reward or value. Canadian Geological Survey including

| | Nat. History Museum. | Civil Govt. List. | Total. |
|---------|-------------------------|----------------------|-------------|
| 1879... | \$52,933.97 | ..... | ..... |
| 1880.. | 52,127.32 | ..... | ..... |
| 1881.. | 65,791.36 | ..... | ..... |
| 1882.. | 61,720.60 | ..... | ..... |
| 1883.. | 62,328.34 | ..... | ..... |
| 1884.. | 60,000.00 | \$30,504.00 | \$90,504.00 |
| 1885.. | 60,408.97 | 31,967.33 | 92,376.30 |
| 1886.. | 78,537.69 | 35,956.03 | 114,493.72 |

Through the kindness of the Hon. J. W. Powell, director of the United States Geological Survey, we are enabled to give the following statistics of geological work done in the United States.

| U. S. Federal expenditure during the years | | | |
|--|-----------------------|-------------------------------|-----------|
| Fiscal year. | General Appropriation | Special Approp. for Salaries. | Total. |
| 1879-80.. | \$100,000 | \$6,000 | \$106,000 |
| 1880-81.. | 150,000 | 6,000 | 156,000 |
| 1881-82.. | 150,000 | 6,000 | 156,000 |
| 1882-83.. | 222,000 | 34,940 | 256,940 |
| 1883-84.. | 304,700 | 39,940 | 344,640 |
| 1884-85.. | 453,700 | 35,340 | 489,040 |
| 1885-86.. | 467,700 | 55,540 | 503,240 |
| 1886-87.. | 467,700 | 35,540 | 503,240 |

The appropriation for the fiscal years 1887-88 is the same as for the present year.

The following is the work done by the several states independent of the above amounts:—

ALABAMA.
There is a state geological survey in progress under the direction of Dr. Eugene A. Smith University, Tuscaloosa County, Alabama. It is supported by an annual appropriation of five thousand dollars for the period of ten years, beginning with 1882.

ARKANSAS.
A geological survey of this state was made 25 or 30 years ago by Dr. David Dale Owen, whose reports were published in two volumes, dated 1858 and 1869, respectively. No further official geologic work has been done in the state; but within a few weeks a new state survey has been established, with Professor John C. Branner as state geologist. The terms of the law establishing the survey are not fully known; but the salary of the state geologist is \$3,500.

CALIFORNIA.
There is no state geological survey in California, but there is a state mining bureau

which publishes annual reports. It is in charge of Mr. Wm. Irelan, jr. This bureau is supported by a special tax on the certificates of stock corporations. According to the report of the state mineralogist the expenditures for the fiscal year ending 15th May, 1885, were about \$7,800; and the appropriation and mining bureau fund for the period from April, 1885 to 1st October, 1886, was \$25,664.44, of which \$16,457.31 was expended.

COLORADO.
There has never been a geological survey of Colorado in any proper sense of the term. There has been for some years a state geologist who is not salaried and has no appropriation, but who is simply a mining engineer whose clientele is increased by his nominally official position.

CONNECTICUT.
There has been no geological survey in Connecticut for many years.

DELAWARE.
A geological survey of Delaware was made many years ago; and certain geologic investigations are now in progress, but without special appropriation, by the Professor of Geology in the State Agricultural College.

GEORGIA.
There is no regular organised geological survey in the state. Certain geologic investigations are, however, carried on by the Board of Agriculture.

ILLINOIS.
A geological survey of Illinois was completed some years ago at a total cost (including publication) of about \$190,000. Since the completion of the survey a small annual appropriation has been made for the maintenance of the State cabinet, and the curator of the cabinet (the ex-State Geologist) has done some original geologic work.

INDIANA.
The State survey is supported by an annual appropriation of five thousand dollars; but somewhat doubtful intelligence has just been received that this appropriation has been discontinued.

IOWA.
Two Geological Surveys of this State have been made under special appropriations, but the last was completed in 1870, since that date no official appropriation has been made.

KENTUCKY.
An official State Geological Survey is in progress under the direction of Prof. John R. Proctor, State Geologist, Frankfort, Ky., but the amount of the annual appropriation we cannot give.

MARYLAND.
There have been two or three Geological Surveys of Maryland, but these have been discontinued for several years.

MICHIGAN.
A geological survey has been maintained in this state for several years. It is supported by special appropriations. The present state geologist is Mr. Charles E. Wright.

MINNESOTA.
A state geological survey is supported by the income from the sale and rental of the same lands of the state. The annual expenditure ranges from three to four thousand dollars; the aggregate from 1872 to the 1st August, 1884, being \$39,267.10. This does not include publication.

MISSOURI.
A geological survey of Missouri flourished from 1853 to 1873. It was supported by special appropriations for field work, salaries, &c., and printing which aggregated \$176,185.55. The survey was discontinued in 1876, and has not been re-organized.

NEBRASKA.

There has never been a regularly organized state geological survey in Nebraska; but some investigation has been carried forward indirectly under state auspices in connection with the state university—the professor of geology in that institution being authorized by the university authorities to devote a part of his time to original investigation. Thus the state indirectly pays at the present time about \$1,500 or \$2,000 per year for geologic work.

NEW HAMPSHIRE.

A geological survey of New Hampshire was prosecuted during the years 1869-78 inclusive at a total cost (including publication) of about \$60,000. The survey was discontinued in 1878, and has not been renewed.

NEW YORK.

New York was one of the first states of the union to institute a geological survey. The work of the original survey extended over the years 1837 to 1842, and included general natural history as well as geology. The cost of this work was about \$105,000. The results of the work were published at great length and in magnificent style at a total cost of over \$600,000, making an aggregate cost of work and publication in New York of about \$712,000. This includes all publications up to 1880. The survey proper was discontinued about 1842, and such geologic work as was performed was done in connection with the state cabinet of Natural History. About 1880, however, a survey was re-organized, a state geologist appointed and preparations made for the prosecution of geologic work. The amounts appropriated for the survey during the last few years are not known to us. The state geologist is Professor James Hall, of Albany, N. Y.

NEW JERSEY.

A geologic survey has been in progress in New Jersey for many years. In 1864 an appropriation of \$20,000 was voted for the purpose of making a geological survey of the state within four years; in 1869 a supplementary act was passed authorising the continuance of the survey for a further period of four years with an annual appropriation of \$5,000, and the appropriation appears to have been continued until 1876, when a further appropriation of \$8,000 a year for five years more was passed; and this appropriation in turn appears to have been continued without definite action until 1885 when the Legislature made a further special appropriation of \$8,000 a year for five years more, by which time it is expected that the survey will be finished.

NORTH CAROLINA.

The last geological survey of this state was discontinued about 1878.

OHIO.

Two geological surveys have been made in this state—the second by far the more extensive. It was prosecuted during the period from 1869 to 1880 at a cost for field work, &c., of \$85,264; for salaries, office expenses, &c., of \$21,250; and for publications, &c., of \$249,272; or an aggregate of \$355,786. Since 1880 some special appropriations have been made for geologic investigation. The present appropriation is \$3,000 per year, and it is specified in the law making it that it shall be expended in investigations of the petroleum and natural gas resources of the state.

OREGON.

There is not now, and never has been, any regularly organized geological survey of Oregon; but some geological work is performed by the Professor of Geology in the State University at Eugene City, Professor Thomas Condon.

PENNSYLVANIA.

In this state, as in Ohio, there have been two important geological surveys. The cost of the first survey is not known to us. The second survey has been, and is yet, sustained by specific appropriations made by the Legislature at its biennial sessions. Up to 1885 these are as follows:—

| | |
|------------------|-----------|
| Act of 1874..... | \$105,000 |
| " 1876..... | 65,000 |
| " 1877..... | 100,000 |
| " 1879..... | 50,000 |
| " 1881..... | 125,000 |
| " 1883..... | 50,000 |
| " 1885..... | 50,000 |

Total..... \$545,000

This does not include the cost of publication of reports which were issued by legislative order at a cost of about \$500,000 more.

SOUTH CAROLINA.

There has been no geological survey in this state for many years.

TENNESSEE.

A geological survey was completed about fifteen years ago, and has not been re-opened.

TEXAS.

There have been a number of important surveys in this state, but no official geologic work has been done for some years.

VERMONT.

There was a geological survey of this state many years ago.

VIRGINIA.

A geological survey of this state was made nearly half a century ago.

WISCONSIN.

An excellent geological survey of this state was made during the years 1873-79 at a cost for field work, &c., of \$74,000; and for publication, of \$75,000.

The Discoverer of Anthracite.

Anthracite was discovered in Pennsylvania in 1700, by Nicholas Allen. This Allen, according to the stories and traditions that have been handed down about him, must have been a kind of American Rip Van Winkle. He had come down from the Lake Champlain lumber region and opened an inn on the summit of the Broad Mountain. For a time he led a wandering existence, hunting, fishing, and lumbering, while his wife attended to the wants of thirsty travellers. In one of his hunting excursions he camped out at the foot of the Broad Mountain, at a spot where a coal vein cropped out, and, upon lighting a fire, was astonished at the intense heat it threw off. He also saw that some of the black stone had become red-hot. He dug some of it, and carried it home, when his wife, more practical than himself, pronounced it coal. They saw the coal crop out in abundance, and visions of fortunes that might be realized out of it flashed through their minds simultaneously. So, disposing of their effects, they loaded two large covered waggons with the coal, and set out for Philadelphia, with the intention of marketing it there and discovering its true value. They drove along the banks of the Schuylkill, sleeping in the open air at night. At Ports Town three of their horses died, and the coal was dumped into the river. Wearied and disheartened, the pair returned to the old place at the summit of the mountain, and shortly afterwards Allen laid his faithful wife to rest over the coal vein that proved their ruin, and turned his face toward the West, where, after an uneventful career, he enlisted for the campaign under Harrison and fell at Tippecanoe.—Iron.

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| " 17 | 14 | 23 | 640 " |
| " 19 | 14 | 23 | 640 " |

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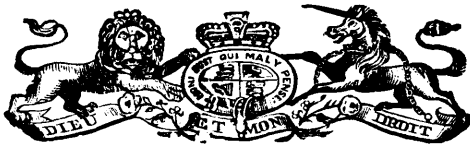
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Mining Regulations

TO GOVERN THE DISPOSAL OF

Mineral Lands other than Coal Lands, 1886.

THESE REGULATIONS shall be applicable to all Dominion Lands containing gold, silver, cinnabar, lead, tin, copper, petroleum, iron or other mineral deposits of economic value, with the exception of coal.

Any person may explore vacant Dominion Lands not appropriated or reserved by Government for other purposes, and may search therein either by surface or subterranean prospecting for mineral deposits, with a view to obtaining under the Regulations a mining location for the same but no mining location or mining claim shall be granted until the discovery of the vein, lode or deposit of mineral or metal within the limits of the location or claim.

QUARTZ MINING.

A location for mining, except for iron on veins, lodes or ledges of quartz or other rock in place shall not exceed forty acres in area. Its length shall not be more than three times its breadth and its surface boundary shall be four straight lines, the opposite sides of which shall be parallel, except where prior locations would prevent, in which case it may be of such a shape as may be approved of by the Superintendent of Mining.

Any person having discovered a mineral deposit may obtain a mining location therefor, in the manner set forth in the Regulations which provides for the character of the survey and the marks necessary to designate the location on the ground.

When the location has been marked conformably to the requirements of the Regulations, the claimant shall within sixty days thereafter, file with the local agent in the Dominion Land Office for the district in which the location is situated, a declaration or oath setting forth the circumstances of his discovery, and describing, as nearly as may be, the locality and dimensions of the claim marked out by him as aforesaid; and shall, along with such declaration, pay to the said agent an entry fee of FIVE DOLLARS. The agent's receipt for such fee will be the claimant's authority to enter into possession of the location applied for.

At any time before the expiration of FIVE years from the date of his obtaining the agent's receipt it shall be open to the claimant to purchase the location on filing with the local agent proof that he has expended not less than FIVE HUNDRED DOLLARS in actual mining operations on the same; but the claimant is required, before the expiration of each of the five years, to prove that he has performed not less than ONE HUNDRED DOLLARS' worth of labor during the year in the actual development of his claim, and at the same time obtain a renewal of his location receipt, for which he is required to pay a fee of FIVE DOLLARS.

The price to be paid for a mining location shall be at the rate of FIVE DOLLARS PER ACRE, cash, and the sum of FIFTY DOLLARS extra for the survey of the same.

No more than one mining location shall be granted to any individual claimant upon the same lode or vein.

IRON.

The Minister of the Interior may grant a location for the mining of iron, not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal its length. Provided that should any person making an application purporting to be for the purpose of

mining iron thus obtain, whether in good faith or fraudulently, possession of a valuable mineral deposit other than iron, his right in such deposit shall be restricted to the area prescribed by the Regulations for other minerals, and the rest of the location shall revert to the Crown for such disposition as the Minister may direct.

The regulations also provide for the manner in which land may be acquired for milling purposes, reduction works or other works incidental to mining operations.

Locations taken up prior to this date may, until the 1st of August, 1886, be re-marked and re-entered in conformity with the Regulations without payment of new fees in cases where no existing interests would thereby be prejudicially affected.

PLACER MINING.

The Regulations laid down in respect to quartz mining shall be applicable to placer mining as far as they relate to entries, entry fees, assignments, marking of localities, agents' receipts, and generally where they can be applied.

The nature and size of placer mining claims are provided for in the Regulations, including bar, dry, bench creek or hill diggings, and the RIGHTS AND DUTIES OF MINERS are fully set forth.

The Regulations apply also to

BED-ROCK FLUMES, DRAINAGE OF MINES AND DITCHES.

The GENERAL PROVISIONS of the Regulations include the interpretation of expressions used therein; how disputes shall be heard and adjudicated upon; under what circumstances miners shall be entitled to absent themselves from their locations or diggings, etc., etc.

THE SCHEDULE OF MINING REGULATIONS

Contains the forms to be observed in the drawing up of all documents such as:— "Application and affidavit of discoverer of quartz mine." "Receipt for fee paid by applicant for mining location." "Receipt for fee on extension of time for purchase of a mining location." "Patent of a mining location." "Certificate of the assignment of a mining location." "Application for grant for placer mining and affidavit of applicant." "Grant for placer mining." "Certificate of the assignment of a placer mining claim." "Grant to a bed rock flume company." "Grant for drainage." "Grant of right to divert water and construct ditches."

Since the publication, in 1884, of the Mining Regulations to govern the disposal of Dominion Mineral Lands the same have been carefully and thoroughly revised with a view to ensure ample protection to the public interests, and at the same time to encourage the prospector and miner in order that the mineral resources may be made valuable by development.

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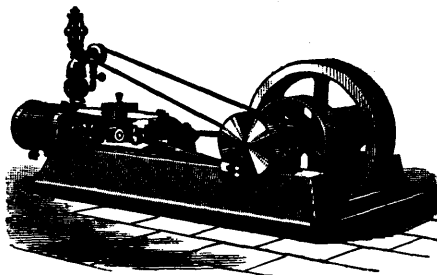
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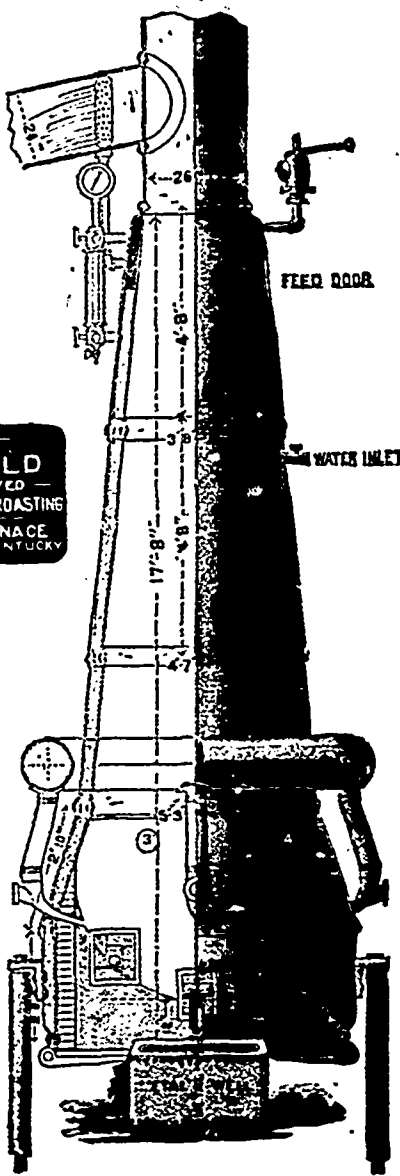
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