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1890.—OTTAWA, FEBRUARY—1890.

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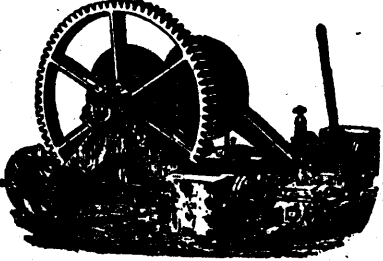
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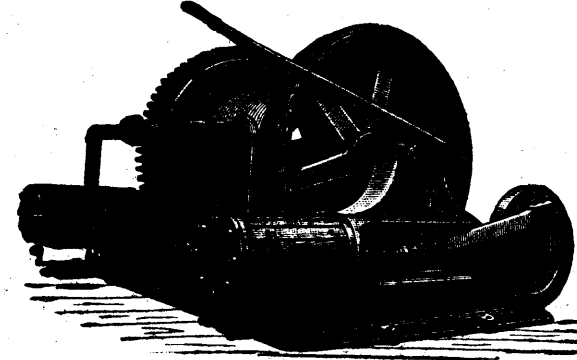
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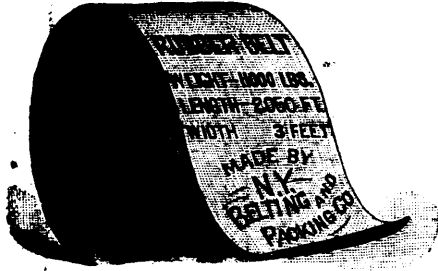
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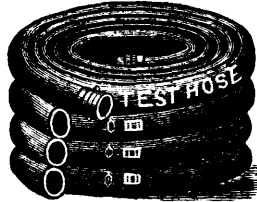
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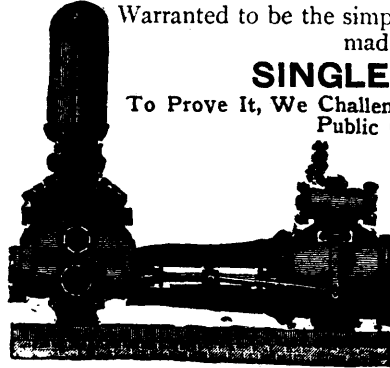
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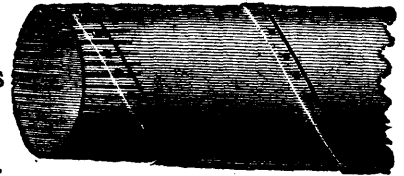
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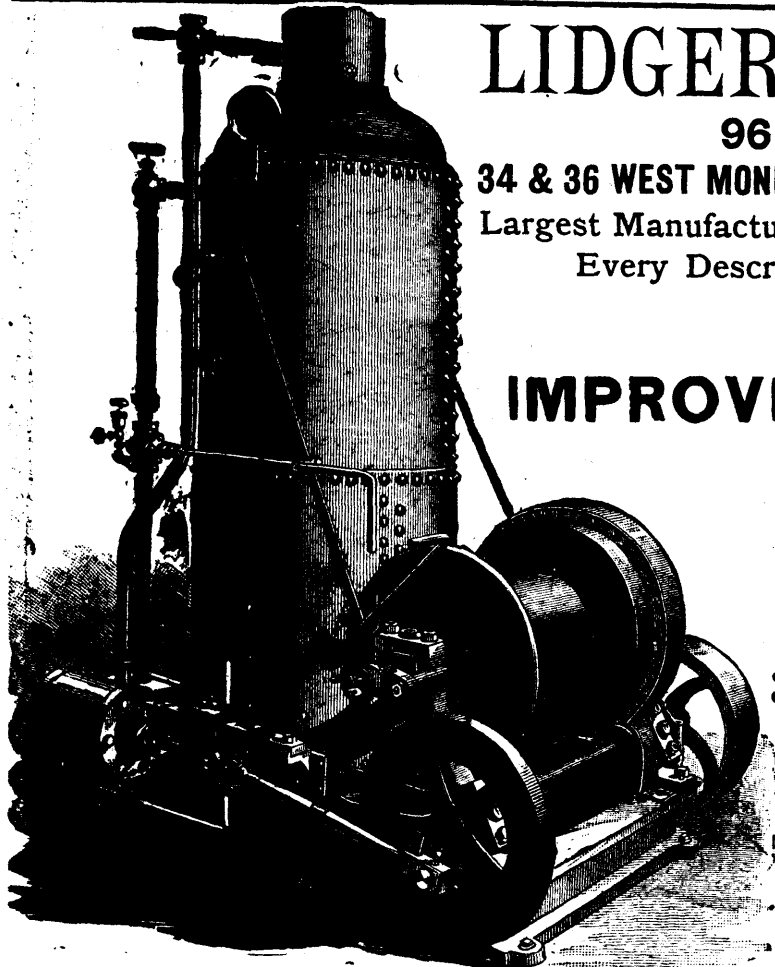
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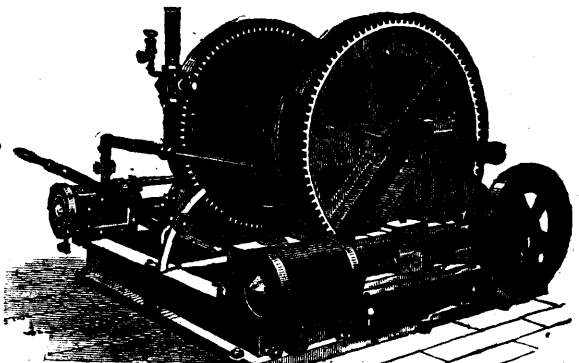
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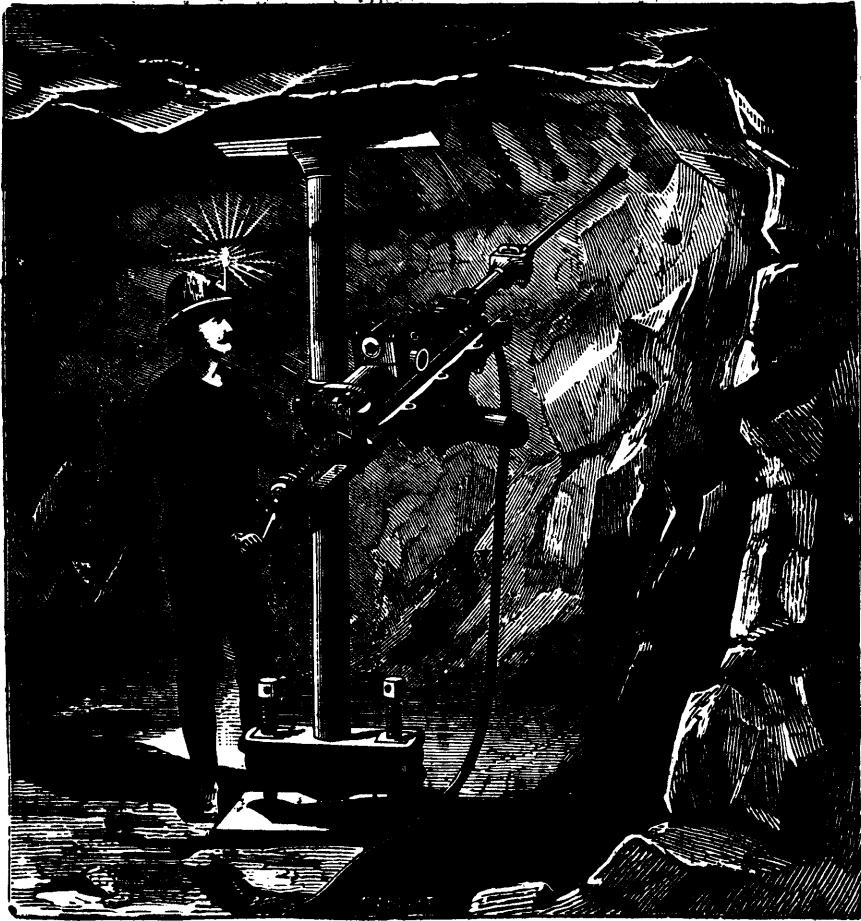
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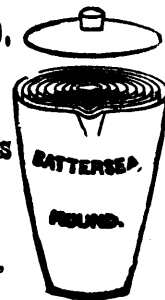
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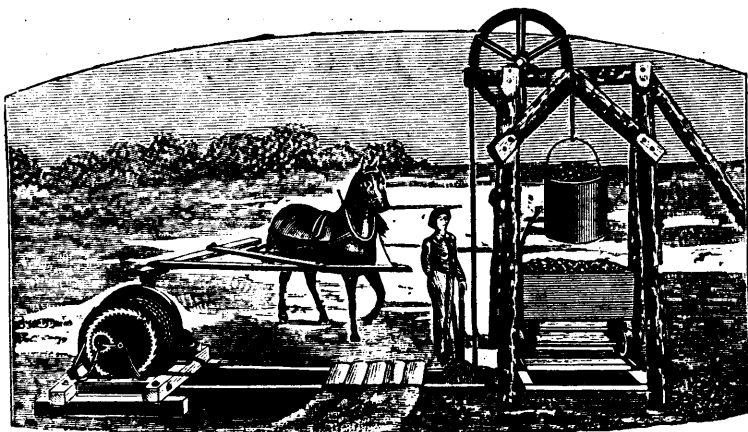
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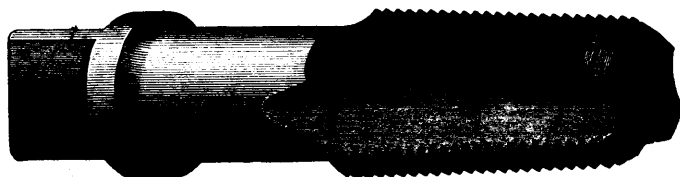
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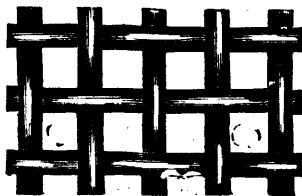
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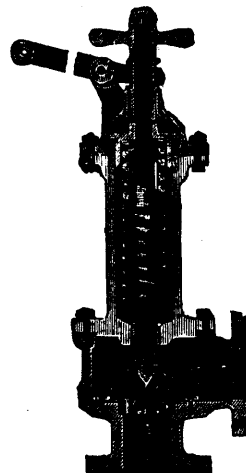
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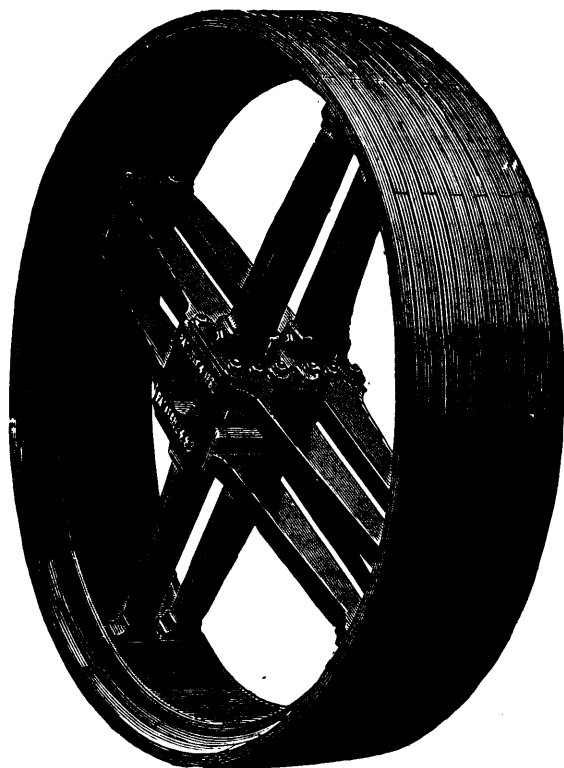
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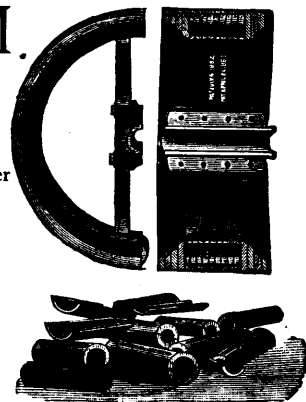
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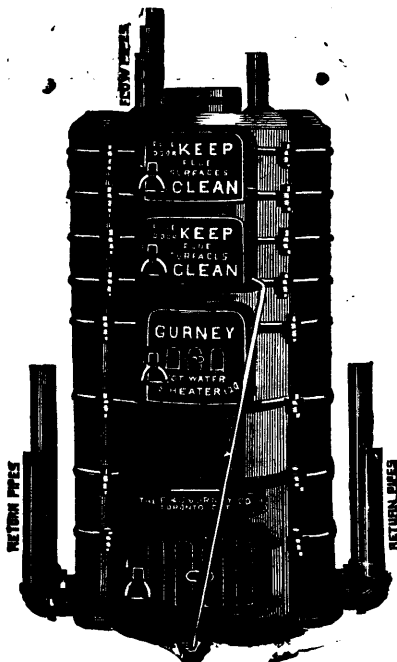
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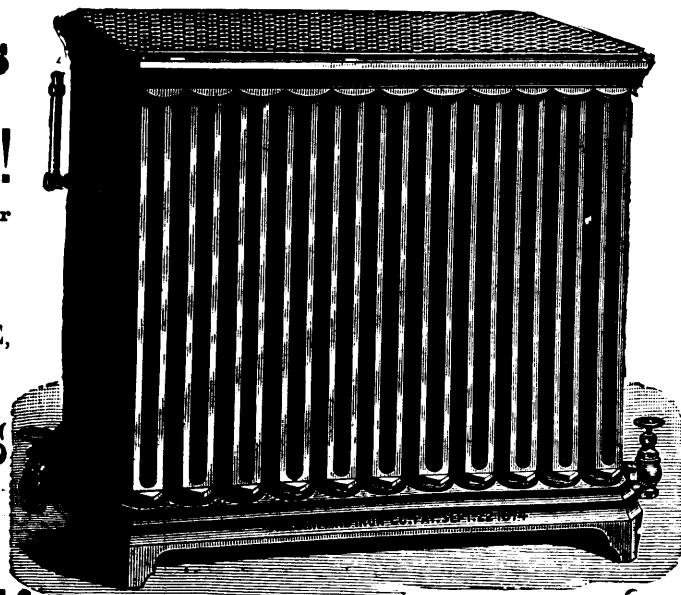
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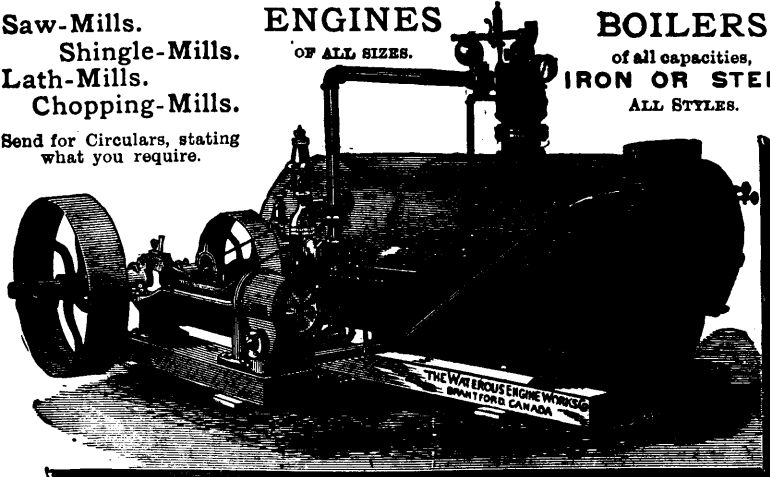
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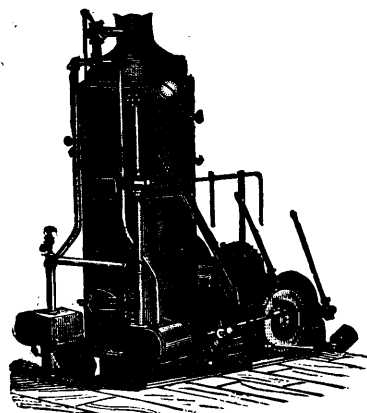
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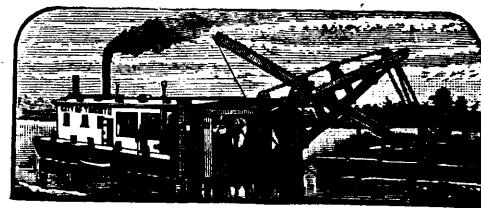
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Florida Phosphates.

Much excitement has been caused in the fertilizer world by the report of the discovery of large deposits of high grade phosphate in Florida. It has been known for a long time that there were deposits there somewhat similar in nature to the Carolina phosphates, but generally consisting of smaller sized nodules, and in some cases of lower quality. Dr. Penrose in his monograph on "The Nature and Origin of Deposits of Phosphate of Lime," which was published last year by the U. S. Geological Survey, gives the result of his personal examination of these beds, but describes them as being "either of too small extent or of too poor quality to pay for mining." He says, "the phosphate found here (in Alachua County, near the central part of the State) belongs to the subdivision of phosphatic conglomerates. The rock consists of small pebbles, from the size of a mustard seed to that of a pea, closely packed in a matrix of indurated calcareous marl." The pebbles averaged 85 per cent. of phosphate of lime, while the whole mass of the rock gave about 48 per cent.

In localities on the west coast of Florida, phosphate resembling that of Carolina was dredged from the rivers, and averaged about 55 per cent. in quality. None of these deposits were deemed to be of any particular commer-

cial value at present, and not much attention was paid to them. But in the spring of 1889 Mr. Albertus Vogt who lives near the village of Dunnellon, in boring for a well found fossil sharks teeth in a whitish soil, which when analyzed by a chemist, proved to be phosphate of lime of high quality. This soil, or soft rock, was found to extend in a more or less pockety belt over a district some 6 miles wide by 30 miles long, in a southeast and northwesterly direction. Matters were kept as quiet as possible and lands were bought up rapidly. Real estate soon achieved a veritable boom and speculators rushed in from all quarters. Mr. Vogt and his brother are said to have realized \$100,000 each in cash, besides controlling a great deal of land, and owning an interest in the Dunnellon Phosphate Co., which was organized in September last with a capital of \$1,250,000. The Bradleys, the well known Fertilizer Manufacturers of Boston, are said to hold 4,000 shares in the company, and Mr. Peter B. Bradley has been appointed general manager. The company owns 39,000 acres of land.

A writer in the *Engineering and Mining Journal* gives the following account, which is confirmed by Mr. Frost, of Charleston: "In the last fall some progressive orange grower in the vicinity of Ocala, with a little more curiosity than his neighbors, sent to a chemist a sample of white subsoil that occurred in his grove, and with which everybody in that section had been familiar, supposing it to be only limestone, for it had been found in every well in the neighborhood. The chemist reported that it was 80 per cent. phosphate of lime. The secret got out and then the excitement began. In the area covering Citrus, Marion and Hernando Counties it seems that almost anywhere a pit or augur will reveal phosphate."

The chief deposits are found on the banks of the Withlacooche River, about 18 miles from the Gulf of Mexico. The phosphate occurs in pockets, which sometimes extend over several areas in width. It lies in beds varying from two to sixteen feet in depth as definitely proved, and much greater depths are asserted. It is of a soft nature and can be dug by hand or by excavators, and varies in color from a dazzling white (when dried) to a cream color. Analyses of different samples range from 40 to 86 per cent. of phosphate of lime. The bed varies in quality at depths, but the average would probably be 60 to 70 per cent.

A company has also been formed at Peace River to work similar deposits, and other corporations will doubtless come into existence. But as far as we can learn there is no immediate prospect of any considerable output of phosphate. Offers to buy cargoes are refused with the response that they cannot be supplied at present, and the whole interest seems to be concentrated upon efforts to sell lands, as is not uncommon in the case of mineral discoveries, there being always a benevolent disposition to allow others

to reap the benefit of the results of actual mining. An English prospectus issued last year naively remarked that the great profit in mining ventures was usually obtained, not by the original owner nor the final purchaser, but by the middle man, and the company proposed to occupy that position. The same feeling seems to animate the investors in Florida, and it does not seem probable than any output will be produced this year sufficient to disturb the markets, which have been very firm in view of an apparent scarcity of phosphatic supplies. The news of these discoveries has caused buyers to hold off, and there has been a decline of a penny in the English market, but if shipments are not made the price will be apt to recover.

Another drawback to the success of these deposits is the uncertainty of quality. It appears to constantly vary in richness, and chemists report that it is impossible to judge of its quality by the eye. It is therefore likely to prove of a lower average by the cargo than single tests may give.

But even if the deposits are all that the land boomers claim, the growing use of fertilizers will soon absorb the surplus, and we can be sure that there will continue a demand for phosphate, and especially for the richest of them all—Canadian apatite.

The Geological Maps of Nova Scotia.

In our November issue we took occasion to comment on the rumour that the Geological Survey would issue its geological map of Nova Scotia upon a reduced scale of four miles to the inch, and we were emphatic in pointing out that such a step would be a great mistake, and was extremely undesirable to those engaged in the extensive mineral developments of that most important mining country. Our remarks appear to have borne fruit, for the subject was recently brought before the Minister of Interior in the following petition presented by the Nova Scotia members of Parliament:—

The Memorial of the undersigned members of the House of Commons, from the Province of Nova Scotia, respectfully sheweth:

That the Geological Survey maps of the Island of Cape Breton, and of parts of the counties of Antigonish, Guysboro and Pictou in the Province of Nova Scotia, have been published on a scale of one mile to the inch.

That, the further surveys made on the mainland of Nova Scotia, have been prepared and plotted on the same scale.

That we regret to learn it is proposed to "reduce" the plans to one fourth the former size, and publish the maps on a scale of only four miles to one inch.

That in the opinion of experienced men most deeply interested in the development of the mineral fields of Nova Scotia, the maps if published on the smaller scale will be so crowded as to render them almost valueless to the public for practical purposes.

That a due regard for the public convenience requires the Geological Survey for the whole province to be published on a uniform scale.

That, as the maps yet to be issued cover the most interesting districts on the mainland of Nova Scotia, embracing the coal, iron and gold mines, it is desirable in the public interest that they be published on a large scale, with clear outlines and affording the fullest information practicable. Any other course adopted will be deeply disappointing—particularly to mining men in Nova Scotia.

That the cost of publication, if that is a material obstacle, may be reduced by a cheaper process of printing, which will serve the purpose, and the cost of "reducing" the office plans can (in part) be saved—but it is submitted that in this matter practical utility and public convenience should be the chief considerations.

We therefore most strenuously protest against the proposed change in the publication of the Geological Survey maps for the Province of Nova Scotia, and respectfully urge that a sufficient appropriation be provided to continue the issue of the Nova Scotia maps on the present scale of one mile to the inch.

It appears that out of \$102,479, voted annually by Parliament for the Geological Survey, about \$5,000 have been spent every year since 1882 on surveys and explorations in eastern Nova Scotia, but that no maps and only one report, which cost \$1,335, have been published. There would perhaps be required \$6,000 to print maps of the country surveyed in these eight years, on the scale and in the manner adopted for those of Cape Breton, and the annual expenditure of \$1,025 would then be sufficient to continue the publication of maps and reports. The industrial importance of the district, which contains valuable mines of gold, coal, iron and copper, has made such close investigations expedient inasmuch that maps drawn on a scale of one mile to an inch show greater minuteness of detail than most of those published recently by the Geological Survey on four or eight miles; their value, consequently, would be greatly impaired by the errors, omissions, and crowding of lines and names unavoidable in reducing them to such scales.

Asbestos; a Review of this Important Industry in Canada.

There is probably no mining interest in Canada that has shown such marked progress, or that gives such promise of profitable and constant returns as that of the peculiar mineral asbestos. Although of comparatively recent date the many uses to which its manufacture has been applied, have increased so rapidly that it is with difficulty that the production can keep pace with the present demand, although the output from the Canadian mines has increased one hundredfold in the last ten years. The word is derived from the Greek, *Asbestos*, signifying incombustible or unquenchable, and this property was known to the Ancients many hundred years ago. The term asbestos is, at the present day, applied to minerals which differ very considerably in their mode of occurrence and composition. That which was first known as the asbestos of the Ancients is a variety of the hornblende family, and allied to tremolite, actinolite, etc. It consists of fine, somewhat elastic fibres, varying in color from almost pure white to greyish and greenish tints, and in length at times nearly or quite two feet, with a soft silky aspect, looking very much, in fine specimens, like floss silk itself. In the flame of the blow-pipe, the mineral is but little acted upon, although after being exposed for some time to long continued heat the fibre loses tenacity, and becomes brittle or even sandy to the touch. It can be spun like cotton and woven

into cloth, and can be manufactured into a great variety of substances such as fire proof curtains, wallpaper, suits of clothing, millboard, rope and steam packing of various kinds. It is of special value for the last purpose, owing to its entire non-conductivity of heat and indestructibility when in the case of the severe work it has to stand in connection with marine and other engines, it is exposed to long and constant wear; in this respect far exceeding any material heretofore employed for this purpose. It has however been found of almost too slight consistency to possess great value for textile purposes by itself, but this has been overcome by combining the spun fibres of the mineral with threads of cotton or flax, and in the museum of the CANADIAN MINING REVIEW can now be seen a complete suit of clothing from helmet to shoes such as is supplied to the firemen of Paris and other cities on the continent, dressed in which a man can walk with almost absolute impunity into the hottest flame. The face in this case is protected by a very fine wire gauze, which enables the wearer to see dimly and to respire as well as the dense atmosphere which he has to penetrate will permit. For this very unique outfit of asbestos manufacture we are greatly indebted to the kindness of Mr. Ed. Wertheim, of the American Asbestos Co. (Limited), now successfully operating mines of the mineral in Black Lake district. The suit was made at Mr. Wertheim's extensive factories at Frankfort, Germany, and is well worthy of the attention of our civic authorities, who may be interested in the better protection of our firemen. Besides the true asbestos of commerce, other varieties known as mountain cork, mountain leather, and mountain wood are met with, but these have not yet been found adapted for use in the arts or manufactures, or at least not to any very great extent.

The mineral which is produced in Canada at the present day under the head of asbestos, is in reality not asbestos proper, but a form of serpentine called chrysotile. This occurs in veins in certain portions of the great belt of serpentine rocks of the Eastern Townships of Quebec, though in the serpentines of the Laurentian also this mineral is sometimes found in small veins, but not as yet in quantity to be economically available, though possibly subsequent exploration in this direction may disclose workable deposits there as well. In the Laurentian rocks of certain area, however, the variety actinolite sometimes forms hilly masses of considerable size, which has been mined for some years, and while not as yet found to be suited for the manufacture of millboard, and the finer qualities of steam packing, answers admirably for cements, paints, etc., in the same way as the tremolite of the State of New York; these deposits of actinolite are therefore highly important, and will without doubt increase rapidly in value.

Although of such recent date, the Eastern Townships asbestos, for the name may as well

be retained, has now a world-wide reputation, and is shipped in large quantities to the various countries in Europe, England, Italy, Germany and Belgium, and to the United States also, and of the many firms now engaged in its manufacture, the greater portion draw the bulk of their raw material from a small area in Eastern Quebec; the Italian mines, from which the asbestos was formerly obtained being worked with far greater difficulty than those in Canada, while the supply of the mineral is much more uncertain, and although for certain special lines the Italian may be more valuable than the Canadian, the latter has been found of sufficient value for most purposes so as to almost entirely supplant the former, even with those firms who control the output of the Italian mineral, a fact evidenced by the late purchase of a Canadian property by the United Asbestos Co., of London, England.

Although asbestos was known at many points in Eastern Quebec more than thirty years ago, and was exhibited at the International Exhibition in London in 1862, no attempt was made to work the mineral for some years. The credit of the discovery of the Thetford area is probably due to a French-Canadian named Fecteau, and following upon his discovery certain areas were secured from the Government by private parties. The true value of the mineral was not at first recognized, and in the first year of mining operations, (1878) only 50 tons were taken out, for which a ready sale was not at first obtained. The importance of the discovery was however speedily ascertained, and new companies obtained tracts of rocky land in the townships of Thetford and Coleraine, and began the work of exploration and mining. Had the Government of Quebec at that day been in possession of the requisite information regarding its mineral lands, it is very probable that the thousands of acres which rapidly changed hands in that section of the province, would have brought in much greater returns than the usual Government rate. Curiously enough, however, though the areas of the serpentine in the townships of Thetford, Coleraine, Ireland and Wolfestown are very extensive, the portions in which the mineral asbestos is found are comparatively rare and the mining though now prosecuted for nearly a dozen years, is practically confined to two small sections about four miles apart. The first, and as yet the most important of these, is the small mound near the Thetford station on the Q. C. railway, which rises about 80 to 90 feet above the track; the other, the bold ridge of brownish looking rock to the southeast of Black Lake station, which assumes much greater prominence, and probably has an elevation of 650 to 700 feet above the railway at this point. It must, however, be said in regard to some of the areas of serpentine that lack of sufficient exposures, owing to soil and forest growth, prevents in many cases, a careful search, but in other portions where the

bare rock is well exposed as on the great ridge of Ireland and Wolfestown, as well as much of that towards Lakes Caribou and Little St. Francis, much of the rock has a hard reddish-brown weathered surface which does not promise favorable results to the prospector, who from a comparatively brief experience can very generally decide, with a fair amount of assurance, whether certain areas are likely to prove of value or not as a source of supply for asbestos.

The growth of the industry can be seen at a glance by comparing the output of 50 tons in 1878 with that of nearly 6,000 tons in 1889, a total which would have been further increased, presumably by some 500 tons at least, had the pits of the Scottish Canadian Company at Black Lake been in operation. The importance of this industry to the Province of Quebec may be inferred from the fact that this amount represents a cash value at the mines of about \$450,000, and the industry has now risen to such proportions that hundreds of thousands of dollars of capital are now seeking investment wherever an opportunity of successful operation is presented. Caution, however, on the part of those desiring to invest is advisable at present. The productive areas of the present asbestos district are very well known to those interested in the industry, and the really valuable areas now in the market can easily be counted on the fingers of one hand.

The methods of working are being radically changed. The old system of hand labor and horse derricks which have prevailed for years, and which in the face of a limited demand answered well enough so long as the depth and extent of the quarries were small, have now become entirely impracticable in the face of large pits and the urgent necessity for large production. Steam derricks, drills, and the most improved labor-saving appliances are now being rapidly introduced. All the new companies are putting in plant of the most approved pattern, with the result of much greater economy in labor and greater capacity of output, which in this case also means largely increased profit. Further improvements are, however, urgently called for, and that very speedily, if the mining of asbestos is to be carried on at the maximum of profit. Some simple appliances by which the mineral, especially the shorter and poorer grades, can be separated without the tedious process of cobbing by hand, should be the earnest study of all interested in the business of mining, and what is at present of quite as much importance, especially in the case of those companies who have been at work for some years, is the necessity of getting rid of the huge and unsightly dumps which now cumber the good ground and limit very seriously the extension of operations as well as the profitable working of some of the pits now carried on.

There is no doubt that in the case of the Thetford mines these dumps cover some very rich ground, and the same remarks apply also

to certain areas at Black Lake. The mining of asbestos at either place has not been of a highly scientific character, and during the visit of the American Institute of Mining Engineers to this section last October, many remarks of this character and as to the desirability of placing these mines on some more desirable basis for future successful operations were expressed. In particular the bad management of the dumping ground was commented on. The removal of these, however, should not, if properly undertaken, be attended with any serious loss, and might even possibly be conducted with profit. It is well known that in the early years of the industry the separation of the smaller veins was not closely attended to. Large veins were plenty, and cheap and speedy extraction was a necessity, consequently much very fine fibre went into the lower part of these unsightly heaps of what is regarded as refuse. In fact even in the newest portions of these dumps, veins of asbestos ranging from half to three-quarters of an inch can be frequently seen, all of which should repay extraction if suitable machinery were employed. While in the present condition of most of the pits, veins of asbestos of large size, ranging from one to three or more inches, are common, the uncertain nature of the mineral is such that in view of the investment of hundreds of thousands of dollars at which many of these properties are now held, when any are placed in the market, the great desirability of testing the rocks at lower levels by some cheap but satisfactory method should be apparent to all interested, and not only so but on the part of an investor is almost a necessity. To the company investing many thousands of dollars in an asbestos property to-day, the chances for successful working, or of getting back their own with profit, depend very largely upon the continuation downward for a considerable depth of profitable veins; for while in the case of a property, acquired at Government rates of \$1.00 per acre, the capital upon which dividends must be paid is very small, the case is very greatly reversed when a price of \$1,000 to \$3,000 per acre is demanded, and the cost of a plant sufficient to put such a property on a satisfactory working basis is added. This means a very different method of conducting mining operations, and a constant and sure source of supply for some years to come at least is a first requisite. The advisability of thus testing the lower portion of the serpentine has been pointed out in the reports of the Geological Survey, and the use of the diamond drill by which cores could be readily obtained at a very cheap rate from a number of holes, bored at different angles, advocated. The cost of boring such holes to a depth say of 150 to 200 feet should, when the machine is on the ground, not exceed fifty cents per foot, and should veins of asbestos reticulate through the rocks as plentifully at such depths as are now seen

at the surface, their presence would, without doubt, be recognized in some of the holes.

As regards the present status of the industry, there are at present engaged in mining at Thetford no less than six companies, two new ones having commenced operations during the past season, viz., Messrs. Lucke and Mitchell, of Sherbrooke, and A. H. Murphy & Co., of Montreal. The low lying area between the railway and the Thetford River has been proved to some extent by different parties, and while promising veins have been found at several points, these do not appear so numerous or so important as regards size and quality as those in the knoll at Thetford station. These areas should be thoroughly tested and their value ascertained before dumping grounds are located there, which may require to be removed again before long, since it is very possible that large and important veins may be concealed. On the property of Lucke & Mitchell several veins of very fine fibre, in thickness up to nearly two inches, are found in a portion of the low lying area, so that care is necessary in laying out the work for the future.

At Black Lake several new companies have taken up areas and commenced development work, preparatory to mining during the coming season. These are for the most part located contiguous to the line of the Quebec Central railway to the southwest of the present workings, and adjoining the mine of the Anglo-Canadian Co. Among these new companies are the St. Julie Mining Co., the Black Lake Mining Co., and the Laurier Mining Co., but in none of these has the development reached such a point as to enable one to pronounce definitely upon the success of the several undertakings. The works of the American Asbestos Co., on the high ridge southeast of the Black Lake station are, however, worthy of mention for the amount of work done during the past season, and for the energy and system displayed, as well as for the good results already obtained. This mine is at the highest elevation of any at present worked. The plant is excellent, and the quality of much of the fibre very good, a fair proportion ranking No. 1. New workings of the Anglo-Canadian in the face of the high hill which is about 350 to 400 feet above the railway at this point also show excellent veins of asbestos, while in the pits of the United Asbestos Co., which has lately acquired the property known as the Frechette-Dauville mine and which is intermediate in position between the Scottish and the Anglo-Canadian mines, some very fine "cotton" is obtained, the percentage of firsts from this pit during the past season probably amounting to over forty per cent. This mine is now being thoroughly equipped with steam derricks, compressors, drills, etc., by the Jenckes Machine Co. of Sherbrooke, who have lately made a specialty of mining machinery.

To the north-west of the Coleraine station, adjoining the area of Fenwick and Sclater, opera-

tions have been commenced during the past season by W. H. Lambly & Co., of Inverness. Near the crest of the hill in which this mine is situated several very good veins are seen, but work has not sufficiently developed the property to ascertain the value of the lower cuttings. As in the case of the copper industry some years ago, an asbestos boom will doubtless set in, and some of the many properties placed upon the market will furnish very poor returns to the investors. All is not gold that glitters, and all serpentine is not asbestos bearing. The folly of placing at greatly inflated prices, properties comparatively undeveloped, should be avoided in the interests of legitimate mining. While from certain standpoints the prospective profits of asbestos mining may seem very large, the actual returns are not in all cases commensurate with the expectations. The figures quoted of prospective output and profit in several of the prospectuses which have lately appeared, can never be realized, since these figures are, to a large extent, based upon an exaggerated output of first quality, chimerical ideas which in the case of the properties mentioned can never be realized either for quality of fibre or quantity of production; and it should be the endeavour of every one engaged in legitimate mining to discourage any attempts that may be made to flood the market with undeveloped and sometimes unprofitable areas, at figures which even the most profitable mines at the present time would scarcely warrant. The profits from asbestos mining must very largely be obtained from the output of "firsts" and "seconds." There cannot at present prices be any great margin in "thirds," and still less on "waste," and as the percentage of "thirds" from some of the mines is nearly equivalent to half the output, the source from which profitable returns can be reasonably looked for is largely reduced. These proportions can readily be seen from the figures quoted in the last issue of the Geological Survey, where the percentages of the different grades for the several localities are stated, as also in an excellent paper by Dr. Ellis on the mining industries of Eastern Quebec, read before the Ottawa Meeting of the American Institute of Mining Engineers, and reproduced in another portion of this issue.

Notable Prosperity of Port Arthur Mines.—In his address to the Board of Trades Mr. Thomas Marks, the president, dealt at considerable length upon the rapid growth and development of the mines in the vicinity of Port Arthur, indicating the prosperity of the mines in the following terms:—The Port Arthur silver district continues to be prominent, and never in the history of silver mining here have matters looked so prosperous. Large shipments of ore have been made all through the season, new mines are being worked and prospects developed, and altogether, affairs in the Port Arthur silver district are bright and business like. The recent dividend at the Badger of ten per cent on the total capital stock of \$250,000, after having returned to the proprietors all the money invested by them in mining, machinery, purchase of lands, &c., some \$200,000; the rise in Shuniah Weachu stock, the development at the Beaver, the rich ore body struck at the Elgin, the showing at the West End, one and all point to the eventual value to the district and our people of the silver mines.

Quebec Crown Lands; Gross Misrepresentation of the Output of Quebec Mines.

In his Annual Report, recently issued, the Commissioner of Crown Lands for the Province of Quebec announces that the revenue from the sale of Crown lands during the past year has been \$58,818.94, of which \$4,997.50 was realized from mining lands. The foregoing figures, he says, "show that the Province is making progress, and that our sources of revenue are being developed in a satisfactory manner." Quite so; but unfortunately it is progress towards the time when the revenue will decline from the exhaustion of the forest, and the depletion of rich areas of mineral wealth which, under a just and equitable system of mining laws, ought to be yielding a large and increasing yearly income to the Provincial Treasury. Again, we are informed that "the fees on permits, etc., granted to persons interested in mining amounted to \$124, and the expenses to \$3,229.27." We have been told that the Government has under consideration a revision of its effete system of mining laws; surely it is full time when such an absurdity as this appears from year to year in its Blue Book. Appended to the report is a statement of the work done by the Mining Service for the year, in which some statistics of the production of the Quebec mines form a prominent and attractive feature—we say attractive, for any one conversant with these industries cannot fail to be impressed with striking instances of their glaring inaccuracy. Here, for instance, are a few of the discrepancies:—

PHOSPHATE.

QUEBEC MINES, 1889.	Mr. Obalski's Fanciful Figures.	The Actual Shipments.	The REVIEW's Authority for its Returns.
Name of Company or Mine.	Tons.	Tons.	
Ottawa Phosphate Co.	3,500	1,300	Lomer, Rohr & Co.
Canadian Phosphate Co.	7,300	6,040	Millar & Co.
Central Lake Mining Co.	1,000	210	Lomer, Rohr & Co.
Phosphate of Lime Co.	6,500	6,886	Wilson & Green.
Dominion Phosphate Co.	6,000	8,350	Lomer, Rohr & Co.
Little Rapids	500	Nil; no shipping done.	W. A. Allan.
Blackburn Mine.	1,500	800	Lomer, Rohr & Co.
Jackson Rae.	200	Nil.	do
Chapleau Lot.	Not mentioned.	125	do
Grier Lots (East Templeton).	do	100	do
Chas. Lionais & Co.	150	170	do
Bassin du Lièvre Mining and Milling Co.	1,700	Did not raise a pound.*	.....

* "These 1,700 tons," write Messrs. Lomer, Rohr & Co., "are certainly incorrect, as this company did not raise any phosphate during 1889. They ground for the Canadian Phosphate Co., the Ottawa Phosphate Co., as well as for ourselves, all of which has been included under the shipments of the different companies."

ASBESTOS.

			Quebec Central Ry. Returns.
Thetford District.	3,850	4,803	
Black Lake	1,560	1,725	do do
Coleraine	175	124	do do
Broughton.	6	8	do do
Lévis	Not mentioned.	16	do do
Danville	328	400	Estimated; Irwin & Hopper.

INDIVIDUAL INACCURACIES.

American Asbestos Co.	380	530	American Asbestos Co.
United Asbestos Co. (formerly Frechette)	330	379½	Mr. Frechette.

COPPER.			
QUEBEC MINES, 1889.	Mr. Obalski's Fanciful Figures.	The Actual Production.	The REVIEW's Authority for its Returns.
Name of Company or Mine.	Tons.	Tons.	
Eustis Mining Co. (Including 1,700 matte.)	33,000	34,089 (Inc. 1,773 matte.)	Eustis Mining Co.
G. H. Nichols & Co.	35,000	36,000	G. H. Nichols & Co.
Cillis and Moulton	2,000	No shipm'ts; 2,000 tons raised, est'd	Dr. Ells.
Memphremagog Mining Co.	900	800	Mining Bureau, Geol. Sur. Can
Excelsior Copper Co.	255	255	Quebec Central Ry. Returns.
FELSPAR.			
Villeneuve Mica and Mining Co.	250	411	Canadian Pacific Ry.
IRON.			
Bristol Iron Co.	Not mentioned.	2,650 Shipd. Nov. & Dec.	Bristol Iron Co.

A Lesson from the Toronto Fire.

If the destruction of the University of Toronto, deplorable as we all must feel it to be, will only impress upon Parliament the very urgent necessity there is of better protection from a similar and what would be a more serious disaster to our Geological and Natural History Survey Museum and offices, it will not have been an unmixed evil. As we have repeatedly pointed out in these columns, the present incommensurate structure is utterly inadequate to the wants and uses of the institution, and adjacent as it is, to a number of rickety old fashioned buildings, it has absolutely no protection against destruction by fire. At present it holds the most precious collection of minerals, fossils, and botanical specimens contained in any one building on the American continent. The loss of such a valuable collection would be irreparable. In a monetary sense they represent more than a million of dollars. Surely these are worthy of a better fate? If, instead of indulging in jealous intrigues and internal bickerings over family troubles, the members of the staff would unite in pressing the urgency of this matter with half as much energy and zeal as they have lately displayed in pulling the political wires for purely personal ends, something definite might be done to avert a public calamity, which may occur at any time under existing circumstances. Now that Parliament is in session it is both right and proper that the facts should be placed before the representatives of the people, and that they should be asked to assist the Government by their support, in projecting the erection of such a structure as would place Canada abreast of the other nations of the civilized world in the march of improvement.

Differences in other returns are also apparent; but we think these figures are sufficient to show that absolutely no reliance can be placed on Mr. Obalski's statistics. Mr. Obalski states that these estimates are very approximately made; this is just what we object to. The accurate returns of the shipments of phosphates, asbestos, copper and the other minerals are accessible at the end of the year, and can readily be obtained if the information is sought from the proper quarters. There can, therefore, be no excuse for discrepancies like these in statistics bearing the impress of Government authority; they are misleading to the public, and do great injustice to the mines and the very promising industry which they represent.

Imports of Coal, by Water, at the Ports of Montreal, Sorel, Three Rivers and Quebec, for the Years 1888 and 1889.

(Authentic figures compiled for the REVIEW.)

	MONTREAL.		SOREL.		THREE RIVERS.		QUEBEC.		TOTALS.		REMARKS.
	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	1888.	1889.	
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
CAPE BRETON MINES—											
"International"	72,341	82,879	1,191	.....	.....	.....	4,615	3,841	78,147	86,720	Inc. over 1888, 8,573
General Mining Association.	45,917	45,297	6,698	8,404	3,500	1,300	25,073	21,828	81,188	76,829	Decrease, 1888, 4,359
Sydney & Louisburg Coal & Railway Co.	48,777	48,915	.....	3,900	.....	.....	7,689	5,759	56,466	60,074	Increase, 1888, 3,608
"Caledonia"	46,414	33,454	9,739	9,910	.....	3,000	.....	10,077	56,153	56,441	do 1888, 288
"Gowrie"	38,837	32,106	10,898	7,372	.....	.....	583	550	50,318	40,028	Decrease, 1888, 10,290
"Glance Bay"	39,933	31,411	1,500	4,819	2,184	2,089	1,368	.....	44,985	38,319	do 1888, 6,666
PICTOU COUNTY MINES—											
"Intercolonial"	54,906	35,452	.....	9,200	.....	.....	.....	.....	54,906	44,652	do 1888, 10,254
"Vale" and "Acadia"	22,073	1,213	.....	.....	.....	.....	.....	.....	22,073	1,213	do 1888, 20,860
FOREIGN COALS—											
Scotch	21,733	12,331	.....	.....	.....	.....	25,474	21,273	47,207	33,604	do 1888, 13,603
English	5,580	4,791	.....	.....	.....	.....	12,256	15,948	17,836	20,739	Increase, 1888, 2,903
Welsh Anthracite	4,155	8,286	.....	.....	.....	.....	4,105	.....	8,260	8,286	do 1888, 26
	400,666	336,135	30,026	43,605	5,684	6,389	81,163	79,276	517,539	466,905	

Rumored Discovery of Coal North of Lake Superior.

Late Port Arthur papers are full of accounts of supposed discoveries of coal said to have been made in the country north of Lake Superior. From time to time similar discoveries have been alleged to have been made in various parts of the Provinces of Ontario and Quebec in localities where it would be almost impossible for coal to occur, if there is any truth in the conclusions of geologists. On looking into the question and reading what is said in the reports of the Geological Survey as to the rocks of the region referred to, we have come to the conclusion that while nothing is impossible, it is *exceedingly improbable* that coal of any kind exists in the region to the north and northwest of Lake Superior. Dr. Bell in his report for 1877, describes beds of lignite in the drift along the Missinaibi River far to the northeast; but in his report for 1886 the same gentleman gives reasons why true coal need not be looked for in the great region westward of James Bay, including the country in question. No coal has been found in any part of the world in rocks of such ancient date as those which occupy the whole country to the north and west of Lake Superior or until we come to the plains; and Dr. Bell shows that the evidence of the drift is all against the chances of finding coal anywhere to the northeast. The Geological work bearing on this problem having been done already by the Dominion Survey, we do not see that anything is to be gained by the proposal to ask for \$1,000 from the Government of Ontario and the same amount from that of the Dominion. The ignorance of the results already arrived at by our own Survey appears to be at the bottom of much misunderstanding which might be obviated if the Reports of the Survey, or rather a summary of them, were better disseminated. Cases of this kind show the necessity of finding better means of diffusing among the public the valuable information already acquired at the public expense.

The Economic Geology of Ontario.

Although the Report of the Royal Commission appointed to enquire into the mineral resources of Ontario is not yet ready for distribution, we have been favoured with a glance at the advance sheets of that portion of it which has special reference to the economic geology of the Province. Dr. Bell has evidently done his work in a painstaking and highly creditable manner, and has succeeded in condensing into some fifty pages, not only an interesting, but a scientifically accurate description of what is known of the geology of this section of the country up to the present time. The first part of his report defines the proper meanings of some of the commoner geological terms which are often too loosely used, and explains the origin of the

proper names in Canadian geology. An outline is then given of the various rock systems and formations of Ontario, and each is described in the light of the most recent investigations. These divisions are described in their chronological order. The origin of the various Laurentian rocks and the true position and relations of the Huronian system are clearly stated. After the general description of the Huronian the leading facts are given as to iron, copper, nickel, silver, gold zinc, antimony and other ores in this pre-eminently metalliferous formation. The Animikie, or silver-bearing formation of Lake Superior is described in an interesting and intelligible manner, and all dates of discovery, workings, etc., are accurately stated, Dr. Bell having been personally familiar with these. The various unaltered formations with their accompanying economic substances, such as salt, gypsum, petroleum, natural gas, etc., are described in their proper order. Dr. Bell is a specialist in surface geology, and devotes a few pages to a graphic summary of this branch of geology as far as it refers to the Province of Ontario. A few pages are added in regard to the copper, nickel and gold mines of the Sudbury district, so as to bring the subject up to the end of 1889. Taking it in its widest sense we do not remember to have read any geological report which, for the number of pages, has proved so interesting and satisfactory. We understand that the complete Report of the Commission, which, as we have said before, has been far too long delayed, is to be submitted to the Local Legislature during the present session.

Importation of Mining Machinery.

In the House of Commons on the 31st inst.

Mr. Lister asked whether the Government has allowed any machinery used in the copper or nickel mines at Sudbury to be imported free of duty, or to be used in bond? Has the importation into Canada of any mining machinery been permitted without the payment of duty during the past five years?

Mr. Bowell—Application was made for the admission, free of duty, of some machinery that had been used in the mines of the United States, for use in the copper and nickel mines at Sudbury, Ontario, which was conceded by Order-in-Council. The British Columbia Government appropriated a sum of money to purchase machinery for the purpose of erecting reducing works in the Cariboo district, British Columbia, upon which duty was paid, and application was made to the Dominion Government for a refund of said duty as such machinery was not manufactured in Canada. That application was granted. No refund has been made, for the reason that it has not yet been shown to the Department what portion of the machinery imported is not manufactured in Canada. When that is done, a refund will be made.

The Natal Coal Fields.—The existence of extensive coalbeds in Natal of a rather better quality than any yet found the Cape Colony has long been known; but owing to the absence of any local demand and the prohibitory cost of transit by ox wagon, they were almost unworked until recently, when the railway from the port of Durban was extended sufficiently near them to admit of a portion of the supply for the locomotives being conveyed to the line. An extension of the railway to the Transvaal border, now in progress, will admit of the coal being put direct into the trucks, when it is anticipated that the Natal railways will be worked exclusively with local coal, and that the coasting steamers will also be supplied with it. Mr. William Milne, locomotive superintendent of the Natal Government railways, considers that some descriptions of Natal coal are almost equal in steam-generating properties to South Yorkshire coal, which was exclusively used formerly on the Natal railways.

LETTERS TO THE EDITOR.

Phosphate Analyses.

LONDON, ENG., January 15th, 1890.

The Editor,

SIR,—I have read with great interest Captain Adams' letter in your November number on the subject of the sales of Canadian phosphate in Europe.

The first point about which Captain Adams complains is the cash discount of 2½%, the answer to which is that it is the custom of the trade. I should imagine that when Captain Adams purchases machinery or supplies for his mines that he secures a discount for cash payment; but in addition to this there is another matter to be considered, viz.: that the broker in Europe who sells the phosphate to the manufacturer often has to take the risk of drawing on his buyer, whereas he accounts to his seller on a cash basis.

The next point is the moisture question. A few years ago when phosphate was sold "as it rises" (*i. e.* analysis on the normal state) it frequently happened that the test was below guarantee, simply because the moisture was taken into account in the analysis and was not deducted from weight, the result being that a cargo of phosphate sold as 80% and which tested say 81% on the dry basis, but only 79% in its natural state was rejected for being below guarantee and a heavy allowance claimed. Captain Adams also appears to lose sight of the fact that what is lost in weight is made up in the analysis which is proportionally higher; and further than this, the phosphate being sold with one-fifth of a penny rise for every unit above guarantee, the seller secures an additional price for every unit, as the rise is taken on the analysis of sample dried at 212°, and not on the analysis in normal state. On a cargo testing say about 83% on dry analysis, and only 80% in normal state, the gain to the seller would be about 4s. 2d., or \$1 per ton.

Further, Captain Adams, while on the one hand objecting to have the moisture deducted from weight, claims on the other to have his phosphate analysed on the dry state; in other words he wants to be paid the phosphate price for any moisture which the cargo happens to contain.

To come now to the question of difference in tests of samples taken on shipment and on discharge, Captain Adams appears to have been singularly unfortunate in his experience. For the last two years all the phosphate shipped by the Canadian Phosphate Co., limited, has been analysed previous to shipment, and the results obtained on both sides have been practically identical. I think an explanation of Captain Adams' trouble may possibly lie in the fact that his shipments may have been mixed ones, *i. e.* the collective output from a large number of pits which gave different grades of ore, and would be therefore very difficult to sample. I have seen the sampling done at numerous places in England and on the continent, and I am of opinion that the current system of taking about 1% of the cargo as it is being discharged from the ship is as fair a method as could be adopted, for the whole sample taken is ground up to powder and well mixed before the final samples are taken. In the case of mixed shipments it is more probable that the discharge sample would be the correct one, as after the double or treble handling, the various grades would be thoroughly distributed through the whole cargo. I think, however, that in taking samples up country at the mines, a loss of 1% in the test should be calculated on, seeing that the phosphate is likely to get a certain amount of extraneous matter mixed with it during its conveyance from the mines to Montreal, and during shipment from the dirty wharves provided at Montreal.

I do not at all agree with the suggestion to leave the sampling to one recognised authority, for in cases of dis-appointment on the part either of buyer or seller, which would be sure to occur sooner or later, the trouble would recommence. In addition to this the cost of sampling, which is now very trifling, would be most materially increased, for such a sampler would want at least four or five guineas a day, and as he would have to be waiting at all times in the docks until the steamer commenced to discharge the phosphate, payment would have to be made for about four days work on each shipment.

As to there being anything in Capt. Adams' argument that buyers' chemists are *ipso facto* lower than sellers', this I do not for one moment admit, for in one contract A will be the chemist for Buyer and B for Seller, in the next *vice versa*, and so on. For my own satisfaction I have made a list of a number of cargoes, and I find in adding up the total of thirty tests by buyers' chemists and by sellers', that whereas the sellers' tests gave a total of 2423 units, buyers gave 2433, or an average difference of

about ½%. I have seen cases where differences between chemists have been 2% or even 3%, but the reference to the 3rd chemist always settles this point.

On the question of reductions claimed for cargoes being under test, Capt. Adams has given your readers but one side of the case, viz.: the seller's, who, having delivered a cargo inferior to what he has sold and guaranteed, finds himself obliged to suffer in consequence. Now let us consider the buyer's position. A manufacturer has a buyer of say 1000 tons of 18% superphosphate; before accepting the order he enquires the price of the cheapest phosphate from which he can make this quality: he chooses perhaps 80% Canadian and buys 500 tons with which to fill his order. When the Canadian phosphate arrives it tests say only 78%, or not sufficiently high to enable the manufacturer to make the superphosphate he has sold. The manufacturer has therefore to replace with material from another source, and it frequently happens that he has to pay a higher price for his raw material. He therefore not only loses part or all of the profit he calculated on making, but finds his work blocked with a lot of material which he did not want. Therefore, in making an offer for the same he calculates the loss he has incurred in having to buy other material, and deducts this from what he considers the value to him of the 78%, which he never bought, and which the shipper who sold him 80% expects him to keep. I have certainly known cases where claims have seemed excessive, but it is not always possible to know how the buyer is placed by the default in guarantee, and the broker or agent in Europe being thus between the buyer and seller, may find himself in a truly trying position, his seller having delivered a cargo below guarantee and his buyer claiming a heavy allowance. The seller thinks the broker is not looking after his interest in settling with a heavy allowance, and the buyer refuses to listen to any new offers of phosphate made by the broker, because he cannot rely upon receiving what he has bought. I have known instances where the buyer has consented to a re-sampling in order to satisfy the Canadian seller, but I have never yet heard of a case of this kind where the second sampling has given any appreciable difference from the first.

As to selling phosphate on a sliding scale without guarantee, the proposal is absolutely impracticable, for the manufacturer only buys phosphate of that particular grade which enables him to produce the superphosphate for which he has buyers.

In conclusion, though I admit there have been troubles in the Canadian phosphate trade, I am of opinion that it has in most cases been the fault of the sellers, who generally imagine their phosphate to be of a better quality than it really is; but I think that now that the industry is beginning to be more seriously studied and treated with more system, the results obtained in Europe will not be a cause of dissatisfaction to the Canadian sellers.

I am, yours, etc.

C. C. HOYER MILLAR.

MONTREAL, Feb. 15th, 1890.

The Editor,

SIR,—With your permission I would like to have space for a few remarks on the subject of Phosphate Analyses, which has been under discussion in your columns for the last three months.

There is no doubt that in the past, miners of Canadian phosphate have been disappointed at the valuations of their ore at European ports, even though they have based their expectations of returns on analyses of their goods made by Canadian or U. S. Chemists. The question is, what has been the cause of their disappointment? Is it the sampling, or the analysis, or both? I have had some little experience in sampling, with more in analysing Canadian phosphate, and I am firmly of opinion that very many, if not all, the cases of disappointment are to be traced to improper sampling of the ore, either here or on the other side of the water.

Sampling, as Mr. J. Lainson-Wills very properly remarks in your January issue, is no easy matter, and it is high time that our miners should pay more attention to the matter here, as well as at the port where the European purchaser accepts the cargo. More careful attention to this matter will, I am convinced, result in fewer disappointments when accounts of sales are received.

As to the analysis, chemists, both on this continent and in Europe, are almost a unit in using what is known as the Molybdate method, and when working on duplicate samples find no difficulty, as a rule, in obtaining closely concordant results. At the same time it must be admitted that the correct determination of the amount of phosphoric acid in a sample of ore is by no means an easy matter; indeed, in the valuation of no other commonly occurring ore is greater care required.

In conclusion I may be permitted to add that I am surprised to see Mr. Lainson-Wills advocating the method of analyses he outlines in the January REVIEW. This method, which is uncertain, and likely to give

high results, has for some years been almost universally discarded in favour of the Molybdate method already mentioned.

I am, yours, etc.,
J. T. DONALD.

MONTREAL, Feb. 21, 1890.

The Editor,

SIR,—I have read with interest the comments made by correspondents in your January number upon my previous remarks as to the commercial difficulties attending the sale of Canadian phosphate. Mr. J. Lainson-Wills, in his learned article, waives aside the question by saying: "the commercial dealings offering no difficulty to any competent man of business." So it appears that the whole trouble is due to the incompetency of Canadian shippers, and as they all, without exception, have suffered severely from the causes indicated, they all stand condemned. If our inefficiency is the cause of all our troubles, it is well that we should know it; but it would be a kindness to us if Mr. Lainson-Wills would give such instruction as might enable us to reform, or else convince us of our hopeless incompetency and induce our retirement *en masse* from the business in favor of competent men. His prescription of Maret's method of analysis is said by our best authorities to be defective, but he hits the mark when he suggests that "the same method of analyses be adopted by the respective chemists."

Mr. Hutchinson's analyses show a gratifying agreement, in no case being as much as one per cent. different. But his statement confirms my assertion that the buyer's analysis is lower than the seller's in a large proportion of cases. *In the five instances which he gives the buyer is lower every time.* I denounce this as a grave commercial scandal worthy of the attention of the honorable chemists whose reputation is necessarily involved in such a condition of things. Chemical reactions certainly cannot vary with the differing commercial interests, nor can the chemists be supposed to prostitute their noble science. The explanation is that different methods are used, and after a little experience it is found out that certain men are usually higher or lower in their results, and these henceforth become sellers' and buyers' chemists, respectively. The fault, if it be a fault to follow the recognized custom of taking every possible advantage in trade, lies with the merchants and manufacturers, and the remedy rests with the chemists. Let them adopt uniform methods of analysis, and we shall doubtless secure an average agreement in results.

Yours, etc.,

ROBT. C. ADAMS.

Cobalt in the Nickeliferous Pyrrhotite of Sudbury.

MONTREAL, Feb. 11th, 1890.

The Editor,

SIR,—In a recent issue of your Review reporting the Transactions of the American Institute of Mining Engineers in Ottawa, I noticed a statement to the effect that pyrrhotite never contained cobalt.

In December last, a specimen of Sudbury pyrrhotite free from gangue was placed in my hands for analysis. On careful investigation it was found to contain 3.843 per cent. of nickel and 0.59 per cent. of cobalt. I may also add that it contained 0.33 per cent. of copper.

Cobalt is found in the pyrrhotite of Elizabethtown, Ont., and in that of other localities in Canada.

Apologising for encroaching upon your valuable space, I am,

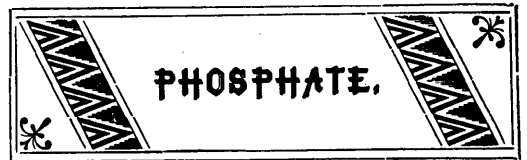
Yours, etc.,

MILTON L. HERSEY, B.A. Sc.

Chemical Laboratory, McGill College.

Metallurgical Progress in 1889.

The metallurgical progress of the past year has been mainly in the direction of perfecting existing process rather than in that of new discovery, at any rate as far as can be judged by communications made public. At the spring meeting of the Iron and Steel Institute considerable interest was exerted by a record of experiments on the addition of nickel to iron and steel, which had been carried out at Halside in Scotland, by Mr. James Riley, and showed that lined steel containing 5 per cent. of nickel has its elastic limit and alternate strength raised by nearly one-half, while the hardness is but slightly augmented. With the large increase in the supply of nickel from Canada, it is not improbable that steel of this kind may become practically useful at no distant date. The open hearth furnace, variously modified both as regards shape and material of construction, continues to increase in usefulness. For the large purposes, such as the ingots required for modern artillery, furnaces of 30 to 40 tons capacity are now frequently employed, and the increasing use of dephosphorising methods, even with the highest class of pig iron, is specially noticeable. This is rendered possible by the use of refractory basic materials, such as caustic magnesia, and more particularly chromic iron ore, the latter being used not only for melting furnaces but also for the beds of reheating furnaces.



In General.

Messrs. Andrew Hunter & Co., 4 Fenchurch Avenue, London, Eng., have acquired the business formerly carried on by Messrs. Moller, Gaetz & Co., as chemical brokers and phosphate merchants.

In another portion of this issue we publish a summary of the evidence in the suit of the Hamilton Fertilizer Co. vs. Wilson, which opened at Hamilton on the 7th inst. The suit was for payment of a note for \$120 given for a shipment of "Sure Growth Fertilizer." The analysis of the fertilizer gave:

Phosphoric acid, soluble in water.	0.86 %
Soluble in citrate of ammonia	5.61
Insoluble	1.71
Ammonia	5.40
Potash	5.24
Moisture	7.03

The defendant alleged that it had not benefitted his crops, and refused to pay. In all probability the fertilizer did not produce immediate effects owing to deficiency in soluble phosphoric acid, but the land will perhaps show its good effects in the following years. Since this was written, we find that pressure upon space compels us to withhold the evidence and verdict in this case.

Markets.

The following is an extract from Messrs. Couper Millar & Co.'s circular under date of 16th ult: The "Corner" in phosphates becomes daily more acute, and it is hard to say how manufacturers' wants are to be supplied during the spring months. Long prices are being paid by continental buyers for high test material, and very little obtainable, while medium and low test is scarce, the strike of the coal workers on the Continent having actually shut up some of the works *pro tem.*, which tends to aggravate the situation, they pleading "force majeure" as a reason for non-delivery on existing contracts. Mineral phosphates.—South Carolina offering sparingly at 11d. to 11½d. per unit according to port. Somme continues scarce; indeed, there is very little available for early delivery of any test. Canadian enquired for, but raisers are not disposed to sell yet at even 1s. 3d. per unit for 80 per cent. with 1-5 of a penny rise, basis London delivery. Belgian, owing to the coal strikes, is, generally speaking, off the market for the present. Aruba is not offered, and the much-prized Curocoa does not come forward. Cambridge and Bedford coprolites wanted, but what little is raised is consumed in the district.

Later advices, under date of 10th February, state that the "boom" in Florida phosphates has had a tendency to depress the market, and quotations for Canadian are a penny less. 1/3d. can be obtained at Hamburg, and 1/2d. for English ports. South Carolina has dropped 50 cents per ton, equal to one half-penny per unit. 65% phosphates have been sold for next year's delivery at nine pence, which is an advance of one halfpenny on last year's prices.

Freights.

The outlook for the coming season is good. Quotations are as follows: Liverpool, 6/3d.; Glasgow, 6/3d.; London, 7/6d.; Hamburg, 12/6d. to 15/. An unprecedented number of outside vessels are reported to have been secured for deals, and plenty of room is therefore anticipated.

Templeton District.

Mr. A. S. Thomson, of Toronto, is now operating with a small force on Lot 27, Range 10, in the district of East Templeton. During December about 60 tons of No. 1 ore were mined and hauled to station.

Operations are now going ahead at the McLaurin property, lot 7. A couple of boilers and other machinery have been shipped, and, as soon as the snow leaves the ground, work will be pushed actively on the other portions of the property.

About 900 tons have been shipped to the front from the Blackburn since the beginning of the year. The average daily output at present is eleven tons, with a force of 50 men. Three boilers and four steam drills have been added to the plant, and the prospects for a large output during the coming season are good.

The Annual General Meeting of the Templeton and Blanche River Phosphate Co. was held at Montreal, on the 1st inst. The following directors were appointed:

Wm. Cassils, president; R. McLea, vice-president; Dickson Anderson, managing director; Hugh Graham, J. M. Kirk, Henry Hogan, A. Holden, directors. The retiring directors were H. J. Beemer and T. Trimble. Mr. P. S. Ross was re-elected secretary to the company.

A little mining has been done on Lot 35 in the Gore of Templeton with most satisfactory results. A vein of pure green apatite forty-four feet long by three feet in width, and other "shows" equally promising, have been uncovered. The owners will resume working as soon as the snow leaves the ground.

Mr. Wm. MacIntosh, of Buckingham, is hauling phosphate to the Blanche from his Murphy lot. Recent developments are reported to be highly satisfactory.

Lievres District.

The output of the North Star to date is estimated to have been a little over 2,000 tons. Mr. R. N. Hall, M.P., of Sherbrooke, is now in London with the object, we understand, of placing this productive and well developed property, associated with some adjoining Lots, in the hands of an English syndicate which proposes to acquire them. We have heard it stated on good authority that the profits of this company on last year's operations were between twenty and thirty thousand dollars. Capt. Williams has a force of some 60 men now in the pits, which are all doing well.

The High Rock Mines, which lately have been in rather hard luck, are now looking very much better, and all the pits, particularly the Cap Rock, are turning out satisfactory outputs once more. Foreman Smith is now running a tunnel from No. 11 through to No. 9, and anticipates the discovery of some rich veins.

The pits of the Canadian Phosphate Company, although slightly troubled with water lately, have been turning out exceedingly well. Especially is this noticeable in No. 2, where large masses of high grade are found and the pieces being too large for the tubs are being hauled up by chains. The Star Hill Landing is well filled up with various grades of ore, ready for shipment on the opening of navigation.

The Anglo-Continental Guano Co. has appointed Mr. Smith, a gentleman reputed to have an extensive experience in the mining of phosphates in Europe, as the superintendent of their recently acquired property. Mr. Smith has arrived at the mines, and is now engaged in operations preliminary to more active work.

At Little Rapids, work on the newly discovered fissure proceeds with a small force. Developments are reported to show three feet of clean ore in the vein. This property is now in good shape for more extensive workings.

Some very important developments have been made during the past few months on lot 27, in the 4th Range, Portland West. Average samples of the ore, which is red in colour, have analysed 89 per cent. of tribasic phosphate of lime. Mr. Lainsion-Wills reports it to be the most remarkable surface showing of apatite in this country, covering, as it does, an area of about 200 feet by 40 feet, and revealing the existence of a vast deposit of the purest crystallised red apatite, having a course of N.W. and S.E.

Peter Powers and a force of some 25 men continue to make satisfactory headway at Central Lake. The mine is being outfitted with an excellent plant comprising 40 H.P. boiler, drills, steam hoist and other machinery.

Mr. S. P. Franchot, of the Emerald, is now in London.

The Dominion Phosphate Co. (of London) have some fifty men working under Manager Gibbs. This mine is also being equipped with new machinery, including 50 H.P. boiler, additional steam hoists, drills, derricks, etc. A couple of large scows for the shipment of their output below the rapids are in the stocks.

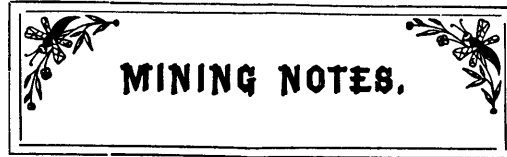
Kingston District.

We regret to have to record this month two very deplorable accidents, which resulted fatally, at the pits of the Foxton mine. The accident on the 4th inst. is described by an eye-witness as follows: Dennis Mooney, working in one of the shafts, 150 feet deep, placed a portion of a steel drill on the bucket to be taken to the surface. When he thought everything was clear he resumed his work, but he did so too soon. The bucket was being pulled from the opening just about that time, and, canting, the point, which is about 11 inches long, descended with great force. It came in contact with Mooney's head, cutting through his hat and then through

his skull, and wedging itself solidly in his head, one end protruding through his mouth. When he was raised from the pit he presented a terrible appearance. The bar and hat were removed, the latter containing a handful of brains. A physician was summoned, but nothing could be done to save the man's life.

The other unfortunate occurrence took place on the 13th inst., and is described as follows: Michael Hogan fell out of a bucket head foremost down the dark shaft for a distance of ninety feet. He was only engaged at the mine for half a day. As he was being drawn up at six o'clock he grew nervous, lost his hold, and though grabbed by a companion, fell overboard to his death.

The output from these mines has not been so good this month, in consequence of a good deal of dead work in the pits. A fault has been found in the bottom of the main pit which has shifted the phosphate and reduced the production temporarily.



Nova Scotia.

At the annual meeting of the Cumberland Railway and Coal Co., held at Montreal, on the 12th inst., the old board of directors was re-appointed.

At the annual meeting of the Londonderry Iron Company, held at Montreal, on the same date, a report of the operations of the company during the past year was submitted. A dividend of 6% on the preferred stock, payable on 15th March, was declared, and the old board of directors re-elected. At a subsequent meeting of the directors, Mr. A. P. Paterson was appointed president and managing director, Hon. Donald McInnes, vice-president, and Mr. James Phymster, secretary.

The annual meeting of the Black Diamond Coal Co. was held a few days ago. The report of the directors was fairly encouraging. The following were elected directors: D. C. Fraser, Graham Fraser, Geo. F. McKay, J. L. Jennison and Harvey Graham. The directors recommended the payment of a dividend of 10 per cent. on the nominal capital of the company. The recommendation no doubt was very satisfactory to the shareholders.

We understand that the New Glasgow Iron, Coal and Railway Co. has made a contract with the Stellarton Brick Manufacturing Co. for the supply during this year of 650,000 red brick to be delivered on cars at Pictou Landing. This will insure a good season's work for the brick company, and looks like business on the part of the iron company.

It is reported that the Londonderry Iron Company, owning the Acadia mines, will open and operate the Torbrooke iron mines in connection with its works. These mines are in Annapolis County, N.S., and produce red hematite ore of a very superior quality. The company, it is stated, has secured leases on the property covering about two miles of the ore vein, which is six feet in width, and contains 62 per cent. of metal.

Whiteburn District.

The McGuire mine, to which reference was made in January issue, is reported to be closed for a long time. The Graves mine has made a change of management, Mr. Whidden retiring. The new manager, Mr. W. J. Smart, is an American, and has had an extensive experience in mining in the United States.

Pleasant River District.

Messrs. Thompson & Newcombe have about finished their preparations for active work, and will give their property another test. Larger pumps have been ordered, and will soon be placed.

Molega District.

The Parker-Douglass Co. have received a small diamond drill this week, and intend to use it for prospecting their extensive property. It is intended to bore horizontal holes from the 100 ft. level first, and subsequently to be used for prospecting from the surface. The same company has also on the way an 80 horse-power Rand air compressor, and seven drills, and are considering plans for the transmission of power, either by air or wire rope, from an extensive water power distant about one and a half miles from the mine.

The Caledonia Co. expect to start their mill in a few days. This company is employing a large number of

men and should be one of the largest producers in the camp.

The Malaga Mining Co. are working four of their lodes this month with good prospects, and the product will be large as usual. The company are considering plans for increasing the facilities and output of the mines, and have employed J. E. Hardman, M.E., to consult with Mr. McGuire, the manager, relative to the same.

Oldham District.

The property of the Oldham Gold Co. will be sold, by order of the Court, at Oldham on March 22nd. Little work has been done on this property for some years.

The Standard Gold Company's property, now owned by John Kilhun, Esq., is being prospected by cross-cuts and drifts under ground, and the management hope to reach new pay ground in a few months, or less time.

Fifteen Mile Stream.

The Egerton Gold Mining Company has sold all its property and privileges to a small syndicate, which has appointed J. A. Fraser, of Glasgow, as manager. It is understood that new machinery will be put in at once, and work be vigorously prosecuted this summer.

Central Rawdon.

Manager Willis had the mill running during a part of January, and reports the results as coming fully up to the standard.

Millispigate District.

Work has been recommenced upon a small scale on the property of the Duluth Gold Mining Co. It is of a prospecting character, but the results thus far have been most encouraging.

Beaver Dam.

Work here was discontinued in January for the winter. As soon as the weather will permit, the building of the new stamp mill will be commenced. It is reported that Mr. Turnbull will reside at the mine and manage it, and will also continue the supervision of Mr. North's mine at Renfrew.

New Brunswick.

The treasurer of the Brunswick Manganese Company, to which we referred in our last issue of January, has received advices, according to Boston papers, that a cargo of 200 tons of ore was shipped to Andrew Carnegie, of Pennsylvania, on the 23rd ult. The company has also much more ready for shipment. The reported net profit is some \$11 per ton. Owing to the tides of the Bay of Fundy, shipments are necessarily irregular.

Quebec.

The Villeneuve Mica & Mining Co. expect to have 1,000 tons of their spar ready for shipment in the spring. This spar (orthoclase) is being largely utilized in the manufacture of pottery ware, for which experiments have proved it to be admirably adapted. The shipments last year were purely of an experimental nature, and comprised:

To Trenton, N.J.....	171 tons
To England.....	225 "
To St. Johns, Que.....	15 "

Total..... 411 "

Some three tons of uncut mica (muscovite) are now lying in stock.

The asbestos market remains firm; prices range much higher than they have ever done before, and as the demand is undoubtedly greater than the prospective supply even better figures may be looked for during the coming season.

The American Asbestos Co. (Limited), have driven a tunnel from the foot of the hill under their No. 2 and 3 pits, and are now driving a rise to cut the No. 2 pit. The tunnel is 6 x 6 feet, and the rise is being driven in rich asbestos ground. By means of this tunnel they will do away with all pumping, and it will at the same time give them a splendid face or slope to work on. About 150 men and boys are employed.

We are indebted to Mr. Klein, the courteous manager of these mines, for the following official returns of exports and production during 1889:

EXPORTS.		MINED.	
No.	Tons.	No.	Tons.
No. I.....	51 $\frac{1}{2}$ ⁰⁰	No. I.....	79 $\frac{5}{8}$ ⁰⁰
No. II.....	68 $\frac{7}{8}$ ⁰⁰	No. II.....	81 $\frac{2}{8}$ ⁰⁰
No. III.....	259 $\frac{2}{8}$ ⁰⁰	No. III.....	357 $\frac{1}{8}$ ⁰⁰
Hornblende....	2	Hornblende....	12

Total tons.... 381 $\frac{1}{2}$ Total tons.... 530 $\frac{1}{4}$

Average men and boys employed during year, 60. These mines were first opened last year, and during the

first six months, only hand-work by contract system was in vogue. An excellent equipment of steam working machinery was then introduced, and the results up to date have been most satisfactory.

Messrs. King Bros. contemplate equipping their mines at Thetford with a complete new working plant.

All the machinery of the United Asbestos Company Limited, Black Lake, is now on the ground and nearly ready to run. As soon as the weather becomes a little more settled the management will increase the force, and work the mine on an extensive scale. From returns received from Mr. Frechette, who formerly operated the property, we are informed that the exports to the United States during 1889 were:—

	Tons.
No. 1.....	165½
No. 2.....	62
No. 3.....	132¼
Waste.....	20
Total.....	379¾

Average number of men and boys employed during year about 30.

Prospecting on the property of the Black Lake Mining Co. has developed some very nice veins of asbestos.

The asbestos lots in Coleraine, in which Messrs. Lucke & Mitchell, Sherbrooke, have a part ownership, were merely worked last season with a view to prospecting the property. The surface work was so satisfactory that it has been decided to put in a complete plant early in the spring, and go to work in earnest.

The Geological Survey map of the asbestos region is now in the hands of the engraver, and will be ready for distribution at an early date. The map is a fine piece of work. The difference in the Surveys of some of the Lots, particularly those of the Thetford district, when compared with the Surveys previously executed by the Crown Lands Department at Quebec, show a wide divergence in the location of some of the properties, and we should not be at all surprised to find some lively litigation among the owners as a result. The surveys made under Dr. Ellis, being the most recent, are probably the most accurate.

Capt. Williams will commence operations on the Murphy Lots early in the spring. The exports in 1889 were: To United States, 66½ tons; Canada, 51½ tons. The average men and boys employed were 24 during four month's work.

It is, we believe, the intention of the Anglo-Canadian Co. to equip their property with an additional plant, in order to carry on more extensive operations. A number of new places were prospected last year, and these are sufficiently promising to warrant the addition of steam power to work them. The ground in rear, adjoining the Frechette (now United Co.'s) mine shows equally well, and a large quantity of choice material was obtained from these pits during last year. Mr. R. T. Hopper informs us that the total output from the pits during 1889 was 603 tons, of which about 500 tons went to the United States and the balance to Great Britain.

A further dividend of 10 per cent. is proposed by the board of the Bell's Asbestos Company Limited, making 22½ per cent. for the year 1889. The sum of £1,938 will then remain to be carried forward. We are indebted to Mr. Thos. Sheridan, manager of the company's mines in Canada for the following figures of production during 1889:—

	Tons.
No. 1. Crude.....	1,200
No. 2. do.....	200
No. 3. do.....	400
Total.....	1,800

Mr. W. H. Lambly, of Inverness, did a little preliminary working last year on his property, Lot A, Coleraine. About four months work was done with an average of eight hands, and twenty-three tons were raised.

Official figures received from the company state that the output from the Eustis copper mines during the year ended 31st December last amounted to 34,089 tons of 2,240 lbs. Of this quantity 18,114 tons were smelted, 14,725 tons exported in raw state, and 1,250 tons put in stock. The matte produced comprised 1,773 tons.

Messrs. G. H. Nichols & Co. advise that the production of ore from their Albert mines, Capelton, during the

year ended 31st December, 1889, amounted to 36,000 tons, of which about 25,000 tons were exported,

The Brompton Lake Asbestos Company gives notice of application for Letters Patent of incorporation. The chief place of business of the new company is to be at Quebec; capital \$60,000, in 600 \$100 shares. The names of the applicants are:—E. B. Greenshields, Montreal; Sir Donald Smith, of Montreal; Frederick Stancliffe, Montreal; R. W. Hudson, Bankhall, Liverpool, Eng.; E. J. Hale, commission merchant; Elliot E. Webb, William Cook, Archibald Hay Cook, advocate; G. H. Thomson, Andrew Thomson, president of the Union Bank, Quebec, all of Quebec. The said E. B. Greenshields, Andrew Thomson, A. H. Cook, E. J. Hale, G. H. Thomson to be the first and provisional directors of the company.

Ontario.

A member of the Local Legislature writes to us as follows: "It is expected that the report of the Mining Commission will be ready for distribution during the present session. The Commissioner of Crown Lands has a couple of Bills to amend the mining laws, but neither have as yet been introduced. He tells me that he has some provisions to prevent the taking up by one person for speculative purposes of large areas, but the royalty business he does not feel so sure about."

Reports from the County of Hastings point to a revival of the mining operations in that district. The company that recently purchased the Bull actinolite property is now working with satisfactory results. Rumours are also current that other mines which have long been idle will shortly be worked again by a wealthy syndicate.

Sudbury District.

Dr. E. D. Peters, the well known American metallurgist who has been so eminently successful in the management of the extensive mines and works of the Canadian Copper Co., has resigned to superintend the construction of the new works of the Westinghouse Air Brake Co., Southern Arizona. Dr. Peters is succeeded by Mr. Woodbury, of the celebrated Calumet and Hecla mines, Mich.

At the mines, work goes along very much as usual. No. 2 furnace has shut down for a few days in order to admit some repairs, and No. 1 is now in good running order. The company is at present erecting a school house at Copper Cliff. It is estimated that about 3,500 tons of matte is now in the stock yards.

Mr. Merry, representing the mines operated by Messrs. Vivian & Sons, states that some 90 men are now working in his pits making preparations for an active season's work.

Port Arthur District.

The past month has been unusually encouraging. The continued good fortune accompanying the development of the Beaver mine at great depths by means of the diamond drill, as well as developments at places where the workings are in the cherty formation underlying the Animikie black slates, has demonstrated the fact that this lower formation carries silver veins of great richness. Some of the assays are reported as going about \$700 to the ton. This fact will undoubtedly be the cause of many more prospects being opened up, as numerous minor investors have been holding back pending the result of the operations of others.

In addition to the prosperous condition of the Beaver, Badger, Elgin, Shuniah Weachu and West End mines, another couple of silver prospects are coming fast to the front.

The vein on the "Murillo" property about ten miles west of Port Arthur has widened, and is now producing first-class ore in quantity. This prospect is owned by an English company, who are equipping the mine with all the machinery necessary for rapid and economical working. An English assayer is resident at the mine.

The next aspirant for honours is the "Star" prospect on the west boundary of the township of Strange, about 2½ miles north of Whitefish Lake. There is a large group of promising veins in this locality, and the reported extraordinary richness of the first shaft is attracting much attention and numerous enquiries for lands in the neighbourhood.

The iron land excitement still continues. It is not known what success the engineering party exploring for a branch of the Canadian Pacific railway line to the Atikokan iron has met with. Those best competent to judge predict a very easy route for over four-fifths of the distance.

The iron king of the district, Mr. R. R. Paulson, is building a depot for supplies, outfit, etc., at the east end of Arrow Lake to facilitate the development of the immense iron tract which he controls. It is expected that the P. A. D. & W. railway will reach these lands before next fall, as the contractors are displaying unusual energy. The bridge across the Kaministiquia river is just approaching completion, and for about twenty-five miles further the line is dotted with camps of men taking out ties and timbers.

It is reported that the old reliable Rabbit Mountain mine has been bonded to a syndicate, who have guaranteed to spend \$10,000 in a test, and will purchase if development proves favourable.

The Board of Trade at its last meeting discussed the "Torrens" land title system, Hunter's Island lands and local crown lands agencies in mining districts, and appointed experienced men to co-operate with the Bar association in memorializing the Ontario Government to make certain changes highly desirable in outlying mining districts. In the "Torrens" system it would appear that more than four owners cannot be entered against one piece of land. Now when valuable mining discoveries are made it is not unusual to hear of sales of even a fiftieth part, and most people, especially Americans, desire to have a tangible, saleable document, which at present cannot be obtained. The Hunter's Island question is a most annoying one for those who purchased in good faith years ago, and have not received their titles. The want of a title has doubtless caused much loss and worry to the original purchaser, and the Government should take immediate steps to have the ground carefully inspected in order that patents may issue for lands which are in no way valuable for timber. Mining lands open for sale ought to be placed in full charge of the local Crown Lands Agent. It is extremely annoying to have strangers—intending purchasers and explorers—asking day after day what lands are available, and to hear the answer "you will have to write down to Toronto and find out for yourself, and you may get an answer in a week." What is there to prevent the Government placing all saleable lands in the hands of its local agent who is acting under their instructions and can at an hour's notice seek advice from headquarters when in doubt. No money need go into their hands but should be deposited in the bank to the credit of the Government, and a copy of the deposit receipt given to the Crown Lands Agent. This would obviate any possible objections, and any one on arriving here and starting out for the mining region, could go out with a full understanding of what he was about. An explorer or intending purchaser would not be wasting time and money on land which might be already the property of another, and the waste of a week in corresponding with the department would be obviated.

The Star has the following comment on the West Beaver property, now on the English Market: "We observe that a fresh attempt is being made to induce the public on this side to purchase what is known as the West Beaver Silver Mine. We are informed that the mine is 'extremely valuable,' and the Beaver mine is being trotted out as being 'in close proximity,' and as having yielded £60,000 in less than two years. No one who knows the facts will wish to dispute that the Beaver is fairly valuable, but there is nothing to show that the West Beaver, or the properties now offered to the public are of value. There is no record of profitable bullion. The Porcupine was opened some years ago, but we have yet to learn that it was done so at a profit. The truth is the promoters of the syndicate are trying to dispose of the West Beaver and other properties on the strength of the Beaver—the one mine which has paid for working."

Now we know little about the merits of the West Beaver, and can therefore say nothing in its favour or against it; but we most emphatically repudiate the statement that "the Beaver is the one mine that has paid for working." The Star is apparently very ignorant of the Port Arthur district, and should make itself thoroughly acquainted with the facts before making itself ridiculous by any such untruthful assertion.

The January shipments from the Badger amounted to \$15,000. Its superintendent at present is engaged principally in developing new ground, very little stoping being done.

The Shuniah Weachu Mining Company has driven a drift through an ore body 125 foot long, west from No. 3 shaft. It is all shipping ore, averaging 450 ounces to the ton. A block of ore has been opened up in No. 4 shaft east and west, between the first and second levels, 60 feet deep by 90 feet long. Stoping on both of these ore bodies will be commenced in a few days. The stock of this company is steadily going up in the English market, and the developments at the mine appear to warrant it.

Rat Portage District.

Messrs. Matheson & Chaffee are preparing to resume operations on the Winnipeg Consolidated. The present depth of the shaft is 125 feet.

The new English company formed by Messrs. Taylor Sons to work the Sultana is to commence operations in the spring.

Mr. Oliver Dounais is pushing the development of his claim at Clearwater Bay. He has two shafts down some 100 feet, and has begun cross-cutting.

Man. & N. W. T.

Application for Letters Patent under the "Companies Act" is made on behalf of the Crowfoot Coal Company, Limited; capital stock \$25,000, in \$100 shares. The names of the applicants are:—William A. Allan, Ottawa; Henry LeJeune, Regina; H. E. Secretan, Civil Engineer; A. F. Eden, Land Commissioner, and Heber Archibald, barrister-at-law, the last three named applicants being of Winnipeg. The said William A. Allen, A. F. Eden and Heber Archibald are to be the first or provisional directors of the company.

British Columbia.

It is rumored that the Island Mountain Company, Cariboo District, will commence working again in the spring. A proposition has been made by Mr. C. D. Rand, of Vancouver, on behalf of some British capitalists, to the owners here of some 23 locations, for the purpose of forming a joint stock company, with a capital of \$300,000, and to commence work by the first of May. All the owners here have signed their consent. It is generally considered that capital is all that is required to make this place one of the richest gold mining centres in the world. If the above-named companies go to work, it will make a change for the better for the whole Province of British Columbia, which is universally acknowledged to be a country possessed of vast mineral resources, awaiting development.

The Nason, of Antler Creek, has again shut down, the pumps not being able to manage the water, and the claim still remains unprospected. The Barker Co., of Williams Creek, is at work running for a spot supposed to be left from old times.

Everything in the mining line looks better and more encouraging at this moment than has been the case in many years back. We are all hopeful and in the best of spirits. The cold weather has again set in, the thermometer registering at the time of writing below zero. Yet it is dry and bracing.

A proposal is on foot to form a syndicate with \$300,000 to develop the property of the B.C. Milling & Mining Co. Messrs. John Taylor & Sons, London, Eng., are interested in the venture.

The four mines at Field, which were part of the assets of the defunct British Columbia Smelting Co., were sold at public auction a few days ago by Sheriff Bedgrave, and were bought in by the Vancouver Syndicate for about \$7,500. These mines, and property in connection, cost the old company in the neighborhood of \$80,000. Mr. Ceperley has gone up to Field as the representative of the Vancouver Syndicate.

Application was made some time ago by the Government of British Columbia for a remission of customs duties on certain mining machinery imported by the Government, and entered at the port of Vancouver. The reply of the Department was that a remission would be granted if it could be shown that similar machinery was not being manufactured in Canada. Among the articles imported was a No. 2 Kendal quartz mill, which is made only in the United States; but as the British Columbia Government has failed to place a distinct value on the mill, and the invoice being a bulk one for mill, engine, boiler, pan, settler, etc., it was impossible to arrive at the amount of duty to be remitted, and accordingly the application has been refused.

We regret very much to have to record the complete destruction by fire, on the 4th inst., of the new Reduction works at Barkerville; loss \$25,000. These works were established in the centre of the Cariboo mining district by the Local Government last summer for the purpose of testing British Columbia ores. They were completed in November, and the operations were very successful. Their destruction by fire is a severe blow to mining prospects, which were looking very bright, owing to the interest taken in the development by English capitalists. It is thought the Government will re-build at once.

D. W. A. Hendryx, manager of the Kootenay Mining and Smelting Company, writes that his brother is in negotiation for the purchase of the Silver King, Kootenay, Bonanza and American Flag mines, the property of the Hall Bros. and others, and located on Toad Mountain, near Nelson.

The Phosphate Trust.

The Phosphate Trust, to which a reference has been made in these columns, has, we understand, been withdrawn in its original form, and it is now said that the proposal will be submitted on a more modified basis. Below we publish extracts from some of the English financial papers commenting upon the Trust and also communications from readers of the REVIEW upon the subject:

A gentleman prominent in the trade writes:—"On Tuesday Mr. _____ told me that our Ottawa County lands are included in the scheme. I gave an offer of these lands to a Montreal lawyer last February for four months, and from what Mr. _____ tells me I infer that his agents must have taken this liberty, although the matter was wholly withdrawn from them last June. I should like very much to see what they have done, and would like to put my people on their track. It is consummate cheek; but nothing surprises me now on the part of a London company promoter.

The *Star* says: "Our well informed contemporary, the CANADIAN MINING REVIEW has received a very remarkable document which purports to be the prospectus of a new concern on the eve of being submitted to the English public under the pretentious title of the Phosphate Trust (Limited.) Our contemporary warns the public against having anything to do with the venture. We repeat the warning. It is not the only one of its kind coming from the same quarter.

The *Financial Times* quotes the REVIEW's article *verbatim*.

"A well-known firm of English chemical brokers and phosphate merchants writes: "We have read and are very much in accord with the remarks in the December number of your REVIEW about the late proposed syndicate for the purchase of Canadian phosphate lands. If any sales had really been carried through on the basis of such figures, the industry could only have been discredited. Well selected lands have a solid value, which we expect will improve."

Another gentleman, well known in London, and intimately associated with the trade, differs from our views in the following terms: "I read with great interest your very able article on 'Phosphates' in the December number, in which you advocate large working capital, the want of which has always been the drawback of Canadian phosphate mining. You further state that large operations are essential to success, and that you hope to see soon a large amount of capital put into the working of these mines. With all this I thoroughly agree. Turning over a few pages, however, I see you go for the proposed Trust. I take it from the opening comments that you had no time to study the "private and confidential" document put before you, or you would have noticed that the essence of the scheme was to get a large sum of money to work the Canadian phosphate deposits, and, further, that 'every property will be separately examined and selected by the company's experts, etc., before being acquired.' Now, the way this scheme has come about was as follows: Dozens of properties were being hawked round in all quarters, and had, say, ten of them been floated, the capital would have most probably exceeded that of the proposed Trust, and there would have been attempts to float some twenty or so more. Now, instead of this having taken place, which would have been a misfortune to the industry, increasing competition in all ways, in the buying of provisions, machinery, etc., and on the other hand, in the selling of the ore, the present scheme seeks to combine a very large number of properties and work them all as one undertaking. The company does not bind itself to acquire the properties offered to it, nor does it follow, as your comments suggest, that, because a property is unknown to you, or to me, or to C, D or E, it is *ipso facto* worthless. Of course the final success of the scheme depends on the management, but I think the idea is a sound one, and I very much regret that you criticised our rough advanced prospectus, marked "private and confidential," in a manner apparently very hurried. Should this scheme not go through, I think it will throw back Canadian phosphate again and make it next to impossible to get any capital put into the industry."

A Montreal firm extensively interested in the mines, and the largest exporters of the mineral last year, have expressed their views in the following terms:

"In the first place, the name of the company, as a "Phosphate Trust," would certainly tend to deceive the public, as a Phosphate "Trust" would intimate that the promoters held at least the "balance of power" in the Canadian phosphate business, whilst if you look into the properties they propose to hold, you will hardly find one of any great importance, and all the actual phosphate producing properties are in other hands. Leaving aside the right of the "Trust" to bring forward a great many properties without the actual consent of the owners, we consider the scheme as by far too gigantic, and we doubt whether anybody with an intimate knowledge of the Canadian phosphate deposits would wish to invest money therein. The taxes on the nominal capital stock of such a company would in themselves constitute a good dividend for any reasonable company.

Curious Occurrence of Lightning in a Scotch Colliery.

Drumsmudden colliery is near to the Ayr and Muirkirk railway, 1½ miles above Drongan station, and consists of two pits, each 200 fathoms deep, and forty yards apart, having a large pumping engine and coupled winding engines, both under the one roof, and built on a stone seat. The height of the chimney is 120 feet, and it is fitted with a lightning conductor, made of copper ¾ inch diameter, about 5 feet long, with copper wire ¾ in. diameter attached. The pumping pit is 10 yards from the boiler stalk, and has a pithead frame 40 feet high, over which two pulleys are fixed, guiding the haulage ropes to the pit bottom. There is also a Guibal exhaust fan connected with this pit. On Wednesday morning, 21st November, 1888, a thunderstorm of unusual and alarming severity burst overhead, and a flash took place at a time when the ascending cage was within 20 yards from the surface. The engine man was made powerless by the electricity, but, fortunately, had the presence of mind to throw himself on the brake lever, and stop the engine. When he recovered, he felt pained in the arms, neck and shoulders. Probably the fluid ran along the beam of the pumping engine, then down the steam pipes which are connected to the winding engine, and along which it would find its way to the throttle valve handle. A heavy charge descended the conductor on the stalk uplifting the earth and ashes at the bottom, but otherwise doing no damage. The pit bottomer of the winding pit heard a loud, cracking noise, and saw a clear bluish flame on the crowns on the roof at the pumping pit. The signal boy was terrified, seeing fire running and leaping between the haulage rope and the rails. The chainman was engaged at the time taking down the empty cage, and was sitting on the last hutch, with his feet on the chain. When about 40 yards down he felt a shock through his legs, and was pitched down on to the road, and lay stunned for a time. Twenty yards beyond the foot of the slope dock, or 320 yards from the pumping pit bottom, and 240 fathoms from the surface, two boys were standing, one having his feet on the rails and his head almost touching the electric bell wires. He got a shock turning him round about, and both were terrified by seeing fire flying between the rails and wire. They ran off to find the oversman. When they found him they were white with fear, and said fire was flying all through the pit. Fortunately no serious injury was done to any of the workmen or property by the above strange occurrence.

Refining Gold at the Australian Mints.—The process employed in refining gold at the Australian Mints, according to the London *Mining Journal*, is different from that resorted to at the British Mint. It seems in Australia that when gold is melted in the crucibles, which are first heated to a dead-red, borax is placed upon the metal in a melted state, then chlorine gas is passed through a pipe, which is gradually depressed until it reaches the bottom, and when the compressor is relaxed, so that the gas bubbles up through the gold in its molten state, but without causing the projection of any globules. Hydrochloric acid from time to time is also introduced into the generator, and by this means a rapid evolution of chlorine is kept up. When the gas first passes into the gold, fumes escape from the holes in the crucibles. These consist only of the chlorides of inferior metals that are attached to the valuable ones, none of the chloride of silver escaping. When any silver remains in the gold nearly the whole of the chlorine continues to be absorbed; afterwards, when the refining is nearly completed fumes of a darker colour make their appearance, and the end of the operation is indicated by the flame or luminous vapour appearing first of a bright yellow colour, and gradually growing into a deep, reddish brown. The value of chlorine in gold refining is certainly not a novelty, but it is claimed it has not before been put into practical use, though its action on gold has been no secret to chemists, for it does not mix with it at a red heat.

180,000 Egyptian Cats: Sale of a Curious Cargo of Very Ancient Manure.

Messrs. Leventon & Co., of Liverpool, received the other day a consignment of 19½ tons of embalmed cats from Beni Hassan, Central Egypt. In this parcel are the remains of about 180,000 cats. Specimens of these have been placed in the Liverpool Museum. Messrs. Leventon & Co. are about to employ them as manure. A correspondent writes: "Last week a most interesting auction was held, in a large Liverpool broker's office—namely, twenty tons of cats. To understand what they were, it is necessary to know something of ancient history. It is well known that many nations, in prehistoric times, adopted the religion of totemism, believing that there was a relationship between man and the bird, beast or reptile which he particularly fancied. The totem of a section of the ancient Egyptians was the cat, hence when a cat died it was gaily buried with all honors—being embalmed, sometimes decorated, and, in short, had as much attention paid as any human being. It had been long suspected that a cat cemetery existed on the east bank of the Nile, and in the autumn of 1889 a lucky Egyptian found this ancient burial ground at Beni Hassan, about 100 miles from Cairo. Laborers were soon at work, and dug out hundreds of thousands of cats. Some were quickly sold to local farmers, and the bigger lots found their way to an Alexandrian merchant—then, by the steamers Pharos and Thebes, to Liverpool, where they were knocked down at £3 13s 9d per ton to a local fertiliser merchant. The auction was only known to the 'trade,' but even the 'bone' buyers looked nervously at the large samples exposed, the genial broker knocking the lot down with one of the pussies' heads for a hammer.

Hoisting Machinery.*

(By William Giliie.)

In this day of progress and improvement, one is struck with the rapid developments that have taken place, and the new improvements that have been introduced for the purpose of raising the mineral from the mines. A good many steps of improvement intervene between the crude methods of slowly winding up small quantities of coal, three centuries ago, and the rapid, well-disciplined extraction of the present day. The ingenuity of man has always been equal to the wants and requirements of his time; and in no other way has his genius been more tasked, than in that of devising methods for raising the mineral from the mines.

Our subject brings to our attention the names of such men as Savoury, Newcomen and Watt. In 1698 Thomas Savoury invented an engine to pump water from the mines, for which a patent was granted, it being known as the "Miners' Friend." The steam was used to produce a vacuum, and the pressure of the atmosphere was depended upon to raise the water in the pumps.

Thomas Newcomen, about the same time, was busily engaged upon his atmospheric engine, and the results though rude and imperfect, were far in advance of anything of his time. The atmospheric engine grew rapidly in favour, and was extensively used by mine-owners, who did not like Savoury's engine. Newcomen's was an atmospheric engine because it depended on the pressure of the atmosphere to perform the downward stroke, and to do the principal part of the work. Its great disadvantage was, that the cylinder was required to be hot at one time and cold at another, thus the fresh steam entered a cold, wet cylinder, thereby losing three-fourths of its power. This wasteful expenditure of steam continued until James Watt, the renowned engineer, having a model of the atmospheric engine to repair, saw the great defect of the engine, and at once went to work to solve the problem of a separate condenser. In this he succeeded, and to him belongs the honour of having invented all the leading principles of the steam engine as we have it now.

Mr. C. M. Percy, in his Mechanical Engineering of Collieries, lays down the following conditions, which every good winding-engine should fulfil: They should be strong, durable, and comparatively light in construction, with more power than is necessary for the maximum amount of work to be done, easy to handle and reverse, quick to start and stop, and capable of reaching their highest rate of speed in a short time; also, they should work in pairs and be so proportioned that in case of a break-down with one engine, the other would be capable of raising the load, although slowly.

Modern hoisting-engines possess all of these requirements, except economy in the well-known horizontal, direct-acting, high-pressure, non-condensing engine.

This question of economy did not matter so much when mining was in its infancy, when shafts were shallow and the products of the mines had to be conveyed but a short distance; but with the great and rapid development of the mining industry, and the fierce rivalry and competition that is now existing, economy is one of the most important points to be considered. Engines work-

ing without expansion and without condensation, are of the most extravagant class, for with non-condensation one-third of the absolute pressure exercises no effective pressure at all, and with non-expansion more steam is required for the same amount of work, than if the engine worked expansively. For, when steam is admitted to the cylinder at a high-pressure the piston attains a great initial velocity, and before the stroke is completed the steam is cut off, the rest of the stroke being completed by the elastic force of the steam already in the cylinder. The steam expands as the piston moves forward, and consequently, its pressure is in conformity with the law of Mariotte's and Boyle, until the piston is at the end of the stroke, thus a great saving in steam is effected, and, as a consequence, a smaller amount of coal is required, and a maximum amount of work is obtained from a minimum amount of steam. If we wish to find the pressure of steam at any point in the stroke, when the engine is working by expansion, and an indicator diagram cannot be taken, we can find it by the following rule:—

Let us suppose that steam is admitted into a cylinder 6' long, at 60 lbs. pressure, and the steam is cut off when 2' of the stroke has been performed.

The pressure during 1st foot of stroke is.....	60 lbs.
The pressure during 2d foot of stroke is.....	60 lbs.
The pressure during 3d foot of stroke is.....	$2/3 \times 60 = 40$ lbs.
The pressure during 4th foot of stroke is.....	$2/4 \times 60 = 30$ lbs.
The pressure during 5th foot of stroke is.....	$2/5 \times 60 = 24$ lbs.
The pressure during 6th foot of stroke is.....	$2/6 \times 60 = 20$ lbs.

Total pressure..... 234 lbs.

Dividing this total pressure, 234 lbs., by 6, the number of ordinates taken, gives an average pressure in the cylinder of 39 lbs., the terminal pressure being 20 lbs.

The great difficulty in applying expansion-gear to hoisting-engines is, that we want full power all through the stroke, and during the changing at the top and bottom of the shaft. Little has been done toward making our winding-engines work by expansion, and while this economic principle has been applied to all other classes of engines, scarcely one per cent. of winding-engines have any such arrangement. We hope that mechanical engineers will soon see the utility of applying some automatic arrangement, making the hoisting-engine as economical as that of any other class.

The work performed by a hoisting-engine is the lbs. of coal raised through any given height, *i. e.*, if 2 tons are lifted from a shaft 600' deep in one minute, the useful work will be equal to $2 \times 2,000 \times 600 = 2,400,000$ units of work, or foot lbs., and $2,400,000 \div 33,000 = 72.73$ horse-power. This work is termed the useful horse-power, without allowing for friction of machinery, etc. Work may be defined as the combination of force and motion. The unit of work is one pound lifted a distance of one foot. While power may be defined as the speed of doing work, the unit of power is a force of one pound put through a space of one foot in one minute. A horse-power is equal to 33,000 units of power. The actual or indicated horse-power is the amount of power that is being exerted by the engine, and includes all resistances such as the moving parts of the engine. The indicated horse-power is found by multiplying the average effective-pressure by the area of the cylinder in square inches, and this by the mean speed of the piston in feet per minute, which gives the units of power; and this divided by 33,000 will give the horse-power of the engine. To illustrate, suppose we have an engine with an effective-pressure of 40 lbs. per square inch, acting on a cylinder 30" in diameter, the speed of piston being 200' per minute. The units of power will be $30 \times 30'' \times .7854 = 706.86''$ area of cylinder, and this, multiplied by the pressure, which is 40 lbs., and the result multiplied by the speed of the piston, 200' per minute, will give the units of power or 5,654,880, and this divided by 33,000 equals 171.36, the indicated horse-power. The average effective-pressure is the difference of pressure between the fresh steam that is entering to force the piston down, and the exhaust-steam that has a tendency to prevent the piston from being driven down. Mr. Percy, in solving questions like the above, allows 50% for resistances, and as the work to be done by a hoisting-engine is not continuous, it is best to have a sufficient margin of power under all conditions.

The modulus of an engine is that fraction, which expresses the ratio of the work done to the power applied. If the work applied to an engine equals 60 horse-power and the engineer only delivers 40 horse-power, then $4/6 = 2/3$ modulus, $1/3$ of the power applied is lost in friction in the moving parts of the machine.

We can ascertain the pressure of steam, and the diameter of the hoisting-drum, when the load is specified, the time of a winding given, with the length of stroke and area of cylinder. For example: If the diameter of

a cylinder is 20", the speed of the piston 360 feet per minute, length of stroke 5 feet, and the time of hoisting from a shaft 720 feet deep, is 40 seconds.

Then, $\frac{360 \times 40}{60} = 240$ feet distance travelled by the

piston in 40 seconds of time, and as the piston makes a forward and backward stroke at each revolution of the drum, the distance travelled in one revolution would be 10 feet. The revolutions a drum would make during a winding would be 240 divided by 10 or 24, and as the shaft is 720 feet deep, $720 \div 24 = 30$ feet circumference of drum, and $30 \div 3.1416 = 9.5$ feet the diameter of drum. If 2 tons or 4,000 lbs. are to be lifted in the load, then $4,000 \times 30 = 120,000$ lbs. the moments that are acting on the drum, and as the diameter of the cylinder is 20", the area will be $20^2 \times .7854 = 314''$ area of cylinder, this multiplied by 10 feet, the distance travelled by the piston during one revolution of the drum, equals 3140. The number of pounds that are acting on the drum $120,000 \div 3,140 = 38$ lbs. pressure of steam that must be applied to the cylinder per square inch, adding 17 lbs. for resistances the total pressure would be 55 lbs. per square inch.

In connection with hoisting-engines various methods have been adopted for the purpose of counterbalancing the load, which I will briefly notice here. The chain and staple are being replaced by more modern methods. The incline counterbalance is used to some extent, the counterbalance force may be found by multiplying the weight of the counterbalance by the height of the incline and dividing the result by the length of the incline. The tail-rope counterbalance consists of a rope the same size as the hoisting-rope passed around a sheave at the bottom of the shaft, the pulley being free to move upwards or downwards between guides. The Koepe system does away with the winding-drum and substitutes a sheave connected with the engine. There is a return sheave placed at the bottom of the shaft. Two ropes are used, one connected with the tops of the cages passing around the sheave that is used instead of a drum. The other is attached to the bottom of the cages passing around the sheave in the sump. The advantage claimed for this system is, that it gives a perfect counterbalance in all parts of the winding; smaller engines are required as well as engine-rooms and no drum is necessary.

The conical drum is fast coming into favor, as the load is uniform throughout the hoisting, the full cage at the bottom of the shaft being attached to the small diameter of the drum, and the empty cage at the top of the shaft to the large diameter, so that the principle of the drum is, that a heavy weight, when acting on the short arm of the lever, is equal to a lighter weight applied on the long arm.

Everything in connection with a hoisting-engine should be kept in good order, so that the friction of the machine will be reduced as much as possible, and the guides in the shafts should be kept well greased, thus increasing the amount of work.

The Mining Industries of Eastern Quebec.

(By R. W. Ellis, L.L.D., Geological Survey of Canada.)

That portion of Quebec to which the few remarks I propose to make are more particularly intended to apply, viz., the Eastern Townships, has long been known for its mineral wealth, and has enjoyed a reputation for mining enterprises, second probably to no other part of Canada. Capital has been invested in large amounts at various points, some of which has yielded a handsome return to the investors, while in other cases the inevitable results of rash and foolish speculation have followed, much good money has been sent after bad, and the principal result has been a dearly bought experience. This is a peculiarity which, I take it, is not entirely confined to Canada, and it can safely be said that this portion of Quebec does present to-day more advantageous openings for the investment of capital, wisely and skilfully applied, probably, than at any stage of its past history. It may be said, generally speaking that these industries are at present confined to not more than half a dozen lines, among which may be enumerated, in the order of their present value, copper, asbestos, roofing and other slates, gold, and the manufacture of lime. Silver, chromic-iron, antimony, nickel and the various ores of iron, have also been worked to some extent.

The relations between the geological structure of any country and its mineral wealth are very close and of the highest importance, but while, as officers of the Geological Survey, possibly the greater part of our energies have been devoted to the unravelling of the complicated problems of structure which have from time to time been presented in regard to the age of the several rock formations in Canada, a certain amount of attention has always been paid to the careful study of the economic aspect of the question. Some of the most intricate problems of geological structure have been encountered in that section of Quebec east of the St. Lawrence River,

*Read at the Ottawa meeting of the American Institute of Mining Engineers.

upon the elucidation of which much labor has been expended for more than forty years. It is no great cause of wonder, therefore, that changes of opinion have taken place concerning the age of certain portions, as new light has been presented by successive years of study.

To better understand the positions of the several mineral-bearing zones of eastern Quebec, it may briefly be stated that the rocks of that section are divisible into three grand classes, viz.: the crystalline schists, which occur in the form of extended anticlinal ridges, the slates and sandstones, often highly quartzose, which flank these ridges on either side, and the areas of volcanic rocks, diorites, granites, serpentines, etc., often of large extent, with which both the preceding divisions are intimately associated. As to their age, the views of those who have more recently studied these rocks differ widely from those expressed in the earlier publications of the Geological Survey. Instead of now regarding the great ridges of crystalline schists as altered Middle or Lower Silurian sediments, it has been very conclusively established, both from palæontological and stratigraphical evidence, that they are much older, being, in fact, for the most part, at least, pre-Cambrian, by which is meant that they underlie the lowest known fossiliferous Cambrian zone. In the same way much of what was forty years ago regarded as Upper Silurian, in which was included a very large area in the southeastern portion of the province, has been found to really belong to the Cambrian and Cambro-Silurian systems. In this way a connection has been established with well-recognized mineral-bearing zones of other provinces and countries, in places where formerly a marked discrepancy in the relations of the rock formations was apparently presented.

As regards the geological position of the principal mineral-deposits of this section, we now find that the ores of copper, where found in workable quantity, are very largely confined to the areas of the crystalline or older schists. Deposits of considerable extent, it is true, are found at other horizons, more especially in connection with masses of dioritic rocks, but as a rule these have not, in so far as yet worked, proved very continuous or of marked value.

On the other hand, the asbestos, or, more properly speaking, chrysotile, occurs in serpentine rocks which are for the most part associated with the Cambrian slates and quartzose sandstones, although serpentinous rocks are found along with the schists at certain points. The roofing slates, at one time regarded as of Upper Silurian age, are also now held to form part of the great Cambrian series, as is also the case, I believe, with the slates of the Welsh quarries, while the gold, the mining of which has, however, as yet been entirely confined to the alluvial deposits, or to the gravels of old river channels, is also without doubt in great part derived from quartz-veins in slates of the same Cambrian age. The statement as to the age of this last is important, from the fact that these slates were for many years regarded also as of Upper Silurian age, and have been so described in the *Geology of Canada*, 1863, in which the earliest views of the Survey as to the structure of this region, viz., those of 1847, are simply repeated. The resemblance of these gold-bearing slates, which are especially developed in the Chaudière and Ditton areas, to those of the Cambrian gold series of Nova Scotia was, however, pointed out many years ago, and referred to by Logan, Selwyn, Hunt and others.

The copper-deposits in Eastern Quebec, operated for many years, and still worked, are those known as the Capelton mines. They are situated about seven miles south of Sherbrooke, the principal city of Quebec, east of the St. Lawrence, and are located on the eastern flank of a ridge of talcose, chloritic and micaceous schists, which in this locality form a somewhat narrow belt, some miles in extent. It has, in the late reports, been described as the second or Sherbrooke anticlinal. Throughout this belt of schists, with which are associated considerable masses of greenstone or dioritic rock, deposits or veins of the sulphuret or copper pyrites are numerous; and a few years ago, at the time of the great copper boom, a number of mines were opened in this section. While at many of these places the veins promised well at the time, the gradual decline in the price of copper, and the generally low grade of the ore, rarely yielding more than four to seven per cent., resulted in a gradual suspension of most of these enterprises. At the present time, while prospecting is again being resumed with some vigor, mining is confined almost entirely to two locations at Capelton, viz., the Nichols and the Eustis mines. The continued success of these workings has been due to several causes. One, probably, is the great size of the vein, which is stated to reach, in places, a thickness of 45 to 60 feet, and has been worked to a depth of over 1,500 feet. A chief cause, however, is that these ores are rich in sulphur, the bulk of the raw ore being used, first of all, for the manufacture of sulphuric acid, the residue being subsequently utilized for the extraction of the copper. A certain percentage of silver in the ore is also, doubtless, a very important factor as regards their present successful working, the amount at times ranging as high as 10 to 12 ounces to the ton, and probably even

higher, though probably 3 to 4 ounces represent the average.

The output of ore from these mines is large, ranging from 30,000 to 40,000 tons per year for each. While the greater part of this product is shipped in the raw state, smelting works, recently repaired by the Eustis Company, now dispose of over 1,000 tons per month, which is reduced to matte on the spot. At the Nichols mine adjoining, a correspondingly large amount is used for the manufacture of acid. A portion of the latter, with the phosphate of the Ottawa Valley, is converted into superphosphate of lime. This industry, in the not distant future, bids fair to assume very large proportions. At the smelting works of the Eustis mine, the large percentage of sulphur is, at present, burned off and lost.

The larger lodes of copper-ore at these places appear to be mostly in the form of the yellow sulphuret or chalcopryrite, with which is found a very large percentage of iron pyrite. These have their largest development in the townships of Bolton, Hatley and Ascot, though in some of the mines formerly worked, for instance, in the old Huntington mine, a large proportion of the pyrite is the magnetic variety or pyrrhotite. The rocks associated with these ores are, for the most part, schists of various kinds, with diorites and sometimes serpentine. Variegated and vitreous ores are also found, in considerable quantity, in the more westerly belt of Acton, Halifax and Leeds, where they have been worked to a very considerable extent. These are frequently associated with nacreous or talcose schists, as at the Harvey Hill, or with limestones, slates and trappean rocks, as at Acton. At both of these localities very extensive workings have been carried on, and a large amount of very rich ore has been extracted. The mines of Harvey Hill are again being operated under a new management, the new company being styled the Excelsior Mining Company.

A very full description of the character and distribution of the various copper deposits of the eastern townships is given in the latter portion of the *Geology of Canada*, 1863, pp. 709-736, and supplemented in the general report, 1866, pp. 34-44. From these it will be seen that many localities exist in this area other than those just mentioned, which are really deserving of careful attention at the present time as a source of supply for copper, both for smelting purposes and for the manufacture of sulphuric acid. The great and present value, however, of the copper deposits above indicated is more particularly due to the fact that, in the more easterly or Ascot belt, the veins of pyrites which are without doubt in many places, of great extent, contain a very large percentage of sulphur, rivaling, in this respect, most of those yet known to occur in the copper-bearing belts of the Atlantic portion of the adjoining States. Their great importance as a source of supply for ores suitable for the manufacture of acid is just now beginning to be fully realized. It is, presumably not too much to say, that within the next five or ten years, great developments in this respect will take place throughout this section.

In the belt of crystalline schists, both to the north and south of Sherbrooke, recent developments indicate that possibly the heaviest and richest ore veins have not yet been reached; and, in view of the new conditions which have arisen, much of this district would repay careful prospecting. Further to the north again, in Ascot and Garthby, new developments are at present being made that promise fine returns, and bid fair to equal, if indeed they do not surpass, the well-known mines of Capelton.

The asbestos industry, although of comparatively recent date, has since its inception in 1878, rapidly increased in importance, and bids fair to speedily become the leading mining industry of the province. While the occurrence of fibrous serpentine or chrysotile in the Townships has been known for many years, and has been mentioned in the earlier reports of the Geological Survey, its true economic importance remained unrecognized, and it was not until the opening of the Quebec Central Railway across the serpentine belt of Thetford and Coleraine that any importance was attached to this peculiar mineral. Although occurring to some extent with the serpentines of the Laurentian district, north of the Ottawa River, its direction in this extent has not as yet been sufficiently studied to warrant a clear expression of opinion as to the actual value of these areas, and the production of asbestos or chrysotile is as yet entirely confined in Canada to the Eastern Townships, and to the serpentine rocks which are at present regarded as forming a part of the volcanic belt of the lower Cambrian system of Quebec.

This mineral differs entirely from the actinolite of central Ontario, and the asbestos of the Township also presents several points of difference when contrasted with that from the Laurentian district. This is seen in the greater softness, silkiness and tenacity of the fibre of much of the former, a property which gives it great value for spinning and for its working into the finer variety of textures to which it is now so extensively applied.

The stratified rocks associated with the serpentines of the townships in which the workable asbestos occurs are

generally slates of various colours, black, gray, green and purple, with occasionally conglomerate and sandstones, which are often hard and highly quartzose. These are frequently associated with diorites, which often form large mountain masses as at Orford, Ham, Broughton and other points, and which in texture are generally fine-grained, both massive and concretionary, and in colour, range through shades of green to brown.

In the province of Quebec the serpentines extend for many miles, in a series of interrupted outcrops from the boundary of Vermont, nearly to the extremity of the Gaspé peninsula. At several places, notably at Thetford and Coleraine, and in the Shickshock mountain-range of Gaspé it presents a large development. It is sometimes found in bands of a few yards in breadth, apparently interstratified with the slates and sandstones, and sometimes with diorites, in conjunction with which it forms knoll-like hills or elongated ridges of considerable extent. In many places a gradual transition from the diorites to the serpentines can be observed, and it seems very conclusively settled, both from observation in the field on a large scale, and from analyses in the laboratory of the Survey, that much of the serpentine is an alteration product from dioritic rocks, rich in olivine or some allied mineral. While generally massive, the rock has at times a slaty structure, and in many localities the mass is much shattered and broken. More especially is this latter feature noticeable in quarries or areas where dykes of diorite but more generally of a whitish granite or granulate, cut the serpentine. This latter rock, which has generally a grayish or grayish-white color, consists for the most part of orthoclase felspar and quartz, but at times contains an admixture of mica, classing with a true granite. Whatever may be the age of these whitish dykes, which frequently become masses of considerable extent, they certainly are newer than the serpentines, which they traverse, as is evidenced clearly by the alteration and shattering of the mass traversed along the contact. The view is held by many of those engaged in mining asbestos, that the presence of these smaller dykes exercises a favorable influence on the production and character of the veins, in the same way as the action of diorite dykes upon copper or other metalliferous strata on the production of ore deposits.

Among the principal areas of serpentine which are found at so many widely scattered points, the most easterly yet known is at a point called Mount Serpentine, about ten miles up the Dartmouth River from its outlet in Gaspé Basin. The serpentine is here associated with limestone and surrounded by strata of Devonian age. Small veins of asbestos are found in the rock, but not yet in quantity sufficient to be economically valuable. West of this the next observed is the great mass of Mount Albert, whence it extends west in a great ridge for some miles. This mass is known to contain veins of chromic iron, and traces of asbestos have also been observed, but the area has never yet been carefully explored with a view to ascertain the presence of the mineral in quantity, owing largely to the present difficulty of access.

In Cranbourne and Ware, to the north of the Chaudière River and in the vicinity of that stream between the villages of St. Joseph and St. Francis, several small knolls are seen, in all of which small and irregular veins are visible, but apparently not in quantity sufficient to render them economically important, at least in so far as yet examined. Further to the southwest, in Broughton, Thetford, Coleraine, Wolfestown and Ham, a very great development of these rocks is observed, forming at times mountain-masses from 600 to 900 feet above the surrounding country level, and presenting very peculiar and boldly marked features in the landscape by their rugged outlines and curiously weathered surfaces. The large areas of this division terminate southward at a point termed Ham Mountain, a very prominent peak of diorite which marks the extremity of the ridge. In this great area, which we may style the central area, asbestos can be found at many points in small quantity, but at a comparatively few does it occur in quantity and quality sufficient to warrant the expenditure of much capital in its extraction.

The third area, regarding that of the Shickshocks as the first, begins near the village of Danville, and may be styled the southwestern area. Thence it extends through Melbourne, Brompton, Orford, Bolton and Potton, in a series of disconnected hills, to the American boundary, beyond which the continuation of the serpentines can be traced into Vermont. In these areas, with the exception of the peculiar isolated knoll near Danville, the asbestos has, as yet, been observed in small quantity only, and generally of inferior quality. Large areas of soapstone are found at points throughout the area, and the associated diorites have a large development. It must, however, be said of this section, that considerable areas, whose outcrops can be seen along the roads which traverse the district, are concealed by a dense forest growth, and the true value of such portions must, for some considerable time, be largely conjectural. In fact, until the forest and soil are completely removed by the action of forest fires, as was the case at Black Lake and

Thetford, the search for asbestos is likely to prove difficult and unsatisfactory. It is, however, very evident from the studies already made on this interesting group of rocks in Canada, that all serpentines are not equally productive—a fact very evident even in the heart of the great mining centres themselves, where large areas of the belt are made up of what is known as barren serpentine. As a general rule, however, the rock likely to prove asbestos-producing can be determined by certain peculiarities of texture, color or weathering.

At the Thetford mines, and in that portion of Coleraine lying to the northeast of Black Lake, certain conditions favorable to the production of asbestos appear to have prevailed, and have led to the formation of numerous veins, often of large size, which, in places, interlace the rock in all directions. These veins range in size from small threads to a width of 3 to 4 inches, and in rare cases even reach a thickness of over 6 inches. The quality of the fibre, however, varies even in these localities, and while much of it is soft, fine and silky, other portions are characterized by a harshness or stiffness which detracts greatly from its commercial value.

Several theories have been put forth as to the origin of the asbestos veins. From a careful study of many places throughout the belt, it would seem that the theory of segregation applies equally to these as to quartz veins or other mineral lodes. The fibre of the veins, unless distorted by pressure, is always found at right angles to the sides of the fissure, and frequently in veins of what are regarded as of large size, say from two and a half to four inches, the continuity of the fibre is broken by a dividing zone or comb, if one may use the expression, of grains of magnetic or chromic-iron. In certain cases, also, the mass of the serpentine appears to lose color near the veins or in immediate contact with them, but this feature is not always observed.

The fissures or veins are not always regular or persistent for any very great extent. A small vein at the surface, of half an inch in thickness, may quickly enlarge to one of three inches or more, and, continuing, may die out entirely, while others come in on either side. They have much the aspect of gash veins in slaty rocks, though many instances are seen where the fibre maintains a tolerably uniform size for considerable distances.

The containing rocks show the presence of numerous faults, as in other mineral localities, but possibly in the serpentine these are often more plainly marked. These faults throw the veins from side to side, and frequently are of sufficient extent to cut off entirely the working face of a highly productive area, the rock on the other side of the fissure being often entirely barren. The sides of the fault, in such cases, show extensive slickensides, and frequently have great sheets of coarse or woody-fibred, or imperfect asbestos, along the planes of fracture. Occasionally, pockets or small veins of chromic-iron are found in close proximity to the asbestos.

Much of the asbestos found at the surface, or in the upper workings, is discolored. This is generally the case where the rock is shattered by the action of the intrusive dykes, or from some other cause, and the coloring is doubtless due to infiltration of water along the lines of jointing or fracture, becoming less as the rock grows more solid. The quality of the fibre in such cases improves as the mine becomes deeper. A somewhat similar remark may be made as to the quality of the fibre at the surface as compared with that from a lower level, but proceeding from a different cause. Owing to the destruction of the forest over the serpentine knolls by extensive fires or by the action of the weather, the asbestos veins, which are exposed at the surface, have frequently a certain amount of harshness, which entirely disappears as the vein is opened. This peculiarity is probably due to the action of the fire, by which a certain proportion of the contained water of the mineral is dissipated; and in this connection, also, a very interesting study is afforded by the comparison of the output at the Thetford mines with that from certain areas in the Black Lake district. At the former, the fibre is remarkable for its soft, silky character, and the percentage of harsh fibre is comparatively small. The same is true of certain of the Black Lake mines, but at others, though many veins of good size are also found, a very much larger proportion of the fibre is harsh or brittle. The cause of this difference has long been a subject of speculation to those more immediately interested in the subject, some attributing it to a difference in level of the two localities—a theory, however, which can scarcely be maintained in view of the fact that much of the output from the Black Lake mines, from the higher levels, is of the best quality.

The presence, however, of large masses of the intrusive granulite near Black Lake, as contrasted with its almost entire absence at Thetford, where it is found generally in small dykes, leads to the inference that to this intrusion of heated matter may be largely due the lack of softness and silkiness in much of the Black Lake output. The presence of such great masses would have a tendency to dissipate a certain proportion of the contained water from the chrysotile, which is really a hydrous silicate of magnesia, in the same way as the action of the forest fires, though on a much more extended scale. The same

effect can be produced by placing a piece of the mineral in the fire or on a sufficiently heated surface, when in a short time it will be found to have lost its softness to a large extent and become harsh and brittle.

The extraction of asbestos in the present stage of the industry may rather be termed quarrying than mining proper, the workings so far being all open cuts. The rock is blasted out, broken up, carried to the dumps and subsequently cobbled by hand, the latter being generally done by boys. The smaller veins, of a fourth to a half inch, are frequently left in the rock of the dump, as not in the present state of the industry repaying the cost of extraction. There is no doubt, that with suitable machinery for crushing and cobbling the greater part of most or all of the dumps, which have already reached a large size, would easily pay for working over, while the removal of the dumps themselves, from the fact of their covering much valuable ground, will very shortly become a necessity.

The workings at Thetford are at present confined principally to four companies, viz.: King Bros., The Bell Company, Irving, Johnston & Co., and Ross, Ward & Co. These are all situated on a small knoll of serpentine which rises to a height of 80 to 90 feet above the adjacent track of the Quebec Central Railway which traverses the properties. The output from all these mines is practically the same in quality and length of fibre, though in the quarry of Irving, Johnston & Co., veins of extra width, nearly six and a half inches, have been found. This extra length of fibre does not, however, possess any special advantage, since it is generally broken by grains or partings of iron, and for practical purposes good clear fibre of two to three inches, or even less, is quite as valuable as any. In addition to the properties at this place above mentioned, new workings have lately been commenced by Mr. A. H. Murphy, now of Montreal, and by Lucke & Mitchell, of Sherbrooke, both of which promise well. These are to the west of the railway, and at a lower level, and some extra work may be involved in the removal of a considerable covering of drift in places. The ground between the railway and the Thetford River, which here marks the western limit of the serpentine, has also been lately proved to some extent, and portions of it found to contain asbestos in satisfactory quantity, but the greater facilities for working the upper levels are such as to give them the preference for the present.

At Black Lake, four miles south of Thetford mines, four companies are also located. These are the Anglo-Canadian, the Fréchette-Dauville, the Scottish-Canadian and the American Asbestos Company or Wertheim's, at all of which a large amount of work has been done. They are all at higher levels than the mines at Thetford, and the output, as already stated, is not, as a whole, equal in quality comparing the percentage of "firsts" produced. This will be seen from a statement of the relative percentage of the two districts, though this is again to a certain extent affected by the difference in grading practiced by the several companies. Thus from the Thetford area the percentage of "firsts" ranges from 50 to 70; "seconds" from 7 to 30; "thirds" from 20 to 40. From the Black Lake district, the percentages are "firsts" 10 to 50; "seconds" 25 to 30; "thirds" 20 to 60.

The prices of asbestos are at present quoted at a considerable variation, due to the fact just mentioned that the output from the several mines is to a certain extent differently graded. Thus the "seconds" of one mine are quoted at \$75 per ton, while from another the price of "firsts" is very little more. Extra quality of "firsts" again, naturally commands a higher price than the ordinary run of the grade, but generally speaking it may be said that the scale of prices for the several grades of the output at the mines is as follows: Asbestos, No. 1, \$80 to \$110 per ton of 2,000 pounds; No. 2, \$50 to \$75, and No. 3, \$25 to \$40. In addition to the above a certain amount of waste is obtained from all the mines, and is sold at from \$10 to \$15 per ton.

Taking the scale of prices and the percentage of the higher grades, it is seen that at the present time, commercially speaking, the properties of Thetford are entitled to the first place. This is to some extent explained by the fact that a considerable proportion of the Black Lake output is off-colour, the areas worked lying partly below the crest of the main serpentine ridge, and having a considerable covering of drift. At Thetford, owing to elevation of the knoll on which most of the mines are located, the loose or shattered rock, if it ever existed there, has been largely removed by glacial action, the surface of the rock being frequently polished and striated. It has always been expected that the Black Lake output would increase in value when the shattered surface rock was removed, and this expectation has, to a certain extent, been realized in so far as the workings have proceeded, the rock generally becoming more solid at greater depths, and the color and quality of the fibre improving. New workings along the face of the ridge at this place have also disclosed the presence of large veins of excellent material, and greatly superior to that from the lower works, yielding a large percentage of first quality.

Here the action of the intrusive granulites has not been felt apparently to any considerable extent, and the conditions in this respect more closely resemble those prevailing at Thetford.

In estimating the value of Asbestos properties, the question of the relative percentages of output should be carefully considered, since, while the number of tons produced by two areas might be approximately equal, and to the uninitiated the properties in consequence be nearly equal in value, the one from the large amount of "firsts" would be capable of paying very handsome dividends, while the other would require great economy of management and yield far less satisfactory returns.

In addition to the areas just described, several others are worthy of notice. The knoll of serpentine near Danville, of small extent, has been worked for some years by Mr. Jeffrey, of Richmond, with good results. The veins at this place are not large, seldom reaching two inches in width, but the quality of much of the fibre is excellent, and, though small, a considerable number of them produce a good amount of asbestos. The proportion of "firsts" from this mine is at present about twenty per cent., and of "seconds" 60 per cent., the remainder, of course, being "thirds" thus approximating more closely the output of the mines at Black Lake.

A more curious deposit, however, is that known as the Broughton mine. The asbestos here is apparently confined to a single vein, having a hanging wall, in places, of soapstone. This vein was remarkable for its large size when first worked, being at times nearly or quite a foot thick, as well as for the great silkiness and softness of fibre. It had more the aspect of a well-defined vein, and has been worked for a distance of several hundreds of yards, and to a depth of about 70 feet. In the lower workings, however, it decreased rapidly in size, and at last split up into minute strings, rendering it worthless. Another peculiar feature observed at one of the mines near the Coleraine station is the presence of mica, or a similar mineral, associated with the asbestos veins, or in close proximity to them, and occurring in irregular fissures in the rock, of several inches in width. The rock is much shattered, and the mica is not, in so far as yet observed, found in any of the other mines in this section of the country.

In many places the serpentine is intimately associated with masses of soapstone. In such cases, while occasional small and irregular veins of asbestos may be seen, in none of those examined has the quantity, with the exception of the vein at Broughton, just described, been found to be of much economic importance.

The slate quarries, of which a number have been worked to some extent, occur at various localities throughout the Eastern Townships, and are presumably all confined to the slaty portions of the Cambrian system. Several of these were started in the colored bands of what was formerly styled the Lauzon and Sillery divisions of the Quebec group, where red and green shades are common; others were located in what were regarded as slates of Upper Silurian age, the later investigations in the field having very conclusively shown however that their true position in the geological scale is much lower. At the present time, owing to various causes, the economic extraction of slate is confined to but two places, viz., that of the New Rockland quarry, near Melbourne, and that near Danville. The output of the latter is almost entirely confined to school-slates, while that of the Rockland Company embraces roofing-slates, billiard-table tops, mantels, etc. The character of this slate is reported equal to that of the Welsh quarries.

An interesting feature at the former place, geologically speaking, is the contact of the slates with the serpentine, probably by a line of fault. A ready demand exists for the output from both these quarries, and a large force of men is employed. The New Rockland quarry especially has an excellent plant, with a magnificent water power, transmitted to the works by cable, and an outfit of cable or travelling derricks, which work to perfection. This quarry has at present a depth of 200 feet, and is connected with the line of the Grand Trunk railway, four miles distant, by a narrow-gauge road, by which a great saving in the cost of transportation is effected.

The lime works of the Dudswell Lime and Marble Company are well worthy of notice, both for their very considerable extent and for the great purity of the lime manufactured. They are located on a belt of limestone of Upper Silurian age, which is in places highly fossiliferous, and which rests on the one hand upon Cambrian and pre-Cambrian rocks, and on the other upon the Cambro-Silurian sediments of the great eastern area. In certain portions the limestone has been altered to a highly crystalline and compact marble, which, when polished, presents a very attractive appearance, the corals, of which much of the rock is composed, being well brought out. Other portions of the marble show an intricate banding of dark or blackish shades, alternating with yellowish tints, forming the variety known locally as "black and gold," and which has been very favorably compared with the celebrated Porter marble of Italy. Several thousands of dollars have already been spent in

testing the value of this marble deposit, and the rock, a short distance below the surface, appears quite solid, so that large and compact blocks can be readily obtained. The stone for burning is obtained from large ledges of a dark or grayish rock, in places also crystalline, which in the upper quarry presents a nearly vertical face of 80 to 90 feet. This is in close proximity to the kilns, of which there are 10 in all, 6 in the upper or older works and 4 in the lower and newer works, about a half mile distant. Each of these kilns is stated to have a daily capacity of 300 barrels of lime, so that the entire output is not far from 2,500 to 3,000 barrels daily. The lime manufactured is remarkable for its purity, the foreign matter in the rock averaging not more than 1 to 2 per cent., and has already obtained such a reputation for excellence that it controls the market throughout a large part of Quebec and Ontario, and through the adjoining States as well.

It would scarcely be doing justice to the mineral wealth of the Eastern Townships should we omit all mention of the gold-fields of this district. Discovered first in 1835 by a daughter of one of the *gensitaires* of Mr. C. DeLery, in a small stream called the Touffe des Pins, a branch of the Chaudière River, that gentleman, on being made aware of the fact, easily confirmed it by examination of the locality, and obtained several pieces of considerable value. Subsequent explorations of this stream and its tributaries showed that the gold was scattered over a very considerable area, being, in fact, obtainable in greater or less quantity in nearly all the branches of the Chaudière, as well as in the bed of that stream where it was accessible, nearly from the boundary of Maine to that of the seignior of St. Marie.

The limits of this gold-field were gradually extended, and it was found on examination, both on the part of the Geological Survey and by private individuals, that the metal could be obtained, by simple washing in the pan, from the sands and gravels of nearly every stream south from the Chaudière to New Hampshire and Vermont. The character of much of the gold over this area was so fine that the returns were not found to repay the labor of hand-washing, but in certain portions, notably in the upper Chaudière and its branches, and in the south-eastern portion of the province, in the township of Ditton, much coarse gold existed, from which nuggets of large size were obtained, reaching a value in some cases of over \$1,000. The greater part of this coarse gold was water worn, but occasional large pieces were found which were comparatively ragged and had quartz attached.

For some years the source from which this gold was derived was a question not clearly understood. It was first regarded as belonging to the quartz-veins which occurred in the crystalline schists of the Notre Dame range of hills, which traverse a considerable portion of the country in a northeasterly direction, the materials from their disintegration being spread over a considerable area to the south. The age of the rock underlying the area in which the gold was most commonly found was, at that time, regarded as Upper Silurian.

On the upper branches of the Chaudière, and on the Du Loup stream, heavy beds of gravel occur which were deemed worthy of a careful test as to their value as a source of gold; and a series of washings, made in 1851-52, under very disadvantageous circumstances, however, and with very ordinary appliances, showed a very fair margin of profit to operations if conducted in the large way and with a proper expenditure of capital, many of the large areas of gravel being found sufficiently rich to warrant such an enterprise. Unfortunately, the only attempts of any considerable importance in this direction, either through lack of proper management or other causes, do not appear to have been so successful as anticipated; an experience, however, that should not be held as conclusively establishing the unprofitableness of the entire section.

The Ditton area, being entirely in private hands, has furnished no official returns from which the quantity of gold obtained from this district can be ascertained; though, from the coarse character of the gold there found, and the fact that certain persons have carried on mining continuously for many years, it is evident that much rich ground exists on the upper branches of the Salmon River. The appliances for mining and saving the gold appeared to be of the crudest kind, no provision existing for the extraction of the finer portion of the yield. Nuggets of \$50 to \$150 are reported from this place, and many quartz-veins traverse the black slates and sandstones which form the country rocks. Some of these are, without doubt, auriferous, from the fact that ragged gold in quartz is found in close proximity to them.

The largest operations in gold mining have been carried on in the Beauce section, and principally on a branch of the Chaudière River, known as the River Gilbert. Here, also, the mining was of a very crude kind; but though the returns for this area are largely incomplete, the official figures show that for 1877 to 1883 a very considerable quantity of gold was obtained, even under the very unfavorable conditions that prevailed. Much of the gold was very coarse, large nuggets being frequent. Owing to litigation and other causes, the mining on this

stream has, to a large extent, been abandoned, though a large part of the old river channel, from which the greater part of the gold was obtained, yet remains untouched.

The presence of these old river channels in the tributaries of the Chaudière River is a very important feature in connection with the profitable extraction of gold in this locality. Indications of these are visible on the Famine River, the Pozer stream, the Gilbert, which has been worked to some extent and already referred to, the Des Plantes and the Millstream, where successful mining is being carried on at the present time. The bottoms of these channels, which are, in places, many feet below the present water courses, of the streams, contain several feet of well-defined river gravel cemented with sand and clay, in which the greater part of the coarse gold occurs, the upper portion being largely occupied with quicksands, gravel and clay. On the Millstream, also, there appears to be a great lack of appliances for saving the fine gold, the greater part of which is undoubtedly carried down the sluices and lost in the main stream.

A series of essays and examinations, conducted by Messrs. Hunt and Michel, and published in the *Geological Survey Report*, 1866, shows conclusively that many of the quartz-veins in the Chaudière district contain gold in paying quantity. The greater ease of working the gravels, however, and the present lack of capital, has, as yet, diverted attention from the working of these quartz-leads. This lack of capital is, to some extent, due doubtless to certain peculiar conditions of tenure of the lands which are not considered satisfactory to those contemplating investment in this direction. If these were put on a proper basis, and the country thrown open as a mining district, good results would certainly follow.

It will, however, probably be found that the most profitable fields of investment will be confined to the areas of Cambrian slates, and, judging from the fact that the largest nuggets have been obtained in close proximity to certain well-defined quartz-veins which occur in the vicinity of lines of anticlinal structure, the principle now generally admitted in the Nova Scotia gold-fields, that the paying leads are located near these anticlinal axes, will doubtless be found to apply to the gold-fields of eastern Quebec.

In this connection it may be mentioned that in their character the slates and hard sandstones of the Quebec gold-fields are very similar to those of Nova Scotia, and they in all probability belong to the same geological horizon. The southward extension of the Ditton gold field should be looked for and found in that portion of New Hampshire adjoining and lying on the upper waters of the Connecticut River between the Hall and Indian streams. Since black slate and schistose sandstones have been reported by Prof. Hitchcock as there existing, precisely similar in lithological character to those of the Ditton area, and since the strike of the beds in both places is continuous, the valleys of the streams in that section should be also auriferous.

Of argentiferous galena, rich veins are known to exist, more especially in the Cambrian rocks of the Chaudière River, and upon the Du Loup, one of its principal branches from the east. Assays from some of these veins show a percentage of silver ranging from \$30 to over \$400 per ton. The veins are of good size, but the largest deposit, that of Risborough and Marlow, is at present accessible with difficulty. This will be shortly overcome by the proposed extension of the Quebec Central Railway, which is to cross this area, then these properties should become very valuable.

Of the iron ores it need only be said that deposits occur at various points, some of which are of great purity and excellence. The great drawback, at present, to their successful working is the lack of suitable fuel for smelting, wood for charcoal being generally too scarce in the immediate vicinity, while the geological formations in Quebec and Ontario are such as to render the chances of finding coal in either province an impossibility. Should the problem of cheap transportation of coal, either from the mines of Nova Scotia or from those of the United States, to some central point, such as Montreal or Sherbrooke, ever be solved, it is confidently anticipated that these ores will form no inconsiderable factor in the mineral wealth of eastern Quebec.

The deposit of antimony near Garthby has been known for many years, and beautiful specimens can be obtained there, but the lack of a market, in view of the occurrence of large veins of the mineral in Nova Scotia and New Brunswick, and the lack of facilities for extraction on the spot, have hitherto interfered with its successful development. This, also, is one of the problems that should be solved in the near future.

It will be seen from this sketch of some of the leading minerals in this portion of the Dominion, that the chances for the profitable investment of capital in several important lines are not few. Improved methods of mining, a more extended market, and, in the case of the gold, greater security of title to those desiring to invest with a view to scientific mining operations will do much to improve them. The great value of these several industries is only now beginning to be understood, and it

can be safely predicted that before many years the mining industries of this section will take a much more prominent position than they have ever yet enjoyed, and will be regarded with increasing favor as a field for profitable investment by capitalists both at home and abroad.

The Geological Relations of the Principal Nova Scotia Minerals.*

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Any estimate of the economic mineral value of an unvisited district is to the mining engineer largely a comparative one. If he knows that certain minerals characterize any given geological horizon he naturally draws upon his experience of the same ores as met by him under similar geological conditions. And if he has not had the personal experience, the investigation of the geology of a similar district as given in a trustworthy report enables him to lay a fair basis for conclusions.

In a general way these conclusions are of value, and while they pronounce on the possible mineral fecundity of a given district, they often give a decided rebuttal to startling statements of discoveries of ores.

The number of the geological horizons in Nova Scotia is limited, but they are well developed, in some cases typically, and exert a prominent effect on the agricultural and industrial distribution of its inhabitants.

The following table, based on Sir William Dawson's *Acadian Geology*, will serve as an outline for my notes:

Modern.	
Triassic sandstone and trap.	
Permo Carboniferous.	
Carboniferous	Upper coal measures. Productive coal measures. Millstone grit. Marine limestone. Lower Carboniferous.
Devonian	Upper Helderberg. Oriskany.
Upper Silurian	Lower Helderberg. Clinton.
Lower Silurian.	
Cambro-Silurian.	
Cambrian, Longmynd series.	
Laurentian.	

This list is intended to refer rather to the divisions known to contain ores, than to be a complete geological scale of the province.

Geographically speaking, in Nova Scotia proper these divisions are represented as follows: On the Atlantic coast are the Cambrian of the gold-fields with their associated granites. Then follow the measures of the Cobequids running through Cumberland, Pictou, Colchester and Antigonish counties, supporting Silurian and Devonian strata, the latter being met also in the western part of the province. The Carboniferous occupies the gulf shore, and much of the district surrounding the basin of Minas. The Triassic measures are met in narrow fringes and outliers around the Bay of Fundy. In Cape Breton the northern part of the island is largely composed of Laurentian, which occurs also between the arms of the Bras d'Or Lake. The Carboniferous rests on it, and forms fringes, while it is replaced in Richmond county by several large areas of Devonian.

Taking the divisions in descending order, their best known minerals are:

Modern.—Beds of bog iron-ore, manganese wad, peat, infusorial earth and clays are frequently met. A number of years ago the iron ore was smelted in connection with older ores, at Clementsport near Annapolis. Deposits of considerable extent have been observed in Shelburne, Queens, Kings, and Pictou counties, and no doubt exist at many other localities. The wads are met in Cape Breton at several points, in deposits of considerable size, yielding from 20 to 40 per cent. of ore with water, iron, silicious matter, etc. Smaller deposits are not unfrequently found, but as there is no demand they are not sought after. The deposits of infusorial earth have been used locally for insulating steam pipes, and as an absorbent in the manufacture of dynamite.

Triassic.—The trap and associated ash-beds yield numerous varieties of zeolitic and other minerals. At several points they are penetrated by veins of massive and crystalline magnetite and specular ore of remarkable purity. The thickest vein that has come under the writer's notice, of magnetite, was about 15 inches wide.

At numerous points, most noticeable at Margareville, copper ores, principally carbonates with native copper, are found in veins in the trap and ash. These veins have been explored several times without success. No records have been made of the "low-grade" values of these rocks, and I believe from the frequent occurrence of copper ores over so wide an extent of territory that locally, beds may be found carrying the disseminated metal in amounts of economic value. The associated sandstones,

*Read at Ottawa meeting Am. Inst. M.E.

red and friable, yield no building stone of value, and as yet have furnished to the miner only a few tons of manganese ochre.

Permo-Carboniferous.—In the great mass of sediments covering large areas in Pictou, Colchester, and Cumberland counties, and presenting fossil evidence of a transition from the Carboniferous to the Permian, there are few minerals of economic value. A few thin seams of coal are met, with fire-clay. At numerous points the sandstones and shales present irregular bedded masses and layers of copper ores, principally gray sulphurets, with films and coatings of carbonate. These ores are associated with fossil plants to whose presence their deposition is to be attributed. Hitherto, attempts to find these ores in workable amounts have not been successful. A sample from Caribou, near Pictou, gave:

	Per cent.
Copper.....	40.00
Iron.....	11.06
Cobalt.....	2.10
Manganese.....	0.50
Sulphur.....	25.42
Lime.....	0.92

Admirable varieties of building stone, variously tinted sandstones and free-stones have been quarried from these measures.

Upper Coal Measures.—These strata in general resemble those noticed in the preceding section. There is however more coal; and layers of clay iron-stone are frequently met.

Productive or Middle Coal Measures.—The principal mineral of this formation is coal, which is worked in Cape Breton, Pictou and Cumberland counties. Deposits are known in five other counties, but have not been worked to any extent. The production last year was about 1,700,000 tons. The coal is bituminous, and the writer is not aware of the occurrence of any hard coal, although several discoveries of graphitic shale have been heralded as anthracite mines. Speaking in general terms the Cape Breton coal is the most bituminous, that of Cumberland less so, while the Pictou coals rather approach the semi-bituminous or steam variety. All the districts furnish coke of fair quality.

The following average of an analyses, from a paper on Canadian coals, read before the Montreal meeting of the British Association, will serve to show the variation in quality:

	Cape Breton.	Pictou.	Cumberland.
Moisture.....	0.75	1.19	1.46
Vol. combustible matter.....	37.26	29.10	33.69
Fixed carbon.....	58.74	60.63	59.35
Ash.....	3.25	9.34	5.50

The fire-clays accompanying these coals have never been systematically tested as to their value for fire-brick. Some that have come under my notice are too high in alkali and iron, while others theoretically were of satisfactory composition. An investigation into the capabilities of the fire-clays of Nova Scotia would form an object worthy the attention of the Canadian Geological Survey. Beds of cannel and oil coal, and of bituminous shale, are frequently met, but are not at present of economic value.

Beds of clay iron-stone (in a few instances of the black band variety) up to a thickness of 12 inches are numerous. The following analyses made by me are samples from the Pictou coal field:

	Clay Iron-stone.	Black Band.
Moisture.....	2.132	0.732
Iron protoxide.....	45.361	36.000
Alumina.....	16.962	3.180
Silicious residue.....	0.780	16.546
Lime.....	trace	3.780
Magnesia.....	1.655	0.783
Manganese.....	trace	4.450
Sulphur.....	0.612	0.214
Phosphoric acid.....	trace	.586
Carbonaceous matter.....	.....	6.140
Carbonic acid.....	.....	27.589
Metallic iron.....	35.00	28.000

Millstone Grit.—The dividing line between the millstone grit and productive measures is not a fixed one, and consequently there are workable beds of coal in its upper part referred to this horizon, but practically belonging to the productive measures. Throughout this range of measures thin seams of coal occur at numerous points, but in the presence of the larger and better known beds they have not yet received attention. At the Joggins, Cumberland county, large quantities of excellent grindstones are made for local use, and for export, and numerous beds of quarry rock are known.

Marine Limestone.—This horizon is very strongly developed in Nova Scotia, and to its presence is due the fertility of the central and northern part of the province, for its gypsum, limestone, and marl yield soils of permanent fertility. Its most prominent mineral is gypsum, in every variety and texture, which occurs in beds in many cases extending for miles, and reaching in thick-

ness 100 feet. It is quarried for export to the United States, chiefly near Windsor, in the basin of Minas, the annual production varying from 100,000 to 150,000 tons. A few thousand tons are annually sent up the Gulf of St. Lawrence from Cape Breton, but the export trade, on account of the difference in freight, is from the Windsor district. Limestone is equally abundant, and is burned for local use, and used in rough masonry, and at Walton, near Windsor, furnishes a beautiful red stone, which it is said will first be used in the new buildings of a prominent New York newspaper. At several points these limestones carry deposits of manganese, lead, iron, and copper ores and barytes. The manganese is met as pyrolusite with a little hard ore, and is of remarkable purity, carrying very minute amounts of iron. It brings a price varying up to \$100 a ton, but the demand is limited. I am not aware of any deposits of these ores adapted to the steel-makers' purposes. Tenny Cape, Onslow, and Loch Lomond are the best known mines.

The iron ores are limonite, red hematite, and spathic ore. As yet the ores of this series are little worked, but they are of undoubted value. The purity of some of them may be shown by the following analysis of a sample from Brookfield:

	Per cent.
Water.....	11.36
Silica.....	1.54
Sulphuric acid.....	trace
Phosphoric acid.....	trace
Metallic iron.....	60.00

The spathic ore occurs in beds, the limonite and red hematites as contact and replacement deposits. The lead-ores occur as small segregated veins, and as aggregates. The silver contents of the Nova Scotia lead-ores are variable, assays have returned as high as 100 ounces, but the average would not exceed 10 ounces. The copper-ores resemble in composition and mode of occurrence those already described. Celestine, fluorspar, and brine and mineral springs also occur in these measures.

Devonian (Upper Helderberg, Oriskany)—In the hills lying to the south of the Annapolis valley are numerous important bedded deposits of magnetite and hematite. The ores vary in character, but some are of excellent quality and favourably situated for mining and exportation. In Guysboro' county the Devonian measures carry several large deposits of specular ore of good quality, but as yet unproven. The ore is presented in veins and in large masses, and may be connected with the dioritic dykes found at this point. It occurs under similar conditions near St. Peters. I believe that by some of the copper-ores of Poisons Lake and Lochaber in Antigonishe County are referred to this horizon. These deposits are connected with igneous dykes, and, as far as they have been explored, appear very promising, but their distance from shipping, etc., has diverted attention from them.

Upper Silurian.—(Lower Helderberg, Clinton).—In Pictou and Antigonishe counties, strata which are referred to this age carry important deposits of bedded red hematites, varying in thickness up to 50 feet. The ores are silicious, but frequently free from sulphur and phosphorus; their metallic contents vary from 35 to 50 per cent. Owing to their size and accessibility they can be cheaply mined, and will probably be utilized in connection with the richer ores found in their vicinity.

Lower Silurian.—These measures, as developed in Cape Breton carry several beds of red hematite, and deposits of copper pyrites and sometimes cupriferous iron pyrites.

Cambro-Silurian.—This term has been provisionally applied to the mass of strata forming the Cobequid hills and reappearing in Pictou County. The ores occurring in these measures embrace several varieties of hydrated and anhydrous peroxide. At Londonderry the limonite occurs with a little specular in a large interstratified vein containing ankerite and sideroplesite, the latter being used to some extent in the furnaces of the company operating at this point. Magnetites have also been met in parts of this range. In Pictou County the ores occur in interstratified veins in the ankerite, but are principally specular. Copper and gold ores are reported as occurring in this range, but I am uninformed concerning their economic value. The deposits of antimony-ore, at Rawdon, Hants County, have been worked for several years, and are probably extensive. Their exact geological horizon is not yet clearly known, but they are referred to here.

Cambrian (Longmynd).—The only mineral of economic value yet found in these measures is gold. The strata are slate and quartzite lying in large abrupt folds, which have permitted the intercalation of the gold-bearing quartz-veins, varying in thickness up to 12 feet. The gold is also found disseminated in some of the beds of slate. Copper, lead, zinc, iron, and molybdenum sulphides occur with the gold in the quartz-veins, but not in amounts of economic value. The auriferous territory is estimated to cover 3,000 square miles, and as the annual production of gold is only about 23,000 ounces, there is ample opening for miners.

Laurentian.—This series is widely distributed in Cape Breton, and roughly speaking is divisible into the felsite and the limestone series. They contain red hematite, in places magnetic, of excellent quality, although some are reported to be rather high in phosphorus for Bessemer purposes. Copper ores, graphite, asbestos and mica are also found. The limestones are frequently altered into marbles. Some of the deposits are beautifully tinted, and are said to be adapted for building and statuary purposes. At present the West Bay (Cape Breton) marble is largely burned into a lime of excellent quality, which is used in the province, and exported to the United States, etc. To complete the parallel between these Cape Breton strata and the Laurentian rocks of the vicinity of Ottawa, there remains to be discovered in the former "Phosphate Rock," and there appears to be no reason for its absence.

Copper ores are found at numerous points and are undoubtedly valuable as they are widespread and at the surface show well, but up to this date no decided steps for development have been made except in the case of the copper ores of Coxheath, near Sydney. Here the Eastern Development Company has proved several large veins carrying copper in workable amounts to a depth of 300 feet. The ore is calcopyrite with erubescite, and carries considerable amounts of gold and silver. Molybdenite also occurs in small disseminated grains and nodules at several points, and a few lots have been shipped to England.

In summing up these brief notes it may be said that the visitor to the province would place the minerals, irrespective of any development effected, in the following order: Coal, Iron, Gold. It is perhaps unusual to find these three so close together.

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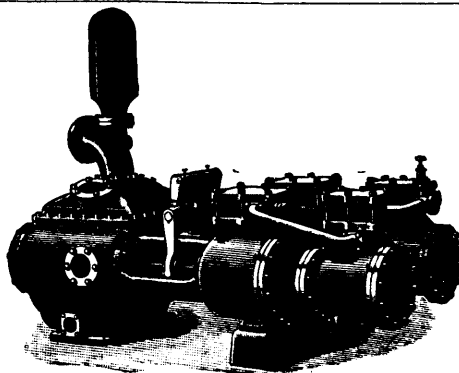
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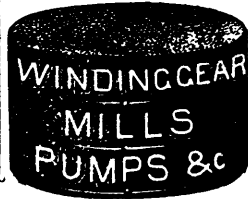
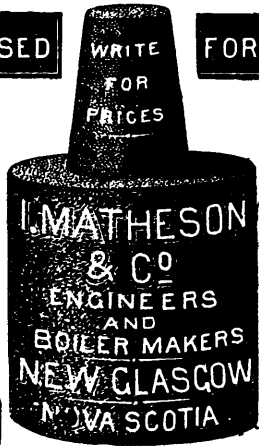
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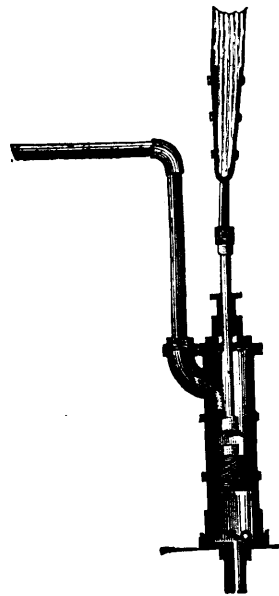
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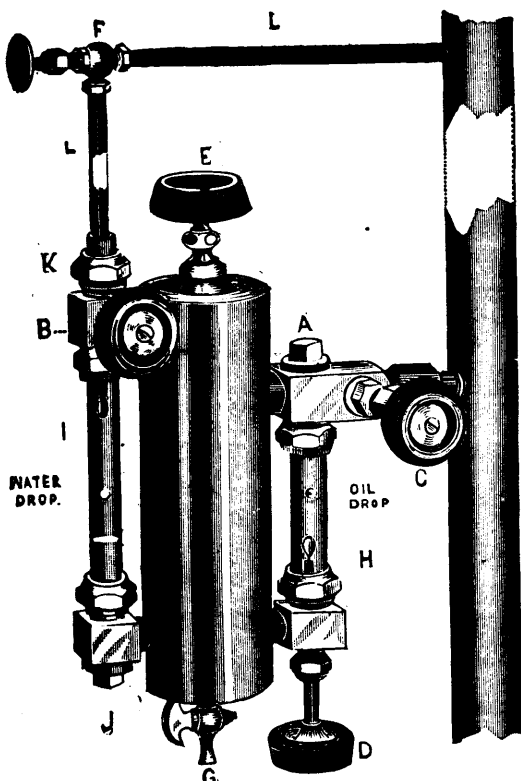
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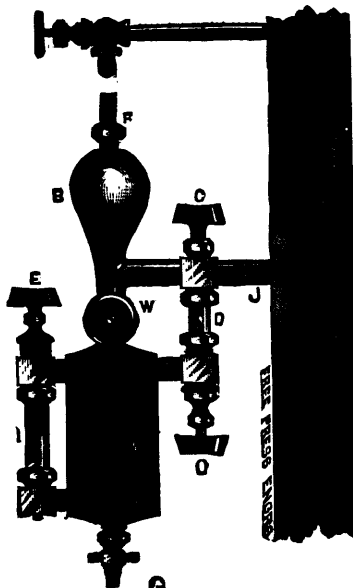
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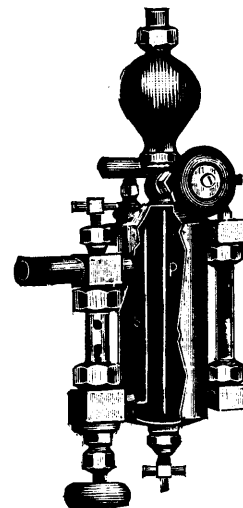
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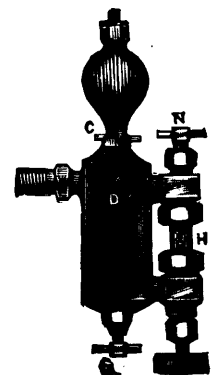
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At 12 o'clock noon, pursuant to an order of this Court made herein on the 1st day of February instant.

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Tender to state price per block of the following dimensions, viz:—3 ft. by 1 ft. by 1 ft., which price must include cost of packing and of the sawdust required for that purpose.

All saw-dust and other refuse on the premises to be removed; only new sawdust to be used.

The ice to be measured before being packed in the ice house and payment to be made accordingly.

N.B.—The ice must be taken from the Ottawa River, above the Chaudiere Falls.

By Order,

A. GOBEIL,
Secretary.

Dept. of Public Works,
Ottawa, November, 28th, 1889.



MONEY ORDERS.

MONEY ORDERS may be obtained at any Money Order Office in Canada, payable in the Dominion and Newfoundland; also in the United States, the United Kingdom, France, Germany, Austria, Hungary, Italy, Belgium, Switzerland, Portugal, Sweden, Norway, Denmark, the Netherlands, India, Japan, the Australian Colonies, and other countries and British Colonies generally.

On Money Orders payable within Canada the commission is as follows:

If not exceeding \$4	20c.
Over \$4, not exceeding \$10	50c.
" 10, " " "	10c.
" 20, " " "	20c.
" 40, " " "	30c.
" 60, " " "	40c.
" 80, " " "	50c.

On Money Orders payable abroad the commission is:

If not exceeding \$10	10c.
Over \$10, not exceeding \$20	20c.
" 20, " " "	30c.
" 30, " " "	40c.
" 40, " " "	50c.

For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa.
1st November, 1889.

WM. STAIRS, SON & MORROW,

174 to 190 Lower Water St., Halifax, N.S.,

Importers and Dealers in all kinds of Mining Supplies, Steel Wire Ropes,
LUBRICATING OILS, EXPLOSIVES, &c. &c.

Correspondence solicited. Goods promptly supplied. Sole agent for Canada for Patent Mineral Fusible Cement.



PROVINCE OF NOVA SCOTIA.

Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

— AND —

PRECIOUS STONES.

Titles given direct from the Crown, Royalties & Rentals moderate

GOLD AND SILVER.

Under the provisions of chap. 7, Revised Statutes, of Mines and Minerals Licenses are issued for prospecting Gold and Silver for a term of six months, which can be extended by renewal for another six months. Mines of Gold and Silver are laid off in areas of 150 by 250 feet, any number of which up to one hundred can be included in one License, provided that the length of the block does not exceed twice its width. Up to ten areas the cost is 50 cents per area, for every area in addition in same application 25 cents. Cost of renewal one half the original fees. Leases of any number of areas are granted for a term of 21 years at \$2.00 per area. These leases are forfeitable if not worked, but advantage can be taken of a recent Act by which on payment of 50 cents annually for each area contained in the lease it becomes non-forfeitable if the labor be not performed.

Licenses are issued to owners of quartz crushing mills who are required to pay Royalty on all the Gold they extract at the rate of two per cent. on smelted Gold valued at \$19.00 an ounce, and in smelted Gold valued at \$18.00 an ounce.

Applications for Licenses or Leases are receivable at the office of the Commissioner of Public Works and Mines each week day from 10 a.m. to 4 p.m., except Saturday, when the hours are from 10 to 1. Licenses are issued in the order of application according to priority. If a person discovers Gold in any part of the Province he may stake out the boundaries of the area he desires to obtain, and this gives him one week and twenty-four hours for every 15 miles from Halifax in which to make application at the Department for his ground.

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for twelve months are issued, at a cost of twenty dollars, for Minerals other than Gold and Silver, out of which one square mile can be selected for mining under lease. These leases are for four renewable terms of twenty years each. The cost for the first year is fifty dollars, and an annual rental of thirty dollars secures each lease from liability to forfeiture for non-working.

All rentals are refunded if afterwards the areas are worked and pay royalties. All titles, transfers, etc., of minerals are registered by the Mines Department free of charge, and provision is made for lessees and licensees whereby they can acquire promptly either by arrangement with the owner or by arbitration all land required for their mining works.

The Government as a security for the payment of royalties makes the royalties a first lien on the plant and fixtures of the mine.

The unusually generous conditions under which the Government of Nova Scotia grants its minerals have introduced many outside capitalists who have always stated that the Mining Laws of the Province were the best they had had experience of.

The royalties on the remaining minerals are :—Copper, four cents on every unit ; Lead, two cents upon every unit ; Iron, five cents on every ton ; Tin and Precious Stones, five per cent. ; Coal, 7½ cents on every ton sold.

The Gold district of the Province extends along its entire Atlantic coast and varies in width from 10 to 40 miles, and embraces an area of over three thousand miles, and is traversed by good roads and accessible at all points by water. Coal is known in the counties of Cumberland, Colchester, Pictou and Antigonish, and at numerous points in the island of Cape Breton. The ores of Iron, Copper, etc., are met at numerous points, and are being rapidly secured by miners and investors.

Copies of the Mining Law and any information can be had on application to

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX

NOVA SCOTIA.

RUSSELL & CO.
 PROVINCIAL AND DOMINION
LAND SURVEYORS,
 CIVIL AND MINING ENGINEERS,
 PORT ARTHUR, ONTARIO.

Mining Properties Surveyed, Reported on and Dealt in

Latest and Most Complete Plans of Thunder Bay
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On sale only at the offices of

THE CANADIAN MINING REVIEW,
 OTTAWA.



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, by 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.

COPIES OF THE REGULATIONS MAY BE OBTAINED UPON APPLICATION TO THE DEPARTMENT OF THE INTERIOR

A. M. BURGESS,
 Deputy Minister of the Interior



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, or collected under the provisions of the Adulteration Act, or 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 analysis and sample of the same shall have been transmitted to the Minister of Inland Revenue and the provisions of the foregoing sub-section have been complied with.

Every person who sells or offers or exposes for sale any fertilizer, in respect of which the provisions of this Act have not been complied with—or who permits a certificate of analysis to be attached to any package, bag or barrel of such fertilizer, or to be produced to the inspectors to accompany the bill of inspection of such inspector, stating that the fertilizer contains a larger percentage of the constituents mentioned in sub-section No. 11 of the Act than is contained therein—or who sells, offers or exposes for sale any fertilizer purporting to have been inspected, and which does not contain the percentage of constituents mentioned in the next preceding section—or who sells or offers or exposes for sale any fertilizer which does not contain the per-

centage of constituents mentioned in the manufacturer's certificate accompanying the same, shall be liable in each case to a penalty not exceeding fifty dollars for the first offence, and for each subsequent offence to a penalty not exceeding one hundred dollars. Provided always that deficiency of one per centum of the ammonia, or its equivalent of nitrogen, or of the phosphoric acid, claimed to be contained, shall not be considered as evidence of fraudulent intent.

The Act passed in the forty-seventh year of Her Majesty's reign, chaptered thirty-seven and entitled, "An Act to prevent fraud in the manufacture and sale of agricultural fertilizers," is by this Act repealed, except in regard to any offence committed against it or any prosecution or other act commenced and not concluded or completed, and any payment of money due in respect of any provision thereof.

A copy of the Act may be obtained upon application to the Department of Inland Revenue, as well as a copy of a Bulletin which it is proposed to issue in April, 1888, concerning the fertilizers

E. MIALL,
Commissioner.

January, 1889.

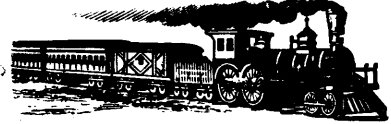


NOTICE

Is hereby given that all communications in respect to matters affecting the Department of Indian Affairs should be addressed to the Honorable E. Dewdney as Superintendent General of Indian Affairs, and not as Minister of the Interior, or to the undersigned. All Officers of the Department should address their official letters to the undersigned.

L. VANKOUGHNET,
Deputy Superintendent-General
of Indian Affairs.

Department of Indian Affairs,
Ottawa, 11th May, 1889.



Intercolonial Railway
OF CANADA.

The direct route between the West and all points on the Lower St. Lawrence and Baie des Chaleurs, Province of Quebec; also for New Brunswick, Nova Scotia, Prince Edward and Cape Breton Islands, Newfoundland and St. Pierre.

EXPRESS TRAINS leave Montreal and Halifax daily (Sunday excepted) and run through without change between these points in 30 hours.

The Through Express Train cars of the Intercolonial Railway are brilliantly lighted by electricity and heated by steam from the locomotive, thus greatly increasing the comfort and safety of travellers.

New and Elegant Buffet Sleeping and Day Cars are run on all through Express Trains.

CANADIAN EUROPEAN MAIL
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Passengers for Great Britain or the Continent by leaving Montreal on Friday morning will join Outward Mail Steamer at Halifax the same evening.

The attention of shippers is directed to the superior facilities offered by this route for the transport of flour and general merchandise intended for the Eastern Provinces and Newfoundland; also for shipments of grain and produce intended for the European market.

Tickets may be obtained and all information about the route, also Freight and Passenger rates, on application to

G. W. ROBINSON,
Eastern Freight and Passenger Agent,
137 1/2 St. James St., MONTREAL.

E. KING,
Ticket Agent,
27 Sparks Street,
OTTAWA.

D. POTTINGER,
Chief Superintendent.

Railway Offices, Moncton, N.B.
14th November, 1889.

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Manufacturers of the Celebrated "Brown Automatic Engine."

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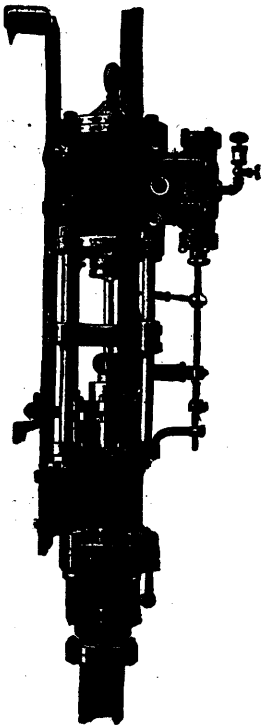
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Hoisting Engines and Boilers, Quartz Mills, Diamond Prospecting Drills, Rock Breakers.

Office and Works, Esplanade E.; Warehouse, 38 Yonge St.,

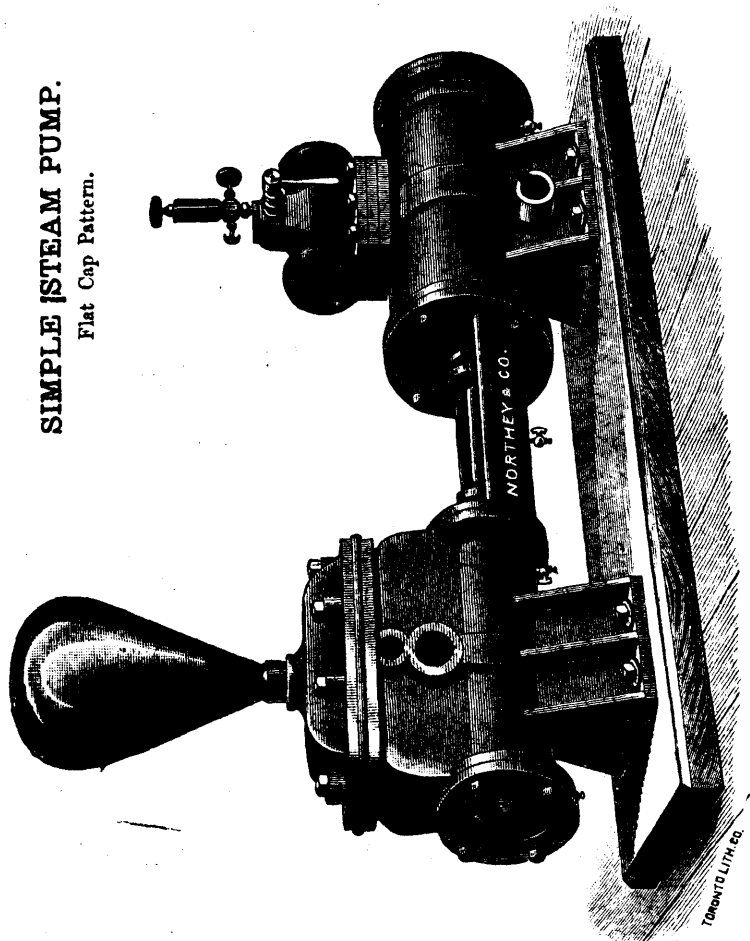
TORONTO.



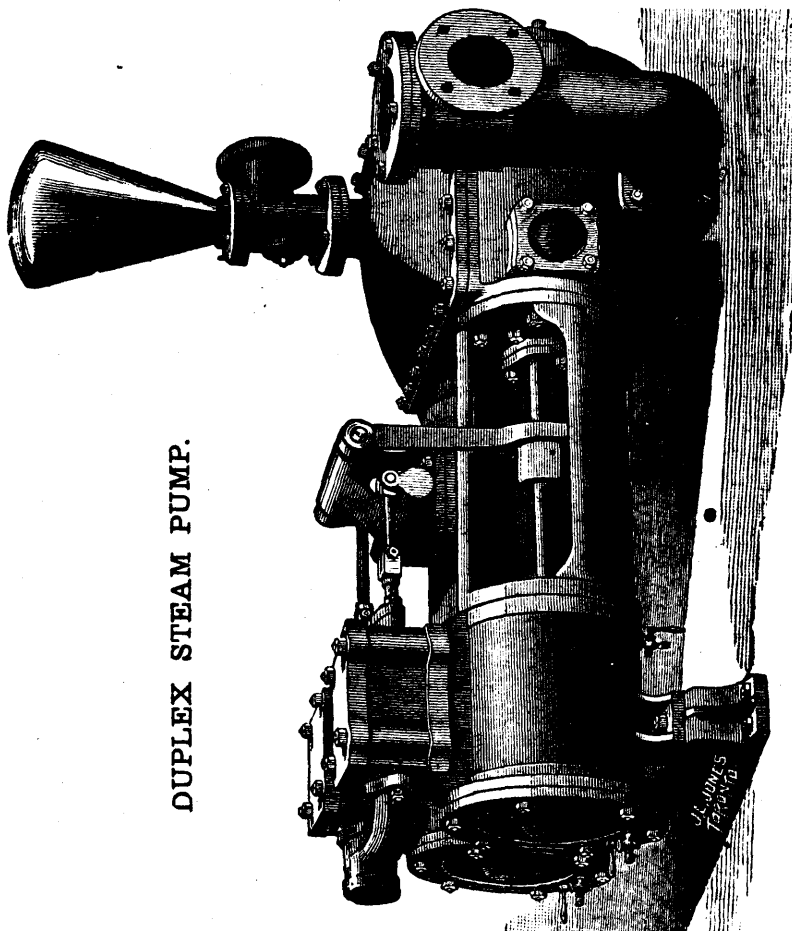
Northey & Co's Steam Pump Works, TORONTO, ONT.

SIMPLE STEAM PUMP.

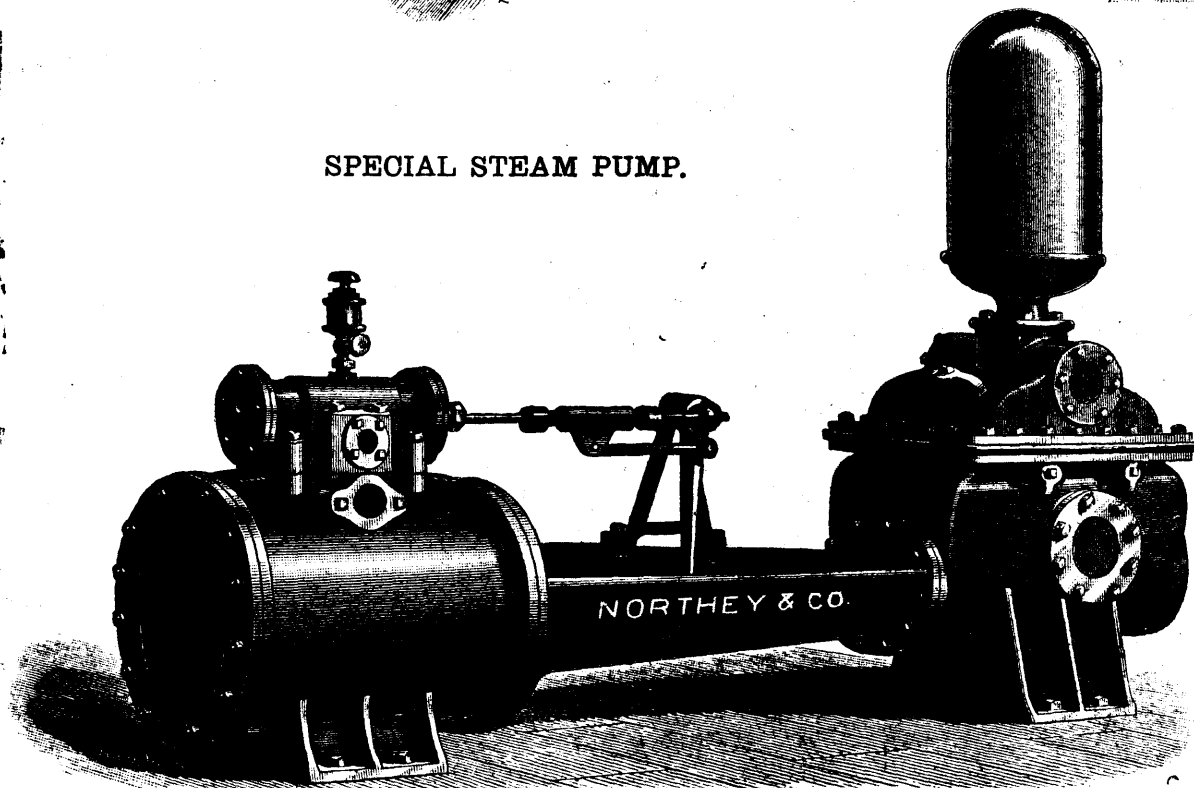
Flat Cap Pattern.



DUPLEX STEAM PUMP.

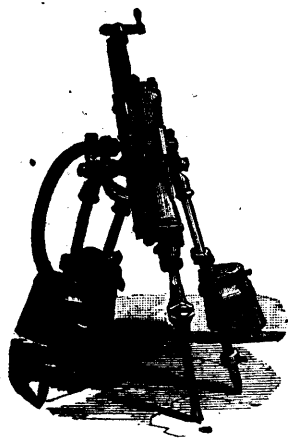


SPECIAL STEAM PUMP.



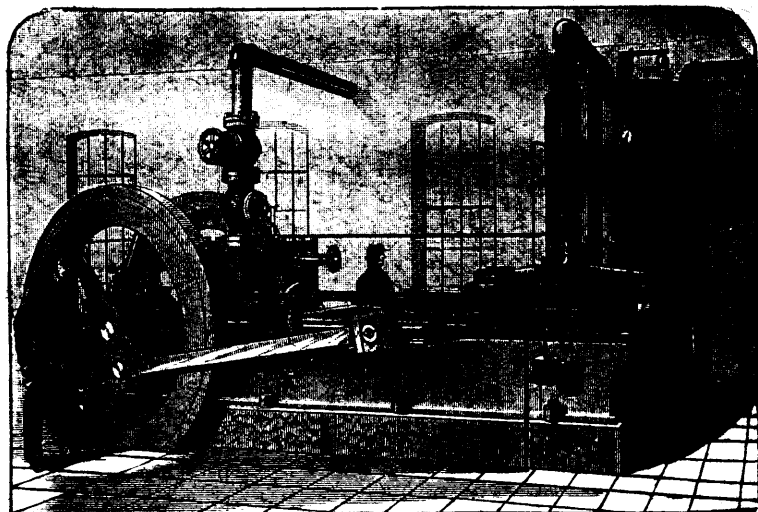
Steam Pumps of the best and latest designs for mining purposes, Boiler Feeding, Fire Protection, and General Water Supply, etc.

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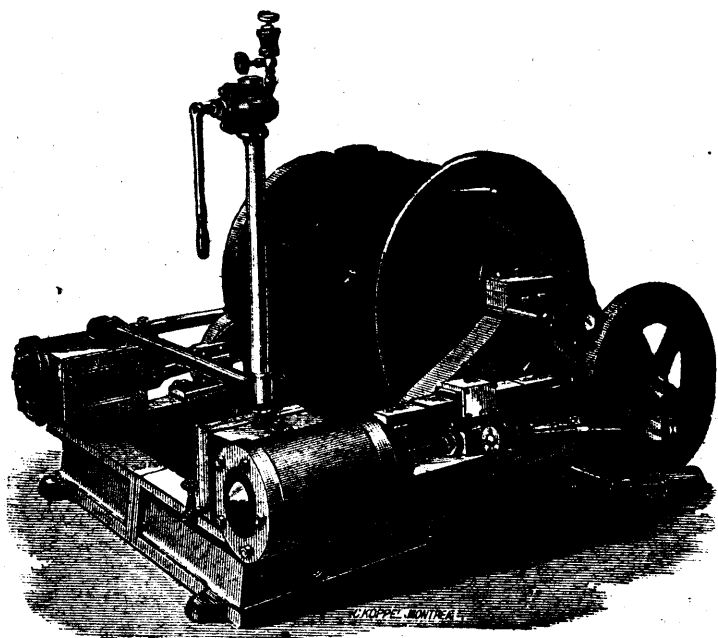


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