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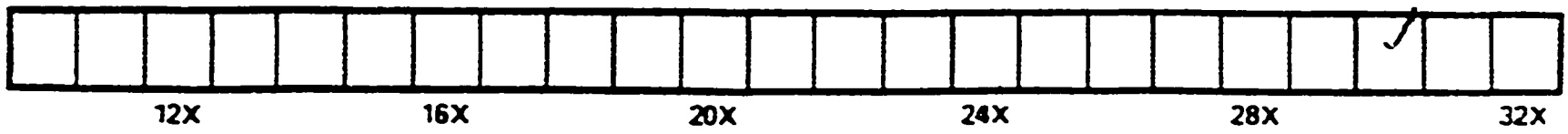

CANADIAN MINING REVIEW

VOL. 4.—No. 2. 1886—OTTAWA, FEBRUARY—1886 VOL. 4.—No. 2

WELLAND CANAL.

Notice to Contractors.

SEALED TENDERS addressed to the undersigned and endorsed "Tender for Lock Gate Timber," will be received at this office until the arrival of the Eastern and Western Mails on TUESDAY, the 9th day of FEBRUARY next, for the finishing and delivering, on or before the 22nd day of June next, 1886, of Oak and Pine Timber, sawn to the dimensions required for increasing the height of the Lock Gates on the WELLAND CANAL.

The timber must be of the quality described and of the dimensions stated in a printed bill which will be supplied on application, personally or by letter, at this office, where forms of tender can also be obtained.

No payment will be made on the timber until it has been delivered at the place required on the Canal, nor until it has been examined and approved by an officer detailed to that service.

Contractors are requested to bear in mind that an accepted bank cheque for the sum of $600 must accompany each tender, which shall be forfeited if the party tendering declines to enter into a contract for supplying the timber at the rates and on the terms stated in the offer submitted.

The cheque thus sent in will be returned to the respective parties whose tenders are not accepted.

This Department does not, however, bind itself to accept the lowest or any tender.

By order,
A. P. BRADLEY,
Secretary.

Department of Railways and Canals,
Ottawa, 22nd January, 1886.

Canadian Mining Review.

OTTAWA.

PUBLISHED MONTHLY.

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UNION CHAMBERS, 11 Metcalfe Street.

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

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

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

All matter for publication in the REVIEW *should be received at the office not later than the 20th of the month.*

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

The opening up of new tracts of country throughout the length and breadth of the Dominion by means of railway enterprises and exploration in the interests of our lumbermen is concomitantly bringing an increased number of mineral occurrences to view. Comparatively few people in Canada seem to realize the importance to a country of encouragement to mining industry, and among certain classes mining is looked upon in no other light than that of speculation, while some people go so far as to term it a gambling operation. Farmers have been known to come to hopeless grief in attempting to prosecute farming on legitimate principles; but who will deny that the largest source of wealth is derived from cultivation of the soil? Because investments in timber limits have, in some instances, proved unprofitable, it must not be said that our lumbering industry has not benefited the country; and because the majority of mines do not pay large dividends, can we question the fact that every ounce of economic mineral brought to the surface represents so much additional wealth to the country in which it is mined? Mining is a steady source of revenue to the older countries of the world, and it might be made a very important and remunerative industry in Canada, and one that would add materially to the wealth of the Dominion. The importance of utilizing natural mineral wealth is so well recognized in Germany that the Government works the majority of the mines. In France all mining engineers are Government engineers; and in England the Government supplies inspectors in all the mining sections, and a record-keeper to collect statistics, while private enterprise does the rest. What is the Government of Canada doing, and what has it ever done, toward furthering and encouraging the development of our mineral resources?

The vast extent of Canada's territorial possession renders it practically impossible for the staff at present employed on the Geological Survey to do more than devote attention to the geological features of the country. It is of course very important that we should have a knowledge of the geological formation of our Dominion, but that her mineralogical features should be almost entirely neglected is not to the best interests of individuals, of our people as a whole, or of any section of our community. A mineralogical and mining department should be attached to the Geological Survey, whose duty it would be to collect and dispense information relating to the mineral deposits in all parts of the Dominion, and to keep records of mining statistics. Up to the present day we have no official record of what has been accomplished by Canadian miners, and no official reports relating to our mineral deposits to which capitalists or any one who may desire to engage in legitimate mining can refer. In a few weeks the mineral resources of Canada will be represented at the Colonial and Indian Exhibition in London by upwards of 725 exhibits, which will doubtless lead to enquiry for reliable information concerning the extent and nature of the deposits. From what official records can this information be supplied? Before capitalists can be induced to invest their money in mining enterprises they must be well informed by some unprejudiced and disinterested authority, and what could be more authentic than the official reports and records of a Mineralogical and Mining department of the Geological Survey? Yet such a thing does not exist.

We have stated in former numbers of the REVIEW that capitalists are making enquiries for mineral lands with a view to investing in them and engaging in active mining operations. Such enquiry continues, but while owners of undeveloped properties hold them at exorbitant prices, capital will seek investment elsewhere and the advancement of our mining industries will be impeded. A *mine* may be purchased without risk as there is no difficulty in arriving at its actual value, but a *prospect* must be looked upon purely as a speculation; it may prove worthless and, possibly, it might develop into a bonanza. The investor who risks his money in a *prospect* should, therefore, not be expected to pay as much for it as he might be disposed to give for a developed mine. Capital is the agent we most require in Canada to successfully build up and develop great mining industries. With its assistance much could be accomplished; without it we are helpless to avail ourselves of the mineral wealth which Nature has so lavishly deposited for our use. Let us, therefore, offer some inducement to capitalists to invest in mining enterprises in Canada and not drive them from us by allowing them no margin for profit on their investments

Mr L. H. Shirley, M. E., of Montreal, and Mr. John Lamb of Toronto have, during the past month, made an extended tour through the phosphate district of Ottawa County and visited all the mines in operation. They report having seen some promising undeveloped deposits and that a very large quantity of ore is being raised at the mines.

Dr Selwyn, Director of the Geological Survey, sailed from New York on 11th inst. by s.s. *Britannic*. The Director has gone to England to see that everything is in readiness to receive the Canadian mineral exhibit for the Colonial and Indian Exhibition, and to personally superintend its arrangement. He will remain in England until the Exhibition closes.

Mr. T. S. Higginson returned recently to Ottawa from the Rocky Mountains, where he had been exploring for the past year, and speaks in the highest terms of the prospects for mining in that region. He has brought with him some wonderfully rich specimens of gold-bearing quartz and argentiferous galena from discoveries he himself made the analysis of which have shown the quartz to carry a very large quantity of gold and the galena to yield upwards of $500 in silver to the ton. Mr. Higginson will return in the spring and proceed to open up and develop these locations.

THE PHOSPHATE TRADE.

The phosphate miners in Ottawa County have done good work since the shipping season closed last autumn, and the piles of ore that have accumulated at the various mines offer an imposing sight to people passing through the mining district. Never in the history of this industry in Canada has there been, so early in the year, such a large quantity of ore mined, dressed and awaiting shipment, as there is in stock at this date; and mine owners will not relax their efforts to keep up, and perhaps increase, the average monthly output, which, for the past five months, has run far in excess of the average for the same period in former years. Everything at present points to a largely increased production for this year, and there exists no doubt that during the shipping season of 1886 many thousands of tons will go forward in excess of last season. The quality of the ore, too, is quite up to the standard of 1885, which was as high a grade as has ever been shipped from any phosphate deposits in the world. During the past two years, owing to the attention miners have given to dressing the ore, the product of Canadian mines has found much favor abroad with manufacturers of superphosphates, and as the production increases, as it is steadily doing year by year, in the

same ratio will the industry advance in importance, until the time may arrive when Canadian phosphate will rule the foreign markets instead of the value of our output being regulated, as it is to-day, by importations into England and Europe from the mines of other countries. Miners are

PREPARING FOR EARLY SHIPMENTS,

evidence of which is to be seen at the various shipping points along the bank of the river du Lièvre, where thousands of tons have already been deposited in readiness to be forwarded as soon as the ice will have left the river. Some ore has been forwarded from the mines in sleighs to the C. P. R. terminus in order that the earliest tonnage may be taken advantage of when navigation opens from Montreal in the spring; but, as this is much more expensive transportation than floating the ore in scows down the river, a small percentage of the output has been sent down this winter.

Several new mines have been opened since last season in the townships of Templeton and Bowman, some of which are yielding ore in liberal quantity and of a high grade, and promise to develop into heavy producers. The older mines in the townships of Buckingham, Portland East, Portland West, and Templeton—such as the "Emerald," "Little Rapids," "North Star," "High Rock," "Star Hill," and the "McLaurin & Blackburn" mines—are turning out more phosphate, and of a higher grade, than at any time since they were first opened. The mines are, for the most part, suitably equipped for economic mining; work is being carried on under better management, and more systematically than formerly; and the facilities now afforded for transportation have reduced this item to almost a minimum of cost; the market abroad continues steady, and it is expected that the rate of freight for the coming season from Montreal to foreign ports will not exceed that of last year. Taking into consideration all the important facts we have enumerated in connection with this important industry, it is not unreasonable to predict a most profitable season for Canadian phosphate miners.

STRIKING COLLIERS.

Nearly one thousand hands went on strike at the Cumberland Railway and Coal Company's mines on the 12th inst. These mines have been known formerly as the Spring Hill mines, N. S., and are the largest collieries in Canada. The strike arose among the cutters working in the north slope, who complained of the unsafe condition of their working places and demanded higher pay in consequence. The manager, Mr. R. G. Leckie, would not accede to their demands and a general strike ensued. It was then proposed that a workingmen's committee should be formed to examine the condition of the slope and report to the managers, who expressed a willingness to abide by its decision. Meanwhile the boiler was blown out, the fan stopped and all operations suspended. After the committee had carefully examined the cause of the grievance it decided in favor of the company and work was resumed, the men starting in again on full time. Anything in the shape of accident or strikes that occur to hamper the full working of these collieries is a serious matter and practically a public misfortune.

CANADIAN PHOSPHATE DEPOSITS.

OFFICIAL REPORT

BY THOS. W. HOTCHKISS, ESQ., U. S. CONSUL AT OTTAWA.

In Mr. Hotchkiss's report to the Consular Bureau at Washington he attaches much importance, and justly so, to the rapidly growing phosphate industry in Canada. The statistics of this trade which he has embodied in his report vary somewhat from the figures which have, from time to time, been published in these columns, but they are sufficiently accurate to enable those who read them to arrive at a fair idea of the magnitude to which phosphate mining in this district will attain. Mr. Hotchkiss has advanced theories and presented many points for the consideration of those who are engaged in the manufacture of fertilizers in the United States from mineral phosphate; and, while it cannot be expected there will be a consensus of opinion on all the issues he has raised, it is not unlikely that his report will lead to close enquiry into the actual relations which now exist between the phosphate miners of Canada and the manufacturers in England, Europe and the United States, and may be the means of opening up a new market for the product of Canadian mines.

The Consul's report is as follows:—

"There are but two important industries materially affecting the interests of the United States, connected with this Consular district, viz, the manufacture of white pine lumber and the mining of "apatite" or mineral phosphate of lime.

It is within the last ten years that the discovery was made of the important deposits of apatite in the apparently barren hills of Quebec and Ontario; but for several years all efforts made in its behalf were of an experimental character, and only within three or four years has any practical development of the deposits been prosecuted, or the real value and merit of the mineral as a fertilizer been established.

When, by analysis and actual use, it had been demonstrated that this mineral was composed of 80 to 90 per cent. of phosphate of lime, the interest of wide-awake men, commercially and speculatively, was drawn towards it, until it bids fair to become a powerful factor in the industries of this section. Its development and production is rapidly increasing, and as the profits, thought to be very great, become more widely known, it is reasonable to expect a still more rapid development.

SITUATION OF THE DEPOSITS.

Examining the map of Canada it will be found that the Ottawa River is the dividing line between the province of Ontario and the province of Quebec. Crossing the Ottawa at Ottawa City (which river is navigable from Ottawa City to its confluence with the Saint Lawrence, near Montreal), we are in the province of Quebec; continuing northerly for eight miles will bring us into the township of Templeton, in the county of Ottawa, and the region of the phosphates. Go north-east from Ottawa City 20 miles, and the township of Buckingham is reached. Here will be found the best deposits that have as yet been developed. All this district lies less than 70 miles north of Ogdensburg, N. Y.

New discoveries are constantly being made, and new "phosphate properties" offered in the market. Other deposits, however, less in extent and value, are found in other parts of the Dominion.

EXTENT OF MINING.

In the earliest stages of this mining it was conducted in a rude, primitive manner, as well from want of capital as lack of the necessary experience, and as usual in such cases with doubtful success. In a few cases it must be admitted, through the failure of the deposit, it resulted in the suspension of the enterprise.

In the last year matters have immeasurably improved. British and American capitalists have so increased their means and abilities that the industry is placed in a lucrative condition.

SHIPMENTS OF PHOSPHATE.

The following table will show the shipments from Canada for the past three years of crude apatite:—

Years.	Quantity.	Value.	Value at Montreal.
	Tons gross.		Per ton.
1882	16,585	$333,019	$20 68
1883	19,466	421 962	21 67
1884	23,000	519,000	20 25

The shipments for 1885 are known to exceed 25,000 tons. The district alluded to mined in 1884 20,353 tons, the balance of the output for that year going from the smaller workings along the Rideau canal in the vicinity of Kingston.

When the Canadian phosphates were first introduced in the market they were naturally looked upon with great suspicion, through a want of reliable knowledge of their value as a fertilizer; but at this time the condition is entirely reversed, every pound of the output being contracted for in advance of its production.

As mined it is of every shade of color, from a light gray to nearly black. From irregular "pockets" in small deposits, as well as in large blocks and masses, in apparently inexhaustible volume—superficial, shallow, and down deep in the bowels of the hills—now mixed with pyroxenic rock, gneiss, mica, etc., which usually accompany the deposit in this country, to solid masses of almost pure phosphate.

QUALITY OF THE DEPOSIT.

Being a more concentrated phosphate than is known to exist in quantities in any other part of the world, it is greatly sought for to bring up the acid phosphate fertilizer to a high percentage of phosphoric acid.

Regarding the value of this "apatite" as a fertilizer, a reliable authority states that Canadian phosphates contain 89·91 per cent. of trihasic phosphate of lime, according to a most authentic analysis. A comparative table of the analytical composition of phosphates recently published shows that with the exception of three limited deposits in the West Indies, and one in Spain, the Canadian apatite ranks the highest. Also recent foreign official reports show that in those portions of Europe where the sugar-beet is extensively cultivated—France, Belgium and Denmark, notably in France—no fertilizer has been found to equal the mineral phosphates of Canada.

MARKETS.

To the present time the demand has been entirely European, mainly in Great Britain and Germany, though France would take the entire output if she could secure it.

But 254 tons in 1883 and 221 in 1884 went direct to the United States, while Great Britain exported to the United States in 1883 1,262 tons of crude and 7,766 tons of manufactured or superphosphates,—this latter (and possibly the "crude") undoubtedly being Canadian crude chemically treated and returned to America.

The statement of a member of the Canadian Geological staff; that "much of the material mined in Canada, sold and exported to Europe, has been and still is re shipped to the United States, either in a raw or manufactured condition," confirms what the statistics seem to show. Mr. Torrance, of the Canadian Geological Survey, in his last report on the phosphates of this district, also states that "as 1,262 tons of crude phosphate and 7,666 tons of superphosphates were imported into the United States from Great Britain last year, it is highly probable that a very considerably quantity of our Canadian apatite has been used in enriching American lands, after a voyage across the Atlantic and back to the United States."

Here we have indubitable authority that this state of affairs prevails. Does it not become us speedily to seek the cause? It is surely extraordinary in the face of the admitted shrewdness of even the average American merchant. Does it not also suggest the possibilities for fraud and adulteration?

Is there not in this risk alone sufficient to appeal to the intelligence and shrewdness of the American dealers in phosphates and fertilizers? If not, let us see what benefactors our German friends are to the agricultural interests of the United States. This may assist towards sounder views of "protection."

IMPORTS OF PHOSPHATES INTO THE UNITED STATES.

The importation of crude phosphates into the United States in 1883 and 1884 from all countries was as follows, viz.:—

Countries.	1883.		1884.	
	Tons.	Value.	Tons.	Value.
Danish West Indies	275	$ 865	219	$ 1,553
France	102	682		
Germany	44,631	307,570	10,131	67,737
England	1,262	21,081	8,507	157,772
Canada	23	4,430	221	4,325
British West Indies	2,547	25,088	1,365	9,270
French Guiana	270	2,050	125	500
Hayti	235	1,767	590	2,340
Cuba	190	847	81	491
Porto Rico	231	1,625	533	5,115
Dutch West Indies	2	25		
Total	49,331	$369,331	21,910	$223,513

Average value, per ton—1883, $9.78; 1884, $11.08.

The foreign buyers of Canadian phosphates pay from $12 to $18 per ton for [illegible] here, and have paid $20 for 80 per cent. phosphate, delivered on boats at the river (to be taken to Montreal for ocean shipment).

The table shows that the average value delivered in the United States from England, Germany, etc., was $9.78 and $11.08 per ton for the years 1883 and 1884 respectively, and also states the market value here, where produced, about $18 per ton (never less than $12 per ton) for 80 per cent. phosphate. I ask: on what hypothesis or by what method of higher arithmetic can this character of commercial traffic be satisfactorily explained other than through the medium of gross adulteration?

By the table given of Canadian production it will also appear that the Canadian phosphates would have supplied one half the United States demand in 1883 and the entire demand in 1884.

But again, to summarize the case, it apparently shows that the average cost of Canadian crude, as paid by the foreign buyers in 1883, was $21.67 per ton; that the average value as entered in United States customs, imported from foreign countries in 1883, is $9.78. It was purchased in the lump, freighted to Europe, there crushed and pulverized by grinding or otherwise, and returned to the United States valued at half its original cost.

When we consider that Canadian phosphate yields 75 to 90 per cent. of pure phosphate of lime, and that its equal in purity is not found elsewhere in any appreciable quantities, is it not surprising that its intrinsic value should be so little recognized by those who require it to the extent which characterizes the known wants of American agriculturists? And, too, when by a little effort on our part (I speak as an American) every pound needed can be mined here by American industry, placed direct in the American market in its purity, and at a largely reduced cost, quality considered.

MINES.

The Emerald and Star Hill mines, owned and worked by American capitalists, it is stated paid dividends of 30 per cent. to their shareholders last year.

The High Rock mine is owned and worked by an English company, while several smaller interests are worked by individual Canadian enterprise. Up to October 1st, 17,853 tons had gone forward during the present season.

The system of mining is constantly being improved as experience dictates its necessity, the variableness of its stratification compelling frequent changes in method in the interest of economy.

The larger portion of the productive workings are on the bedded deposits; these, however, for the most part are opened only by shallow pits, a condition of things which is explained by the peculiar character and the frequency of the deposits, as also by the economic value of the apatite reached.

This mineral, unlike ordinary ores, is in its crude state a merchantable article of considerable value locally, and finds a ready sale even in small lots of 5 and 10 tons.

The average cost of mining at the better developed deposits is said to be about $3 per ton, gross. Three to four dollars per ton will place it in Montreal for foreign shipment, or thence by the Lake Champlain route to New York; or about the same cost will put it at any of the shipping points between Montreal and Kingston, on the St Lawrence River, for re shipment to the frontier ports of the United States, on any or all the lakes to their western limits. It is well known that any freight of this character moving west by water is carried at nominal figures for its benefits as ballast.

USES OF PHOSPHATES.

The demand for proper fertilizers is limitless, and must remain so.

"The grain exported from Montreal alone, in a single year, has been estimated to contain 2,574 tons of phosphoric acid, which implies the total exhaustion, so far as phosphates are concerned, of 75,000 acres of wheat land, the renewal of which would necessitate the application of 6,000 tons of phosphates." If this be true—and it comes from the highest authority—what could be written of the stealthy exhaustion of the great agricultural districts of the United States, and their present and future necessities?

What possibilities through this crude mineral await the redemption of those hundreds of thousands of acres of once valuable Southern lands "corned to death," and now lying to waste in worthless "sage grass," begging for buyers at $1 per acre and even less?

What possibilities also await the enterprising American who shall engage in this business of bringing this wealth, now hidden in these mountains, to the doors of the American agriculturists?

OPPORTUNITY FOR AMERICAN CAPITAL.

If any prejudice exists as regards Canada, its climate, or its people, I answer that it is misplaced. The people may not be quite as bold and venturesome in enterprise as Americans, but are just as reliable and industrious, and as fully appreciate the dignity of labor.

No people under the sun entertain a more friendly or more exalted regard for the Americans and their characteristic vim, push, energy and shrewdness, than do the Canadians. This is outspoken and unquestionable. There is no class of newcomers who will be more heartily welcomed than the enterprising American. The general good health is seen in the countenances and in the actions of the people. The school system is in all respects fully equal to the educational facilities of the United States. The habits, customs and social atmosphere of the Canadians will not be found uncongenial to Americans.

The cost of living is fully equal in all respects to that of any portion of the Northern States, but not greater. Taxes are a trifle lighter.

Mechanical and day labor does not materially vary from that prevailing in the State of New York, outside of New York City. Shipping facilities are first-class, and freight rates are in general keeping with the ordinary course of rates in the Northern States, which is the natural result of that grand system for transportation so liberally fostered by the Dominion government.

I cannot close this already lengthy report without calling especial attention to the apparent apathy of American capitalists towards this enterprise, which not only promises such remunerative results, individually and commercially, but which is of such vast importance to the agricultural interests of the United States.

If the statements made and statistics given, are reliable, is it creditable to the alleged business sagacity and far-seeing and far-reaching proclivities which are supposed to be so characteristic of the typical American, that this apparent non-interest should exist towards this promising enterprise?

The United States Government admits this article free of duty, and the Canadian government and people are inviting us to come and get it. Neglecting to do this, we are allowing Continental Europe to gobble every pound of the production, pay the freight twice across the ocean, with all the incidental expenses attached to such procedure, and with no known check on its adulteration we complacently purchase it at last at a value that necessitates its re-sale to the agricultural community at a price that virtually amounts to prohibition.

I ask, are not national as well as commercial issues involved in this matter?

(Signed) Thos. W. Hotchkiss.

United States Consulate,
Ottawa, November 23rd, 1885.

ASBESTOS MINING.

This has become one of the most important industries of the Eastern townships, and the annual production of asbestos of superior quality is increasing year by year. In a few years hence the shipments from the various mines will doubtless have assumed large proportions, as the deposits are sufficiently extensive to be capable of yielding this valuable mineral in much greater quantity than miners have yet attempted to produce. For the season of 1885 the shipments from the district aggregated about 1,500 tons, to which the following mines contributed, approximately, the amount set opposite their respective names:—

Johnson's Company mine	383 tons
Boston Asbestos Packing Co.'s mine	379 "
King Brothers' mine	198 "
Ward mine	102 "

The ruling price obtained for the output of last season was $80 per ton (2,000 lbs.) delivered

on the cars of the Quebec Central Railway, which runs alongside the mines, as it came from the pits, without classification of quality. Work at these mines is usually suspended about the 15th November of each year and resumed about the 15th April following. It is thought, however, that operations can be prosecuted profitably the year round, and the experiment is being tried the present winter by the Anglo-Canadian Asbestos Company at its mines at Black Lake. If this company can successfully demonstrate the practicability of mining asbestos to advantage during the winter months, other mine owners will of course follow its example and the industry will thereby be greatly stimulated. The quality of the mineral has gained a world-wide reputation, and as the production increases so will the demand expand in like proportion.

MICA IN CANADA.

It is within the past two years that mica of the best quality, known as *Muscovite*, has been discovered in Canada in marketable sizes and in paying quantity, and to-day we know of several deposits capable of being developed into fairly productive mines. Two in the county of Frontenac, province of Ontario, show well-formed, large crystals at the surface embedded in white quartz; another in Wakefield, county of Ottawa, has been uncovered and numerous crystals have been exposed, which, though small, are of excellent quality; in the Lake Superior and Lake of the Woods districts good mica has been discovered in paying quantity, and a company has been formed in Winnipeg to work an important deposit in the last mentioned locality. In British Columbia also a fairly good quality is known to exist, but no attempt has yet been made to prove the sizes of the available crystals or the extent of the deposits in that province. Some small amount of development work has been done on a deposit about 60 miles from Berthier, east of Montreal, but work has for some time been suspended at this point for reasons unknown to us. The *Villeneuve* mine in the county of Ottawa, of which mention has frequently been made in these columns, has been worked continuously during the past year and has produced many thousands of pounds of mica, perfect in quality, and in sizes varying in dimensions from the ordinary sized sheets used in stoves up to plates measuring 14x12 inches. This mine yields a steady output, and with a little more development will be capable of yielding an almost unlimited annual production. Some specimens of mica have been forwarded from the Villeneuve mine to the Colonial and Indian Exhibition, and we will be much disappointed if they are not pronounced by judges to be of equal quality to any that is produced in any quarter of the globe. Samples that were sent to the Antwerp Exhibition last year created much surprise among the mica dealers of Europe, some of whom expressed a preference for its quality before what they had been receiving from East India and North Carolina.

EXPORTS OF IRON AND STEEL FROM GREAT BRITAIN TO THE UNITED STATES.

	Eleven months ended Nov. 30.		
	1883.	1884.	1885.
	Gross tons.	Gross tons.	Gross tons.
Pig iron	269,395	151,154	99,632
Old iron for manufacture	42,005	24,842	10,359
Steel, unwrought	27,336	12,726	12,570
Tin plates	201,760	195,973	207,318
Hoops and sheets	28,115	19,867	20,861
Bar, angle, bolt and rod	8,328	4,171	2,010
Railroad iron	69,269	17,829	5,469

Colonial and Indian Exhibition.

Canadians, especially those who are interested in the mineral resources of the Dominion, will be gratified to learn that their country will, in all probability, take the lead with her exhibit of the product of the mine at the great Exhibition which will open in London, England, on May 1st. During the past decade of years the mining industries in Canada have advanced so rapidly that we are able to-day to send to London upwards of 725 exhibits of ores and minerals and their products, whereas but 549 specimens were exhibited at the Centennial Exposition at Philadelphia in 1876. To this department each of the provinces, with the exception of Prince Edward Island and Manitoba, has contributed very creditable exhibits, which will, no doubt, be carefully classified and arranged on their arrival in London, so as to be seen to best advantage, under the supervision of Dr. Selwyn, Director of the Geological Survey, and his able assistant, Mr. Chas W. Willimott, who will shortly proceed to England to take charge, under Dr. Selwyn, of Canada's mineral department in the Exhibition. As far as we can learn the different provinces have forwarded mineral exhibits as follows:—

NOVA SCOTIA.

Gold, Silver Copper, Antimony, Lead, Manganese, Iron, Coal, Gypsum, Barite, Infusorial earth; also building materials—such as Granite, Sandstone, Brick, Drain Tiles and Lime. This province will be well represented and her exhibits will be as attractive as those from any of her sister provinces.

NEW BRUNSWICK

has forwarded exhibits of Copper, Antimony, Manganese, Iron, Coal, Albertite and Infusorial earth; besides granite columns, red and grey, from the St. George quarries, and the products of other quarries, all dressed to show tooling, etc. The province of

QUEBEC

has contributed Gold Nuggets from Beauce district, Copper, Antimony, Nickel, Manganese, Iron and Chromic Iron ores; also a fine exhibit of Apatite, Mica, Asbestos, Graphite, Celestite, Magnesite, Soapstone, Potstone, Felspar and Iron Ochre. Amongst the above are some rare and very valuable specimens—notably a solid block of graphite, forwarded by Mr. Walker of this city, weighing 3,000 lbs.; a specimen of apatite, from the McLaurin & Blackburn mine in Templeton, weighing 1,600 lbs., and a magnificent apatite crystal weighing 500 lbs., the property of Mr. W. A. Allan of Ottawa. In addition to the foregoing there are some fine specimens of marble, cut and polished, together with samples of Granite and Porphyry from various parts of the province. The Canadian Granite Company, whose extensive works are in this city, have exhibits of beautifully dressed and polished granite, marble and serpentine columns from their own quarries, and some artistically turned serpentine card receivers. Quebec also forwards a vast variety of specimens of her building stones dressed to a uniform size and showing the various dressings, thereby enhancing the value of superior stones and detracting from those of an inferior character.

ONTARIO.

This province has sent Gold-bearing and Silver-bearing ores and some very fine specimens of the Sulphide of Silver from Rabbit Mountain (Lake Superior District). Lead, Copper and Iron ores are also well represented, the latter by about 40 specimens from all parts of the province, weighing from 50 to 300 lbs. each. A handsome specimen of Barite from Pakenham, pure white, is worthy of mention. Gypsum from Brant county and neighborhood, Salt and Brine, Apatite, Mica, Molybdenite, Pyrite, Pyrrhotite, Kaolin and Lithographic stone are among the exhibits. Besides these there are some fine columns of marble and granite and dressed building stones from a large number of quarries, many of which cannot be surpassed for beauty. Mr. Waterman of London, Ont, has forwarded a large exhibit of Petroleum and its products. Brick and Drain Tiles, for which the province is famous, are also well represented, and it is expected that a large collection of mineral specimens will be forwarded from the Thunder Bay mining district. From the

NORTH-WEST TERRITORIES

there are some fine specimens of Coal, taken from the Galt and Banff mines and from other localities; and

BRITISH COLUMBIA

contributes a collection of Gold from numerous claims, Silver-bearing ores, Copper (native and sulphide) and Iron ores. She also sends fine specimens of Coal weighing from two to four tons, including anthracite from Queen Charlotte Islands. These, in addition to cut and polished blocks of marble and cubes of building stones, make for our western province a good display.

The foregoing will give some idea of the extent of the Canadian mineral exhibit. The care with which all the specimens have been selected is sure to make this department one of the most interesting of the Exhibition and should attract foreign capital to the country for the development of our vast and rich mineral deposits.

HURONIAN MINE.

Frequent reference has been made in these columns to the operations which have been in progress at this mine during the past year or more, and it will, therefore, be of interest to some of our readers to know the present condition of the mine, and to learn of the many natural advantages the property possesses as a mining location.

The *Huronian* gold and silver mine is situated 75 miles from Port Arthur, to the westward, and 50 miles from Savanne station, a point on the Canadian Pacific Railway. During the past year this mine, at which there is a ten-stamp mill, with amalgamated copper plates for free milling and Frue vanners for concentrators, has been tested by its own mill-work with most satisfactory results, and proved to be a very valuable property, capable of a large production, and for which the mine is being developed and equipped. The main shaft is down 150 feet, and a second level has been started. The aggregate of the levels already driven is 260 feet, and a winze, now being sunk to meet the first level, is down 75 feet. The mill tests have shown that the entire vein-stone of the lode is pay-ore; and the vein, which is a true fissure cutting the stratification of the Huronian talcose slates, which form the country rock, has an average width of 5 to 6 feet. In places this vein produces rich sylvanite ore, a compound of gold, silver and tellurium, which is selected for smelting without being put through the mill. The vein-stone is uniformly charged with sulphurets, besides showing a considerable sprinkling of free gold. Not long since a segregated vein, large and rich enough to be worked profitably, was discovered, running with the formation and joining the main fissure about midway between the shaft and the mill. Near the point where it intersects the main vein the winze is being put down,

it being thought desirable to find their junction in the drifts to the south-west, where an unusually rich body of ore is supposed to exist.

The property is well supplied with good timber for fuel and all mining purposes, and a saw-mill attachment to the stamp-mill produces all requisite lumber. A small stream runs through the property in a valley which forms an excellent meadow for hay and pasturage; and on the location, which covers an area of 160 acres, there is good arable land for the production of cereals and root crops. The mill is supplied with water from a small lake on high ground near by, and in every way the mine is admirably situated for working. These important advantages, together with the fact that the veins are so reliable, render it not unlikely that the *Huronian* will make for itself an enviable name as an extensive producer and a dividend-paying mine.

A company has applied for a charter for a railway to connect this mine with the Canadian Pacific Railway and Port Arthur. It is expected that the line will be in course of construction within a few months, and when completed it will not only be of great service to the owners of the *Huronian* mine, but will pass through the new silver region to the west of Port Arthur and supply the miners now working there with railway facilities, of which, at the present time, they are seriously in need.

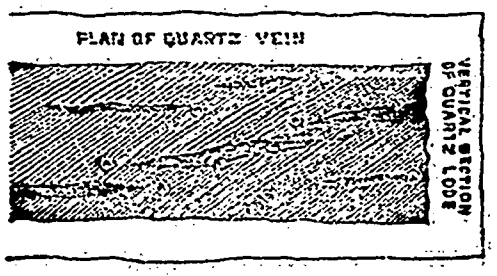
"PAY STREAKS."

NOVA SCOTIA GOLD FIELD.

By G. Henry Kinahan, M.R.I.A., etc., Dublin, Ireland.

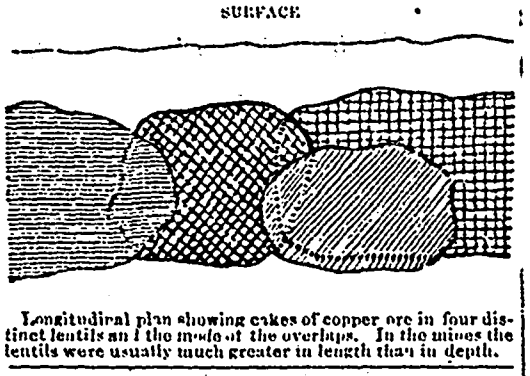
To the Editor Canadian Mining Review.

In the paper on the Nova Scotia gold mines read before the meeting of the American Institute of Mining Engineers at Halifax, Mr. Gilpin regrets that no deep sinking has ever been made below the *pay streaks* to learn whether they set on again or not in depth. I, however, would suggest that perhaps drivings or cross-cuts might be better, if made across the quartz lodes whenever the *pay streak* thins out, either in depth or length. The accompanying rough sketch will represent either the plan or the vertical section of a quartz lode:—



In it shrinkage fissures formed (A, A, A, A, A, A), to be subsequently filled with minerals or metallic ores. Such fissures are not uncommon in lodes, the so-called "strings" or "leads" in many lodes being filled up small fissures of this class. They, however, in some ground occur of a magnitude sufficient to be compared with the *pay streaks* of the gold miners, as was the case in the *Cronebane* mine, Ovoca, Co. Wicklow, Ireland. In this mining sett there is a wide mineral channel made up principally of "iron-masked" or pyritous rocks. On or along the north or "footwall" of the channel lay the "great sulphur lode" (iron pyrites), while in the ground between the sulphur lode and the south or "hanging-wall" the copper lodes occurred. The latter appears to me important, as the mode in which they occurred may bear on the nature of the *pay streaks*.

The *Cronebane* copper veins occurred in vertical lentils of various thicknesses, lengths and depths, that, nearly invariably, gradually died out; the paying portion of one lentil seldom overlapping the paying portion of the next.

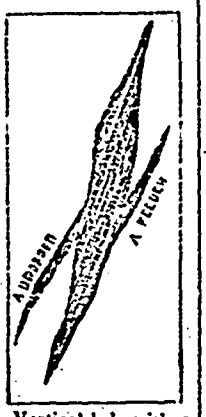


Longitudinal plan showing cakes of copper ore in four distinct lentils an I the mode of the overlaps. In the mines the lentils were usually much greater in length than in depth.

Experience taught the miners that it was a waste of time and money to follow a lentil in depth or length; while if they drove horizontally across the ground they might come to a "copper streak;" on following which they came to a paying lentil.

It is evident that the quartz veins of Nova Scotia must have shrunk, as otherwise the lentils now occupied by the *pay streaks* could not have been formed. During the shrinkage of the quartz vein one continuous fissure might have formed; this, however, does not appear to have been the case in any recorded instance; therefore it is natural to suppose that, as at the *Cronebane* mine, a number of minor fissures were formed, each one beginning in length or depth at or near the end of that in its neighborhood, as roughly represented in the sketch. To test whether the *pay streaks* are of a similar nature to the copper veins of Cronebane should not cost much time or money, and if the trials were successful the resources of this field would be considerably augmented.

I may mention that in depth the Cronebane copper lodes were cut out by the sulphur lode underlying considerably southward—a string coming into the vein from above (a "feeder") made the vein rich, while a "dropper" or one going down from the vein, made it poor.



Vertical lode with a "feeder" and a "dropper." Cronebane mine, Ovoca, Co. Wicklow, Ireland.

Copper Smelting at Sydney Harbor, Cape Breton, N. S.

The proposed operations of the Coxheath Copper Company at their property on Sydney Harbor, Cape Breton, include a railway, narrow gauge, about six miles long, from the mine to Sydney Harbor, a large smelting furnace, and an extensive refining and concentrating establishment. The shafts are to be deepened and levels started to yield 100 tons of ore a day. The natural facilities for smelting copper ore in Sydney Harbor are unsurpassed even by far-famed Swansea. The coal seams yield an excellent coke, one ton of which will smelt eight tons of ore. Limestone and iron-ore are abundant in the vicinity of the furnace site. Already foreign miners and exporters of copper ores are enquiring about the terms on which their ores can be purchased by the Coxheath Company, who feel confident that with the natural facilities of their ores and position they can deliver *matte*, or refined copper to the English or Continental markets at figures far below those now quoted.

CORRESPONDENCE.

Iron Smelting in Nova Scotia.

Editor Canadian Mining Review.

HALIFAX, N.S., January 31st, 1886.

DEAR SIR,—The question of iron smelting has, as shown by Mr. Bartlett's paper referred to in your last issue, long engaged the attention of Canadian speculators. At present I believe that in Nova Scotia only is there any iron smelting. A review of Mr. Bartlett's paper speaks of the Londonderry Iron Works as if from their start some thirty years ago large expenditures had been continuously made on them. I have always understood that the early operations for the manufacture of charcoal pig were economically and successfully conducted, and I know that the troubles did not begin until the attempt was made to erect a large steel-making plant. Owing to well understood reasons, large amounts of capital were unnecessarily expended, and the problem of steel making was not solved. For several years past the furnaces have made large amounts of excellent pig, which has been largely made into bar iron, and the present "liquidation" is for the purpose of re-arranging the company on the basis of iron, not steel making. Should the contemplated amalgamation with the Springhill Collieries be consummated it is expected that the place will be remodelled to meet the present requirements of the Canadian iron and steel trade. Experience has shown that iron can be made here at cheap rates, but the difficulty has been the low price of English pig, and the nominal freights on it from Liverpool to Quebec and Montreal, which allow it to be carried as ballast. There are also other difficulties incident to breaking in on the relations between sellers and the English makers which have retarded the progress of Nova Scotian iron in the upper provinces. However, it is certain that the quality of the Londonderry iron made from a high grade ore is gradually gaining for it a sure foothold in our various markets, and as the prices of English iron appear to have reached the lowest point, the prospects are that the Nova Scotia iron business will have a good futufe before it.

X.

MANCHESTER, ENGLAND,
January 15th, 1886.

Editor Canadian Mining Review.

Sir,—In your issue of November, 1885, I have read an article entitled "*A new use for Asbestos.*" I have used asbestos for the past four or five years in my own print works here in the manner described, viz., for covering rods where exposed to steam, and have found it to answer the purpose very well. It never wears out, but becomes so soiled with color that it would stain our goods, and we are obliged to renew it on that account.

In the same issue of your paper, as well as in the January, 1886, number, attention is called to a material known as *mineral wool*, which you have described as an excellent non conductor, and to this I beg to take exception. *Mineral wool does not* possess "*excellent non-conducting qualities.*" I have had steam-pipes and a steam-boiler covered with it, and in the case of the boiler I did not find it to answer the purpose as well as *saw-dust* used in the same way.

A. B.

Our correspondent's opinion of the value of *mineral wool* as a non-conductor is strangely at variance with the opinions expressed in letters from engineers and others addressed to manufacturers of this material, and on which the articles in question were based.—[ED.]

CORRESPONDENCE.—*Continued.*

SOCORRO, NEW MEXICO,
January 28th, 1886.

Editor Canadian Mining Review,
Ottawa, Canada.

Sir,—In reply to your remarks on the Canada Consolidated Gold Mine, in Hastings County, Ontario, as expressed in the issue of your paper for the present month, I beg to say that I have been well acquainted with this property; also the old "Dean & Williams," the "Fiegel," "Richardson" and several others in the townships of Marmora and Madoc, and know their ores as far back as 1875. Considering their favorable situation, in the midst of an agricultural and lumber country; the cheapness of labor, fuel and material; the large size and richness of the veins, and other advantages, nothing has been needed but good practical management and economy to make these properties productive and paying mines. In the case of the "Canada Consolidated," with a fine reduction plant and plenty of working capital, it should have always been a dividend-paying property instead of a drain on the pockets of the shareholders.

As there is nothing in the ore that requires more than careful milling, elaborate and costly machinery only serves to lose that which it is supposed to save, besides making the operation expensive. In 1876, in the "Fiegel" mill at Malone, I demonstrated the fact that ores from the old "Dean & Williams" and "Gatling" properties could be profitably worked. The "Fiegel" property, which had been considered worthless, I worked successfully for more than a year with an old rattle-trap mill with no other machinery than an engine and two cracked five-stamp batteries, with little or no capital at my disposal, and the ore was not as rich as that taken from the "Gatling" and "Dean & Williams" properties.

It is very evident, by your showing, that there must be loose and extravagant management where a vein with an average width of seven feet, yielding $15 in gold and rich in arsenic, is not worked at a profit. The arsenic alone contained in the ore would yield a profit under intelligent and economical management, and in this far-away and expensive country such a property would be considered a *bonanza*. With the facilities and advantages enjoyed by miners in the district which I have already referred to, the gold ores of North Hastings can be treated at a cost not exceeding $6 per ton.—

DONALD MCRAE.

THE ONTARIO GOLD MINING COMPANY.—This is the name under which an association has been formed and incorporated under the laws of the State of Michigan to carry on a general mining business in the United States, and starting with property located in Boulder county, Colorado, with the chief business office at Toronto, Canada, but with a branch office at Detroit. The directors are Alfred H. Page, president; James Patterson, vice-president; Clarence J. I. McCraig, secretary; Liscom R. Paige, general manager and treasurer; and Jas. S. Gavin, of Toronto and J. W Fletcher, of Detroit. The capital stock is $2,500,000 subdivided into 100,000 shares of the par value of $25. Twenty thousand shares of stock have been placed in the treasury as the base of a working capital. The general manager, it is stated, has twelve years' experience in Arizona, California and Colorado.

Specimens of iron brought from Greenland, and hitherto assigned to meteoric origin, are now found to be part of the products of the country.

MINERALOGY GEOLOGY SCIENCE

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

How Silicates rank in the Mineral Kingdom.

One very evident fact, the mere tyro in the study of nature cannot fail to observe, namely, the constant gradation and progression of more and more perfect beings in the immense scale of the Creator's works. Take for instance the animal world At one end of the series, what do you meet? Organisms so imperfect as to call in question their right to be classed with living beings. In them all the organs are simplified and few in number. Natrition, sensation and motion must in turn depend upon the same organs, for nature has refused them separate means of operation. One step higher and we report progress. The process of nutrition has its own organ, the body cavity; and even in the next higher class the body cavity is reserved to more general purposes, and the animal is supplied with a distinct alimentary canal. The student in zoology can pursue this ascension into the higher grades of animal creation, till he comes to a class clearly distinct from all its predecessors—the vertebrates. In these he finds a superior system of sensation, served by a most perfect nervous organization, and protected by that most admirable of all structures, the vertebrated skleton. Now it is evident that a scientific classification is not a classification at all unless based upon nature. Such men as Cuvier could not have ignored this elementary maxim. They were too familiar with the ways of mother nature, not to fashion their system of classification in such a manner as to bring forth as much as possible the wonderful gradation just alluded to. Hence that admirable classification which enables the youngest student to take in at a glance the whole order of the animal creation; a classification which satisfies the more advanced student and is a sure guide to the original investigator who treads unaccompanied the new and immense fields of natural science.

Can Mineralogy boast of such perfection in its system of classification. At first sight we give it credit for extreme simplicity, but we are soon impressed by its most intricate complexity. Mineralogists have adopted two different methods of classifying minerals, both based nevertheless upon the same principle so that whatever is said of the one is sure to apply to the other. All minerals are immediately grouped according to one of the elements they contain. If the acidic element be chosen we have as many groups as there are negative elements. The entire kingdom is then subdivided into oxydes, chlorides, sulphates, carbonates, silicates, etc. If on the contrary we adopt the basic ingredient the number of positive elements determines the number of distinct groups; hence the calcium, the strontium, the Iron, the copper, the manganese groups, etc, etc. How different from the classification in zoology and botany! In Mineralogy there are no such divisions as sub-kingdoms, classes, orders or families. The kingdom is immediately subdivided into genera. As a natural consequence the continual gradation which we remarked in the other system, is entirely absent. All these groups are on an equal footing. Whilst in the classification of animals, a superior class is found by adding to all the essential qualities of the inferior one, some new property which gives it its title to superiority; in Mineralogy no group borrows from another. Standing on the merits of their respective elements none of which has any right to lord it over another, each stands aloof single in its constitution, unsurpassed in its perfection without a superior or an inferior. All are equal, presenting in fact such a model as a nihilist or a communist might dream of for a democratic government.

But why complain? Is not this system the only one possible for minerals? Does it not come from nature itself? If so we must be silent, as all attempts to improve or correct nature must need prove abortive. Yet the defects of the system are painfully evident. Shall we lay them at nature's door? I say we ought not. The very fact that nature has suggested a completely different order in the other kingdoms strongly favors the presumption that she does likewise in the mineral kingdom.

But we are not trusting solely to presumptive argument. A cursory review of the mineral world will suffice to show that if the universal law of gradation is absent from the class of minerals, the fault is ours, not nature's. We should not forget that Chemistry and Mineralogy are inseparable and therefore that it is in the light of chemical principles that Mineralogy is to be studied.

The first class of mineral bodies which we meet in nature comprises the elementary bodies, consisting of atoms all of one kind. Simple in their constitution they are also remarkably similar in their mode of occurrence, and what is of still greater importance similar in this crystalline structure. One instance out of many will suffice to illustrate this observation. All the metallic elements which occur native, crystallize in cubes or octahedrons of the first system; with only three exceptions and these three: arsenic, antimony and bismuth, take the form of a rhomohedron which to all intents and purposes might be called a cube as its angles are very nearly right angles. Leaving aside the elements, we meet with minerals composed of two different elements. These are not only more complex in their constitution but they exhibit a greater variety in their crystalline forms and comprise classes of great importance owing to the number of minerals they contain and the many interesting laws both chemical and crystallographic to which they conform. The mere mention of oxydes and sulphides will suffice to call attention to the vast importance and decided superiority of this second group.

But we have not yet reached the summit of mineral perfection. Heretofore we have had none but minerals of a constant chemical composition; that is, minerals containing the same elements in the same proportions so long as the identity of the species is preserved. We now come to another class in which we find that perfect chemical constitution and perfect crystalline form, which are the two only perfections that minerals are acknowledged to possess. This is the class of the ternary compound substances in which chemical affinity, no longer restricted to two elements, asserts itself in the combination of two or more binary compounds. The most remarkable of this class are the carbon compounds and the silicates, both eminently characteristic of this third and highest group of mineral substances. Between these two groups the analogy is most striking. Their fundamental elements, carbon and silicon, are closely

allied. Both have a high and varied equivalence, which is an essential condition for producing a multitude of compounds with each of the other elements. Both elements are abundantly distributed in nature. It is almost exclusively in these two series of compounds, namely, hydrocarbons and silicates, that we find that wonderful variety of chemical composition which corresponds to a single simple formula. In them, too, were first observed and afterwards perfectly established those laws of multiple proportion and replacement by mutual equivalence, which the great chemists of the latter part of this century have illustrated.

The narrow limits of this article must exclude many interesting observations that might be made upon the beauties of chemical formulas; the nice distinctions that determine the fixed boundary between bi-silicates, uni-silicates and sub-silicates; the greater perfection of crystallization in carbon and silicon compounds corresponding to greater perfection of chemical constitution, and those mysterious relations between chemistry and crystallography which they partly reveal and which very probably hold the key to the future science of mineralogy.

A cursory treatment of these very comprehensive questions would fail to do them justice, but the mere mention of them is sufficient to remind the specialist of their importance in connection with the subject of this paper. Enough has been said however, I presume, to convince the intelligent reader that the very constitution of the silicon and carbon compounds entitles them to a superior rank amongst inorganic beings. But if these two groups possess so many traits of similarity, they differ as regards the end for which they have been created. The carbon compounds being of organic origin constitute that numerous and continually increasing series which result from the union of chemical force with that other still more incomprehensible activity which is called life. The silicates, on the contrary, are almost entirely absent from organic bodies; and whilst carbon reigns supreme in every realm of life, silicon sways the sceptre in the purely mineral kingdom.

The more we study silicates, the more we are convinced that they are the minerals *par excellence*. We may be mistaken, but still we cherish the illusion. A great naturalist has said that in a certain sense the vertebrates alone deserve the name of animals, because in them solely are developed not only the essential character of animal life, but also that perfect organism which contributes so powerfully to the harmonious working of perception which is the specific property of animals. We would say that silicates alone deserve the name of minerals.

First, they have, with few exceptions, resisted the attempts which have been made to produce them by artificial methods. They are nature's own masterpiece, and she is reluctant to reveal the secret of their formation. Again, the ultimate perfection of the mineral is its crystalline structure. The more symmetrical its development, the more varied are the forms it assumes under one fixed and invariable law, and the more it approaches the ideal of a true mineral. Of course it is true that nearly all minerals show a crystalline form; and many, such as calcite, have it with a perfection and variety which is not surpassed by any silicate; but even calcite, when it becomes limestone, assumes such massive forms as to disguise its true crystalline beauty. Not so, as a rule, with silicates. Even when occurring in large dykes they preserve their crystalline structure, very imperfect sometimes, as might be expected, but asserting itself at the first opportunity in the crevices and cavities of the mass in the form of splendid little crystals, which reveal all the geometrical beauty it had been forced to conceal.

Besides, the immense number of the silicates will always make it at least an awkward task to place divisions which include three or four species on a level with one which contains by far the majority of all the mineral species known. Nor can we ignore the important part played by the silicates in the inanimate world. What is that solid crust composed of, which, we believe, separates us from the ocean of fire which is ever rolling its huge waves beneath us? What substances have contributed most to the formation of those vast mountains which form the backbone and ribs of the continents? What material is that book of solid rock made of wherein the past history of our planet has been written by the hand of death? Silicates, yes silicates, the ubiquitious, all-enduring, grand old silicates.

It is among the silica compounds that with very few exceptions we find the gems, those marvels of the mineral world which astonish the scientific analyst still more than the proud possessor who wears them for their brilliancy and beauty.

One word more. In the animal world we divide all animals into vertebrates and non-vertebrates. All the invertebrates possess more or less of the properties peculiar to animal life; but the vertebrate adds to all other perfections that of its solid interior structure. In the same manner, in the mineral kingdom, elements either by themselves or by combination form all the various species which may be called non-silicates; but when silica enters into their constitution, combining with almost every element, it forms another and higher group of minerals, all of which contain that important factor called silica, and possess as a group such distinctive and important characteristics, that I have no hesitation, and trust my readers shall have none, in regarding them among minerals as vertebrates among animals—that is, as the highest sub-kingdom in the kingdom.

SCIENTIFIC NOTES.

Dr. J. Pelletan, writing in *La Nature*, has lately given to the scientific world a description of the Bertrand mineralogical microscope, just constructed in Paris. This instrument which is one of great accuracy is 23 inches in height. The tube does not draw out. The instrument can be moved quickly by means of a rack, and slowly by means of a screw, having a pitch of $\frac{1}{12}$ of an inch. On the head of this screw, is a division with an index estimating movements of $\frac{1}{200}$ of an inch. In front of the tube is another rack, which moves a piece having an aperture for admitting a parallel passage of light, and one for holding an achromatic lens for convergent light. On the body of the instrument is a scale and a vernier, by which the thickness of specimens may be measured. The mirror is double—plane and concave—and may be given any position.

In the *Engineering and Mining Review* Prof. W. P. Blake describes a peculiar specimen of asphalt found in the Uintah Mountains, Utah. Its mineralogical properties are, "hardness, 2 to 2·5; gravity, 1·065 to 1·070; color, black, brilliant, and lustrous; streak and powder, a rich brown. It is a non-conductor of electricity, and is electrically excited by friction." It is easily fusible in the candle-flame, and burns with a brilliant flame. It is most readily dissolved in the heavier and less volatile acids and fats, such as heavy, lubricating petroleum, warm oil of turpentine, etc. It is insoluble in ordinary alcohol. It is dissolved and becomes incorporated with melted wax, producing a mixture resembling "burnt wax" or ozokerite, with the latter of which this asphalt melts and unites. Prof. Blake says this kind of asphalt will probably be used in the arts, as a pigment, insulator and ingredient in lubricating, cereous and fatty mixtures.

Mr. Geo. F. Kunz, the writer of the above-mentioned article in the *Popular Science Monthly*, is also the author of a recent pamphlet on precious stones, being an abstract from the *Mineral Resources of the United States*. It is a very valuable and interesting *brochure*, as may be seen from the following quotations, regarding the diamonds of the United States: Early in 1855, a laborer in Manchester, Va., found a diamond in some earth he was digging. It was put into a furnace for melting iron, when it remained at red heat for two hours and twenty minutes, after which it was found uninjured, and brighter than ever. It was valued in Richmond at $4,000. The cutting, which cost $1,500, reduced the weight from 23¾ carats to 11$\frac{11}{16}$ carats. Being an imperfect specimen, it is not worth more than $400 to day. The first diamond found in North Carolina, was an octahedron, valued at $100; another greenish in color, was found in 1852, in Lincoln Co.; another, a perfect crystal of white color was found in Mecklenburg Co. Other diamonds weighing from one-half a carat to over two carats are said to have been found in Burke Co.

In the current number of the *Popular Science Monthly* there is an interesting article by Geo. F. Kunz, on the famous Chalcedony Park or silicified forest, in Apache County, Arizona. This wonderful deposit consists of about a million tons of silicified trees, and covers a thousand acres. The writer supposes the manner of silification to have been as follows: "The trees were overthrown, and covered with volcanic ashes and tufa; the heated silicified waters, either gushing from springs, or forced up by the violent volcanic action which felled the trees, percolated through the ashes, cooled on reaching the tree-level, and thus produced conditions favorable to silification." The filtration through the tufa of waters from rains or springs would have assisted decomposition, and caused the silica to be set free. These waters, charged with silica in solution, penetrating into the cells of the wood, the cell-walls and fibres were replaced by jasper and agate, while transparent quartz filled the cells. The presence of oxides of iron and maganese in the waters of filtration produces a more rich and varied coloring in these silicified woods, than is found in these of any other part of the world. "The most remarkable feature of the park," says Mr. Kunz, "is the natural bridge of agatized wood, formed by a tree spanning a cañon forty-five feet in depth, and fifty-five in width. The tree is visible for a length of over one hundred feet. It averages three and a-half feet in diameter, five feet at the thickest part, and three at the smallest." It is doubtful whether jade, jasper, or any of those ornamental stones have the richness of color, and the susceptibility of polish, which this agatized and jasperized wood possesses.

The November product of the great Venezuelan gold mine, *El Callao*, was $211,458. The dividend for the month amounted to $77,280, being 36⅔ per cent. of the product.

Proceedings of the Mineralogical Society for the Month of January.

The fifth annual meeting of the Mineralogical Society of the College of Ottawa was held on December 30th, 1885, when the election of officers took place, and the objects and prospects of the Society were discussed.

On January 5th, 1886, the regular work was resumed. Rev. Father Marsan, O.M.I., read a paper on "Silicates and their place in the mineral kingdom," in which he advocated the quite novel proposition that the silicates should be considered as a sub-kingdom. He treated the subject in a masterly manner, and in the discussion which followed disposed of the principal objections which were brought forward. Mr. W. Herckenrath read a paper on the "Mineralogy of Pliny," showing the great strides in advance made by the science since Pliny's time. Mr. D. A. Campbell gave a series of experiments illustrating the coloration of flame. Prof. Macoun, who was present at this meeting, highly praised the objects of the society and laid special stress on the importance of acquiring a knowledge of sciences by practical experiments such as he had witnessed.

On January 13th Mr. Wade Smith read an interesting paper on "sponges," and showed that though apparently quite foreign to mineralogy, they had in reality a close relation with that science. Rev. Bro. Maloney read a paper on the "Twelve Stones of the Essen." By the novel way in which he treated it he made a comparatively dry subject very interesting. Mr. C. C. Delaney followed with experiments showing the action of acids on limestone.

On February 13th Bro. Maloney continued his paper on the "Twelve Stones of the Essen." Mr. D. Phalen successfully performed several experiments illustrating the methods of testing for metals in solution. Rev. Prof. Marsan read an essay on the "lustre of minerals," which elicited an animated discussion.

BOOK NOTICES.

PRACTICAL AND ANALYTICAL CHEMISTRY: A complete course in Chemical Analysis. By Henry Trimble, Ph.G., Professor of Analytical Chemistry in the Philadelphia College of Pharmacy. P. Blakiston, Son & Co., Philadelphia.

This book supplies a want which has long been felt in institutions, where but a limited time can be devoted to the study of analytical chemistry. Most treatises on this subject are too comprehensive for an elementary course; and the result in many instances has been the elimination of analytical chemistry from the programmes of classical courses. Such a step is certainly to be regretted, as chemistry cannot be properly understood, nor students interested in it, when the subject is presented in its least practical aspect. A work was needed, elementary, yet sufficiently complete to give an exact notion of the science, and to enable the student to pursue afterward, if he so desired, a higher course of qualitative and quantitative analysis. This end has been secured by the present publication, which gives due prominence to every fundamental operation, and the most important confirmatory reactions. The whole work is written in a clear and concise style; tables are most conveniently placed at the end of each chapter, and the clear and beautiful type, distinct headings and neat illustrations, make it a very attractive text-book.

Practical Treatise on Hydraulic Mining in California, with Description of the Use and Construction of Ditches, Flumes, Wrought Iron Pipes and Dams; Flow of water on heavy grades and its Applicability, under high-pressure, to mining; by AUG. J. BOWIE, JR., Mining Engineer, New York; D. Van Nostrand, 23 Murray street, 1885. pp. 313.

This handsomely printed and thoroughly illustrated work meets a want in an adequate manner and we welcome it publication. As a reference both for superintendents and engineers in charge of or undertaking hydraulic mining enterprises, it can but prove invaluable; supplying as it does, information based on the results of experience under almost every possible emergency in mining engineering, coupled with descriptions of the various mechanical appliances requisite under every possible condition. The tables which Mr. Bowie furnishes give the dimensions and cost of all the notable ditches and flumes in California; area and weight of wrought iron pipes generally employed; flow of water through pipes, with a mass of statistics regarding the operations of well known hydraulic mining operations.

The Determination of Rock-Forming Minerals by DR EUGEN HUSSACK, Private Docent in the University of Graz; translated by EASTUS G. SMITH, PH.D. Professor of Chemistry and Mineralogy of Beloit College, Wisconsin. New York: John Wiley and Sons, 1886.

This manual designed especially for the use of students, places before English readers a description of the optical and other physical properties of minerals in a condensed, yet exhaustive manner not found elsewhere, with the methods of investigation and rock-forming minerals; there is also given a copious table of the bibliography of the subject as well as explanation of the numerous cuts. This work may be had through the business office of the *Financial and Mining Record*, New York.

The Manufacture of Magnesium.—The problem of producing the semi-precious metals at a low price is now very actively considered in France, and in this direction small works for making magnesium have been established at Corbeil. The most suitable lamp for burning wire of this metal is now the subject of investigation.

The Poetsch System.—The Poetsch system of freezing a water-bearing stratum for the purpose of sinking through it is to be applied in France to a shaft that has collapsed. This undertaking will be a peculiarly difficult one, and the result will be awaited with interest in all mining circles.

Russian Manganese Mines.—The Manganese mines of the Charapan District, 26 miles from the nearest railroad station, at Kwirila, Southern Russia, are growing in importance. In 1884, the output was 12,050 tons, and it is expected that during 1885 it will increase to 27,550 tons, of which 16,100 tons will be shipped from Batoum, and 11,150 tons from Poti. The bulk of the ore goes to England.

A productive Australian Gold Quartz District.—Charters Towers of Queensland, since the opening of its mines in 1872, has been steadily increasing in the yearly value of its quartz, crushing from 20,061 ounces of gold that year to 103,429 ounces for 1884, the value per ton of quartz crushed having been singularly uniform or about 1 ounce 13 dwts. 11 grains per ton.

MINING NOTES.

NOVA SCOTIA.

Work at the Mount Uniacke mines progresses satisfactorily. The quartz carries gold in paying quantities, and a large amount of it can be mined at comparatively small cost from several lodes in the slate belt.

A good quality of fire-clay has been discovered at New Ross, also a manganese deposit of some extent. The distance from shipping point will, however, be a drawback to profitable mining.

Further work in the north cross-cut from the 150 foot level of the Coxheath copper mine has proved the existence of an additional vein four to five feet thick, the ore of which averages about 8 per cent copper.

During the year 1885 the Springhill mines raised 375,000 tons of coal. This is the largest output yet reached by any Nova Scotian mine, and it is anticipated that next year these figures will be greatly exceeded.

The Acadia and Vale Coal Companies of Pictou County have had meetings of their shareholders to complete the consolidation of all the companies operating in that district under one management.

The manganese deposit at Walton, owned by Messrs. Churchill, has proved to be more extensive than there was reason to expect. Some additional pockets have been met with which will doubtless yield a large quantity of high grade ore.

An unusually rich vein of gold-bearing quartz has recently been discovered on a property owned by Mr. C. B. Hilchey and others at Tangier, and the vein is now being thoroughly tested. Some of the quartz carries from 10 to 12 ounces of gold per ton, and it is expected the vein yield will be much above the average.

The exports of minerals from the province for the past two years have been, as nearly as can be at present estimated, as follows:

	1884.	1885.
Coal (sales)	1,261,650 tons	1,250,000 tons
Gold	16,060 oz.	20,000 oz.
Iron ore	51,845 tons	50,000 tons
Gypsum	111,068 "	90,000 "
Manganese	302 "	250 "
Antimony	600 "	800 "
Limestone	25,567 "	24,500 "
Building stone	780 "	800 "

MOOSE RIVER.—Twenty-five men are now mining in this district, most of whom are tributers. The principal work is being done on what is known as the Little North Lead. The crushing material is composed of slate and small quartz, the thickness varying from 8 to 15 inches, and the yield 6 to 15 dwt. per ton. The new lead which was discovered last November is being worked by Mr. Toquoy with five men. Eighteen tons of quartz from this lead have been put through the crusher, yielding 17 ounces of gold. The ten-stamp mill, which is run by water power, is kept busy night and day, and even with this it is found difficult to crush all the quartz that is being taken out.—*Critic.*

The past year's production of gold in the province shows an increase over that of 1884, the output being estimated, approximately, at 20,000 ounces, as against 16,000 ounces for the preceding year.

The gradual but steady growth of the coal sales in Nova Scotia may be represented by decades of years as follows:

Years.	Tons.
1791—1800	51,918
1801—1810	70,452
1811—1820	91,527
1821—1830	130,829
1831—1840	829,981
1841—1850	1,553,518
1851—1860	2,293,820
1861—1870	4,927,279
1871—1880	7,217,428
1881—1885 (5 years)	6,691,266

NEW BRUNSWICK.

A deposit of *stibnite*, carrying sixty per cent. of *antimony*, has been discovered in Albert county, and miners will be at work on it in the spring to test its extent.

Discoveries of rich deposits of *manganese* have been made during the past few months in several localities in the province, and it is expected there will be a large production of this mineral during next summer.

It is probable that mining operations will be resumed in the spring at the manganese mine at Hopewell, Albert county. The mine has been inspected by a competent mining engineer, who has pronounced it capable of yielding a large annual output under intelligent and efficient management.

QUEBEC.

The Anglo-Canadian Asbestos Company are proceeding with active operations at their mine at Black Lake, and will not, hereafter, suspend work during the winter months as has been the custom.

The *Villeneuve* mica mine in the township of the same name, Ottawa county, is yielding a steady output of very fine mica. The mine is now fairly opened and is capable of producing a large annual supply.

Dr. James Reed has purchased the South Ham mines, Lake Nicolet, Wolfe county. This property includes asbestos, antimony, copper, iron and chromic iron deposits, and embraces an area of 2,000 acres.

The phosphate mines in the de Lièvre district and in Templeton are giving employment to a large force of miners and laborers, and ore is being brought to the surface in great abundance. The mines were never so productive as at the present time.

Good work has been accomplished during the past few months by the St. Onge Gold Mining Company at their mine on State Creek, Beauce. The drift from the bottom of the shaft is now in ground that carries coarse gold in paying quantity and is some feet above bed-rock. This company's prospects are very bright.

ONTARIO

Phosphate mining in the Kingston and Perth districts has not been engaged in during the past two years as actively as formerly; the attention of miners having been attracted to the larger deposits in the county of Ottawa.

The only mica mine now being worked in this province, that we know of, is near Sydenham, in the township of Loughborough, county of Addington. The mica is dark amber in color and is produced in quantity.

A new mining company composed of Toronto, London, Ont., and United States capitalists is being organized for the purpose of purchasing mining options on claims in the Thunder Bay district, and placing them on the market.

Ontario has sent to the Colonial and Indian Exhibition the largest and best exhibit and the greatest variety of iron ores that will be forwarded by any other province of the Dominion. It would be difficult to collect a better display of iron ores from any part of the world.

(*Thunder Bay District.*)

Some good silver ore has been taken from the *Porcupine* mine, and we hear that *Silver Creek* mine is producing a quantity of native and black silver.

The proposed line of the Lake Superior Mineral Railway runs through the silver district passing close to all the working mines on its way to the Huronian mine in the gold region.

The Beaver and Rabbit Mountain companies have given contracts for the erection of mills at their respective mines. It is expected that the mill will be in operation at the *Beaver* by the 1st July next.

The vein of the *Rabbit Mountain* is said to be dipping, with a strong incline, under the *Rabbit Mountain Junior* property, while the vein of the latter dips towards the former property. It is a question which will carry the other when the two veins meet.

Within twenty-five miles of Port Arthur there are five working silver mines, viz: the *Rabbit Mountain, Beaver, Silver Creek, Twin City* and *Rabbit Mountain Junior*. They are within three miles of each other and are connected with Port Arthur by wagon and winter sleigh roads.

Gold and silver were discovered last summer on the east shore of Lake Nepigon. A winter road has been made from Nepigon Station on the line of the C. P. R., a distance of 15 miles, to the location, and miners are now at work proving the discoveries. A car load of ore will be shipped to New York for a practical mill test.

BRITISH COLUMBIA.

About four tons of quartz from Ireland mountain, Cariboo district, have been crushed and found to yield $2lb per ton.

The total exports of gold from the province for the year 1885 amounted to $591,782.52 as reported by Wells, Fargo & Co.

It is expected there will be considerable spreading over claims on Granite Creek and tributaries in the spring, if they should prove valuable, as no doubt many are held illegally.

Work was shut down on Granite Creek towards the end of November. Extensive preparations have been going on during the winter for spring work, which will be resumed about the end of the present month and continued until the June or July freshets set in. When the water again subsides there will be no interruption for the balance of the year.

If capital were forthcoming to develop the quartz ledges which exist in Kootenay district there is little doubt as to the result, the richness of these ledges being well known.

The Quesnelle Quartz Mining Company are doing good work in Cariboo. They have twenty men employed, including an expert and many practical quartz miners.

The total yield of the Cariboo district for the year 1885 is in the neighborhood of $350,000. It has been said by some that Cariboo is played out. Others, however, are of opinion that it has not yet seen its palmiest days.

Upwards of $100,000 worth of gold has been accounted for as having been taken from Granite Creek the past season. There are now wintered in the district about 800 white miners and 300 to 400 Chinamen, and there is no poverty among them.

At Lorne Creek authentic reports show that the yield for 1885 has been considerably less than for the previous year. Gold mining was first started in 1884 on Lorne Creek, which is a tributary to the Skeena River, and the gold taken out of it is valued at $17 per ounce.

Fresh discoveries have been made on what is known as the South Fork of Granite Creek and in some smaller creeks. Campion Creek is also a recent discovery, emptying into the Tulameen river, about twenty miles above the mouth of Granite Creek. Several claims have been located on it and the prospects for gold are very promising.

The following is the total output of coal from the Wellington and Vancouver mines for the year 1885:

Wellington mines (tons)	224,040
Vancouver " "	133,548
	357,588

These two mines furnish employment for over a thousand men.

UNITED STATES.

The production of copper in the United States in 1885 reached about 135,000,000 pounds of fine copper, as against 115,000,000 pounds in 1884.

The product of copper ingot from the Calumet and Hecla mine from 1875 to 1885, both years inclusive, was not more than 4·80 per cent. of the ore mined.

A short time ago a shaft was sunk to a depth of 1,100 feet in Livingston County, N.Y., when a vein of pure rock salt was struck 15 feet in thickness. The salt produced from the seam is 92.57 per cent. of rich chloride of sodium.

The gold bullion produced by the mines of the Plymouth Consolidated Gold Mining Company, California, for the year 1885, was $850,527.11; operating expenses amounted to $319,750.91, leaving a profit of $530,776.53.

It is now an established fact that the Calumet and Hecla Copper Company is to have smelting works at Lake Linden. The new works will be erected by the Detroit and Lake Superior Copper Company, for the smelting of Calumet mineral.

Welland Canal Enlargement.

Notice to Contractors.

SEALED TENDERS addressed to the undersigned, and endorsed "Tender for the Welland Canal" will be received at this Office, from mechanical, skilled practical contractors, until the arrival of the Eastern and extern mails on WEDNESDAY, the NINTH day of MARCH next, for raising the walls of the locks, weirs, &c., and increasing the height of the banks of that part of the Welland Canal between Port Dalhousie and Thorold.

The works throughout will be given in sections.

A map showing the different places together with plans and descriptive specifications, can be seen at this office on and after Tuesday, the 23rd February instant, where printed forms of tender can be obtained. A like class of information relative to the works will be supplied at the Resident Engineer's Office, Thorold.

Parties tendering are requested to examine the locality and bear in mind that the season and circumstances under which the works have to be done, render removal them of an exceptional nature.

Tenders will not be considered unless made strictly in accordance with printed forms and, in the case of firms, except there are attached the actual signatures, the nature of the occupation, and place of residence of each member of the same; and further a *bank deposit receipt* for the sum of *Two Thousand Dollars* must accompany the respective tenders, which sum shall be forfeited if the party tendering declines entering into a contract for the works at the rates or prices stated in the offer submitted. The amount required in each case will be stated on the form of tender.

The deposit receipts that may be in will be returned to the respective parties whose tenders are not accepted.

The Department does not however, bind itself to accept the lowest or any tender.

By order,
A. P. BRADLEY,
Secretary.

Dept. of Railways & Canals,
Ottawa, 15th Feb., 1886.

FOR SALE

Valuable Phosphate and Farming Property,

In the Township of Templeton, County of Ottawa, Province of Quebec, adjacent to the celebrated phosphate mines of McLaurin and Buckham, Jackson Bros., J. H. Post, and others, consisting of

LOT 14, RANGE 10 AND No 14, RANGE 9, CONTAINING 300 ACRES.

Dwelling-house, Barns, Stables and Outhouses, in good order, on the property, in proximity to a good phosphate opening from which several tons of high-grade phosphate have been raised, and where mining operations can be at once started.

The property has been partially prospected and several promising out-croppings of phosphate have been exposed. It has been pronounced a valuable phosphate location by miners working in the vicinity, and satisfactory reasons can be given for offering it for sale.

The owners, Messrs. Pearson, who hold a clear title to the lots, will sell them in *fee simple*, or the mining rights only.

Cost of transportation from the property to point of shipment will not exceed $2 per ton.

For terms and full information apply on the premises, or to

THE POSTMASTER,
East Templeton, Pro. Que., Canada.

Notice to Contractors.

SEALED TENDERS addressed to the undersigned, and endorsed "Tenders for Ice, Public Buildings," will be received at this office until Thursday, the 25th of February next, for supplying the ice required during the season of 1886 for the Public Buildings, Ottawa.

Sealed Tenders, endorsed "Tenders for Ice, Government House, &c." will also be received at the same time for filling the ice house at the Rideau Canal Basin, Ottawa, and that at Government House.

Tenders to state price per block of the following dimensions, viz.—22 by 11 by 11, which price must include cost of packing and all the materials required for that purpose.

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

Department of Public Works,
Ottawa, 26th Jan., 1886.