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The Canadian Mining Review

Established 1882

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ONTARIO

Mining Regulations.

The following summary of the principal provisions of the General Mining Act of the Province of Ontario is published for the information of those interested in mining matters in the Algoma District, and that part of the Nipissing District north of the Mattawan River, Lake Nipissing and French River.

Any person or persons may explore for mines or minerals on any Crown Lands surveyed or unsurveyed, not marked or staked out or occupied.

The price of all lands sold as mining locations or as lots in surveyed townships is two dollars per acre cash, the pine timber being reserved to the Crown. Patentees or those claiming under them may cut and use such trees as may be necessary for building, fencing or fuel, or for any other purpose essential to the working of mines.

Mining locations in unsurveyed territory shall be rectangular in shape, and the bearings of the outlines thereof shall be due north and south, and due east and west astronomically, and such locations shall be one of the following dimensions, viz: eighty chains in length by forty chains in width, containing 320 acres, or forty chains square, containing 160 acres, or forty chains in length by twenty chains in width, containing 80 acres.

All such locations must be surveyed by a Provincial Land Surveyor, and be connected with some known point or boundary at the cost of the applicant, who must file with application surveyor's plan, field notes and description of location applied for.

In all patents for mining locations a reservation of five per cent. of the acreage is made for roads.

Lands patented under the Mining Act are free from all royalties or duties in respect to any ores or minerals thereon, and no reservation or exception of any mineral is made in the patents.

Lands situated south of the Mattawan River, Lake Nipissing and French River are sold under the Mining Act at one dollar per acre cash.

Affidavits showing no adverse occupation, improvement or claim should accompany applications to purchase.

T. B. PARDEE,
Commisioner
Department of Crown Lands, Toronto.

A Narrow Escape.—Hugh McKeevers, a quarryman at Verplanck's, N. Y., celebrated Harrison's election by exploding dynamite cartridges at a safe distance from his house. When it began to rain hard he entered his house, still having one of the dynamite cartridges in his possession. He touched the fuse to the fire in his pipe and attempted to throw the cartridge out of the door. It struck against the woodwork and fell back in the room. McKeevers ran into an adjoining room, where his two children, Hugh, aged thirteen, and Lizzie, aged eleven, were in bed. He threw himself on the bed and covered his head with the bed clothing. When the cartridge exploded it tore out the front and rear of the house, demolished the doors and windows and badly wrecked the furniture. The bed on which were McKeevers and his two children, was blown through the side of the house, but none of them were seriously hurt. The house was completely wrecked.

Vancouver Coal Mining and Land Company.—Commenting upon the agreement recently made by this company and the Messrs. Rosenfeld the *Financial News* says: "Hope deferred seems to have made the hearts of the directors of the Vancouver Coal Mining and Land Company sick, for they are apparently anxious to give up the business just as the horizon is brightening. They have had to struggle for several years against adverse circumstances, which have made dividends scarce, none having been paid since December, 1880. Last year there was a serious explosion in the company's mines which did not improve matters. As a result the debit balance of the company reached the sum of £20,985. The operations of the half year ending with June have been sufficientlv profitable to wipe out this accumulated deficit all but £127. It must be noted that, in spite of the troubles which have beset the company, it has never failed to pay interest on its debentures and to make ample allowance for depreciation, so that whenever the corner should be turned there should be no burden to be cleared off save the simple deficit. It is necessary to remember this when considering the conditional arrangements now made by the directors for selling the property Were the company embarrassed beyond recovery it would be easy to understand the motives which inspire the board, but in the light of the report presented to the shareholders upon December 4 the proposal of the directors is a little mysterious.

Endless Rope Haulage.—Mr. Thomas Henry Bailey read a most interesting paper on the subject of endless rope haulage before a recent meeting of the of South Wales, Institute of Engineers at Cardiff. In the course of this he showed that the importance of efficient haulage to the mining industry of the present day could scarcely be over estimated, as the coal easily reached near the surface had been exhausted in most of the large coal fields of the country, and at the greater depths now necessary colliery owners were compelled to adopt various systems of underground haulage. The two most important features with reference to efficient haulage were the gradient and the friction of the conveyance carrying the load. The particular method under description was that known as the "endless rope" system, which had been laid down in the South Duffryn Colliery at the Plymouth Works, Merthyr Tydfil. A packing of sand behind a brickwork lining of the archway was found to be a sure means of preventing local pressure from the surrounding strata. The whole of the underground engines and pumps required were worked by compressed air. In the Plymouth colliery the rope was carried under the trams or tubs, and the other disadvantage of the system was that to apply it economically two lines of railway were required, and consequently very wide roads were needed to accommodate the large trams used in South Wales. The hauling engines in use shewed a a total indicated power of 18-horse power exerted on the cranks. At the time there were fifteen full trams and fifteen empty trams attached to the rope about forty yards apart, and the engines were making twenty revolutions per minute. The rope was travelling about one mile and one-third per hour. Several members followed in discussion, and agreed that the system was excellent if it was cheap. Mr. Bailey promised to give particulars as to cost at the next meeting, and the discussion was adjourned.

A New Ore Roaster.—An ore roasting furnace has been patented by Albert C. Johnson, of Wilmington, Del. It is for desulphurising copper ores, iron pyrites, gold bearing sulphurets and other ores, and is provided with different compartments in which are placed raking bars of novel construction, the ore to be gradually moved from one compartment to the other, and agitated in each compartment by the raking teeth or fingers, which also impart an outward or inward motion to the ore.

Electric Motors for Underground Haulage.—In a paper read the other day at a meeting of mining engineers, in South Wales, Mr. J. Fox Tallis dealt with the application of electricity to underground haulage, and came to the conclusion that the electric motor was the best means for underground hauling. The author, however, did not consider that locomotive motors were practicable. This view is quite opposed to that held by Mr. A. W. Sheafer, who in June last read a paper on the same subject to the Engineers' Club of Philadelphia. In it he pointed out that mine locomotives are very objectionable on account of the danger to good ventilation caused by the noxious gases thrown off during the combustion of their fuel. In consequence of this they can only be used in the gangways carrying the return current. He points out that the electric locomotive avoid this, as well as other objections, and states that the Lykens Valley Coal Company, at their mines in Dauphin County, have introduced the electric locomotives with considerable success. The comparsion between the cost of mule, steam, and electric haulage is given as follows:—Cost per ton per mile 1-82-100 cents, and 4-10 to 67-100 cents, respectively. An electric railway has also been established since January, 1884, in the Neu-Stassfurt Saltworks, and has been decidedly successful. The plant was made by Messrs. Siemens and Halske, of Berlin and Vienna.

Mines and Mineral Resources of India.—Out of 105 collieries there were 69 at work during the years 1886-7. They employed 24,794 hands, as compared with 22,745 in the previous year, and the total output of coal rose from 1,294,221 tons to 1,388,487 tons. The total imports of coal from Europe and Australia during the year were 765,668 tons. The largest proportional increase took place at the Assam and Umeria coal fields. The Nizam's Railway has now reached the Singareni coal fields, in the Kistna valley, so that before long that coal will displace imported coal on the Hyderabad Railway and on the Madras railway system. Arrangements are being made for using coal from the Dandot mine on a part of the Punjab railway system, and investigations are being made into the three known coal-bearing areas of Upper Burmah. The Chindwin coal is already used to some extent on river steamers. Coal from the Assam mines is said to have come into the Calcutta market, and to fetch as much as 14 rupees per ton. Iron is worked to a limited extent, after native methods, in all provinces and in many districts. The Barrakur Iron Works, which have, within a radius of five miles excellent coal, iron, and lime, did not pay during the year, the stock of pig iron rose from 677 tons to 3,683 tons and there were few buyers. Everywhere English iron is in common use, and generally undersells the local product.

The Salt Beds of South America.—The salt beds on the west coast of South America, according to the description of Dr. Carl Ochsenius, occur in a narrow strip along the coast line of the rainless district, rarely exceeding 25 miles in width. The district is bounded on the north by the Andes, and extends into the coast Cordilleras on the south. The author considers that, before the upheaval of the Andes, salt began to deposit in certain bays, which had been wholly or partially shut off from the sea by the gradual formation of an intercepting bar. Then, while the process of evaporation was yet incomplete, the district was raised by volcanic action, and the mother liquors from the salt lakes eventually escaped, running down into the valleys, and where they encountered no obstacle, reaching the sea. The coast of Cordilleras acted as a barrier in the southern portion of the district while in the northern part the liquors doubtless returned to the sea. The volcanos which produced the upheaval exhaled immense quantities of carbonic acid gas, by the action of which a portion of the sodium chloride in the mother liquors was converted into sodium carbonate. The coast in this part of Chili is studded with small islands containing deposits of guano rich in ammonia. The guano dust is carried by the prevailing west winds far into the country, where, on exposure to the air at a warm temperature, it would gradually oxidise to nitrate, and, acting on the sodium carbonate, would form sodium nitrate, or Chili saltpetre.

Asbestos in California.—One of the largest and most valuable deposits of asbestos in the world has recently been discovered in the Mojave country, not far from the line of the proposed Carson and Colorado railway between Keeler and Mojave. The mineral sources of this region have hitherto been considered worthless, except for the deposits of borax, soda and salt. The asbestos recently discovered near Oro Grande is as fine as has been found anywhere in the world, whilst the amount of mineral in the vein far exceeds that found in any other locality. The vein is about 25 ft. in thickness, and has been proved to extend for a distance of 1,500 ft., and is traceable for nearly three-quarters of a mile by croppings that occasionally come to the surface. Unlike many other asbestos deposits, this vein is almost unmixed with hornblende and tremolite. The fibres are long, silky and of a beautiful pearly lustre. The fibres are tough as flax, and are capable of being spun into a fine thread. Besides the fine fibrous asbestos which occupies the centre of the vein, there are on the outside great bodies of what is termed "rock cork," a variety of asbestos which is as easily cut and quite as light as ordinary cork, readily floating on water; also "rock wood" and "rock beaters," both of which are very similar to rock cork. In the same vein there appears to be an inexhaustible quantity of ordinary asbestos, such as is used for covering steam pipes, &c, The true amianthus is found in veins from 1 ft. to 4 ft. in thickness, and can be pulled out with the naked hand in tufts upwards of 3 ft. in length. Talc is also found in the same neighbourhood in immense quantities, and might be used for making firebricks and melting-pots mixed with asbestos, and no doubt when the Mojave country is opened up for the construction of the proposed Salt Lake City and Los Angeles Railway, the mineral resources of this hitherto unknown region will be fully developed.—*Society of Arts Journal.*

American Institute of Mining Engineers.

We take this opportunity of acknowledging with our best thanks, the courtesy of Mr. R. W. Raymond, Secretary of the American Institute of Mining Engineers, in sending us the advance sheets of the papers read before the October meeting of the Institute at Buffalo. We hope soon to be able to reproduce some of these valuable contributions to mining literature in our pages.

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Provincial Mining Laws.

The present system, which permits the acquisition and control of large acreages of land upon payment of a merely nominal price, is undoubtedly a most favourable arrangement for capitalists and speculators, but is one that is in every way opposed to the interests of the people at large and to the development of our mining industries. Now, vast districts are locked up in a few hands, and no one desiring to operate upon them is permitted to do so unless he can afford to purchase the land at an immense advance upon its cost. In the financial centres there are numbers of men who have developed a passion for mining ventures and who are always ready to risk money in developing and working mines, but who will not lock up funds in the purchase of lands upon which they have to make the expensive outlay for so risky a venture as mining, or, as it has been aptly though somewhat profanely termed, "gambling with God." Everyone who has tried to influence capitalists to embark in mining ventures knows how easy it is to raise working capital alone compared with obtaining money for a scheme weighed down with a preliminary purchase of lands often at ten times the sum required for actual operations. In our phosphate districts cases have occurred where lands originally purchased from the Government for two or three dollars an acre have been resold at $10, $100 and as high as $400 per acre. One tract bought for $5,000 was resold at $16,000, then at $160,000, and part of it again for $450,000. The sums required to pay interest on such large capitalization tend greatly to discourage investment, and the usual failure of mining enterprises loaded up with such a weight of dead outlay is the most serious check upon the development of mining industries.

If capitalists were permitted to lease upon royalty just as much land as they could work and only for such periods as they continued to work, or if the poor prospector could lease the acre on which he has found a valuable deposit and be at no expense beyond the cost of working, sharing his results with the people to whom the soil and its contents by natural right belong, then we should see a vast increase of mining operations, the revenue derived from royalties would be a constant and important source of income, and the people would cease to barter away their natural rights for a paltry "mess of pottage." It is pleasing to note that the Provincial Government of Quebec has decided to revise its Mining Act during the coming Session, while it is not at all improbable that the Report of the Mining Commission will bring about many beneficial changes in the laws governing the disposal of mineral lands in Ontario.

A New Zealand Gold Mining Concern.

A company is now being formed in London, England, under the name of the "Island Block Gold Mining Co., Limited," for the purpose of mining on the Moa Flat Estate, on the Clutha, or Molyneaux River, Otago, New Zealand, known as the Island Block.

The land over which the property extends is four miles in length, varying from 600 to 2,000 feet, and has an area of 800 acres.

From borings obtained by practical mining engineers at different parts of the bed of the river, gold was found in all the test holes yielding an average of about 13 grains to the ton. These holes varied from 22 to 42 feet in depth.

The formation consists of mica schists which has been denuded and carried down from the mountains forming the banks of the river.

The company is about to erect "Hydraulic Elevators" for the working of these deposits. They propose utilizing water, piped about 2½ miles in a direct line from the property, from an elevation of 600 feet or more.

It is claimed that "by the use of these elevators, four men can lift to a height of 60 feet, and *sluice* 1440 tons of wash dirt, sand and gravel, in eight hours, at a cost of less than one penny per ton, and that without steam or any complicated machinery, a force equal to 700 HP (continuous all the year round) is easily and cheaply obtained."

From the altitude of the supply of water, there can be no question as to the power obtained, as it exerts about 260 lbs pressure to the square inch.

But the quantity of material treated, viz.: 1440 tons, by four men in eight hours, is simply *"prodigious,"* as it means 180 tons per hour, or 3 tons per minute.

Admitting that under the great pressure of water (which can be obtained) that the wash dirt, sand and gravel can be *displaced*, how, (in addition to this) this quantity is lifted to the height of 60 feet, and *sluiced*, so as to save the gold, by so small a force of men, is a matter that should be investigated in the interest of cheap and economic gold mining.

Then the question arises, how do they arrange their *sluice* so as to treat so great a quantity in the time above stated, and ensure successful amalgamation? For if the gold be "fine" and "flakey" (such as we have to contend with in western countries) it would be difficult to do this, as the quantity and velocity of the water necessary to properly sluice three tons of wash dirt, sand, gravel, etc., per minute would destroy the proper density, and would not admit of the "fine" and "flakey" gold being caught by the amalgam on the plates, or by the quicksilver in the traps, and it is well known by experience that "fine" and "flake" gold readily floats on water, and if the water in the sluices be too dense and too heavily charged with the slimes, this difficulty is increased. It is also found that if the current be too swift in the sluice, loss of gold will follow.

Therefore, in view of these facts, it would be a matter of interest and instruction to know how this company treats successfully three tons per minute of low grade material carrying only 13 grains to the ton.

In conclusion, from statistics given, they claim that the cost for mining, elevating, amalgamating, management, quicksilver and other charges can be done for 6 cents per ton. If their practical work verifies this, it will reflect the greatest credit on the executive officers in charge.

English Fertilizer Trade.

The rise in phosphate prices is no doubt somewhat owing to the increased demand for fertilizers in England. The farmers appear to be more prosperous than they have been for some years past, and have been better able to pay for manures. The consequence is that all the manufacturers have been able to dispose of their products more fully than for several years.

This trade has been very much overdone in the past, and competition has reduced prices below a profitable point. The increased demand is inducing an effort among manufacturers to combine for higher prices, and if they succeed in this the producers of phosphate may come in for a share of the benefit. A private letter lately received from London says: "There is a very decided movement in England among the manure manufacturers to get better prices, and not before they need, for I am certain there has been a serious loss incurred by all in the trade, without any exception, all from over production and fighting against each other for what trade there has been. A very large meeting was held at the Cannon Street Hotel, and I hear there are some hopes of an understanding, but I don't think there is any chance of success as long as any makers will supply the Farmers' Associations. The fact is, an enterprising man turns up who may have been unfortunate in business; he sets to work and induces maybe a thousand farmers to subscribe one guinea each, which forms his salary. He then gets supplies from one or other of the manufacturers at the very lowest possible prices, and then not only supplies farmers at the cost, within a shilling or two, per ton, but advertises the members' prices in the various agricultural papers, thus at once spoiling the chance of all remunerative prices. He gets cash from all the well-to-do men, and leaves the needy at uncompensating prices for the other dealers and makers."

Our Canadian miners, who sometimes think they are victimized in their sales to English manufacturers, will see that the buyers in turn undergo commercial torture, and that the lesson of the day is conference, conciliation and combination among the workers of each department of industry and trade, in order that the strife of

commerce shall no longer be between individuals but between organized hosts. If users of fertilizers and the manufacturers are each associating to act in unison, it behoves producers of the raw material to likewise combine their forces and harmonize their efforts, and banish forever the suicidal individual strife and opposition among themselves which has too much governed the disposal of their products in the past; for if they have thus been an easy prey to the organized buyers, how can they withstand the united action of an associated industry? Let Canadian miners learn this lesson of the age speedily, and work intelligently and harmoniously together for the advancement of their common interests.

The Mineral Resources of the United States, 1887.

The annual report on "The Mineral Resources of the United States" for 1887 has just been issued by the Geological Survey at Washington, and comprises among the large amount of information contained therein, valuable remarks on and statistics of the production of numerous minerals and their products in Canada as well as in the United States. Under the head of copper, in which speculation has run riot of late, allusion is made to the Canadian Copper Company at Sudbury, Ont., which has developed "down to 300 feet, the existence of a large body of nickel copper ore." The smelting works there, erected by Dr. Edward D. Peters, are also referred to. A number of very valuable letters on the general copper industry are given. Manganese from Nova Scotia comes in for quite a share of notice, a table being given shewing the production of that ore in Nova Scotia from 1861 to 1887 inclusive. The report states that no returns have been obtained from New Brunswick. This seems to us a pity, as the Washington authorities give due prominence in this report to Canadian minerals which bear effect on trade with the United States.

Coal is mentioned as an import from British Columbia into California, and the amount produced in the former Province as well as in Nova Scotia is given in a table shewing the world's production of coal, but nothing is said of the amount of Nova Scotia coal used in the Eastern States, which is rather a curious omission.

The petroleum trade of Canada is dwelt upon at some length, statistics of production in and shipments from Canada being given. Some very interesting details accompany the remarks, both as regards capital invested, the extent of the works of some of the oil companies, and their capacity, and the tinworks connected therewith. These in one company alone own a plant which cost $10,000 for manufacturing cans, mostly five-gallon capacity, and which being put up two in a case, are intended for transportation to the North-West, to British Columbia, and to the Maritime Provinces. The report winds up by saying, "there are no reliable statistics of production in Canada," and the figures given are "the estimates of parties intimately connected with the industry."

The article on natural gas, by Mr. Joseph D. Weeks, contains much research, and is of great interest in connection with the excitement prevalent everywhere in connection with the search for this natural fuel, the use of which, for manufacturing purposes, has already in the United States been the means of saving a great consumption of coal, equal in 1887 to nearly ten million tons. Mr. Obalski's report on natural gas in Quebec has been condensed, and the most salient points of it are quoted *verbatim*. His report is spoken of as "a very thorough study of the conditions under which natural gas has been found."

Nova Scotia and New Brunswick both appear to contribute grindstones to the United States, but no figures are given to shew the amount of that trade. Apatite, as Canadian phosphate is termed in the report, is only referred to as shewing the quantity produced from 1878, and is apparently not yet in any great demand in the United States, the Canadian deposits affording most of the article used in their superphosphate works at present.

Gypsum, both in the crude state and as alabaster and spar ornaments, contributes a fair trade with the United States from Ontario, Nova Scotia and New Brunswick, Ontario contributing the smallest and Nova Scotia the greatest quantity. The production of graphite in Nova Scotia in 1887 was 300 tons, and it is stated that the production will doubtless be increased owing to "the interest of Americans in Canadian mines. It is practically all exported to the United States." A valuable report on Mineral Waters, by Mr. A. C. Peale, will be found very useful by those who seek information under that head, but none of the Canadian springs are mentioned. It appears from this article that the consumption of mineral water from springs is largely on the increase, whilst that of artificial waters is correspondingly diminishing.

The whole report is a most useful work of reference for any library, or for persons largely interested in mining matters. We are glad to see our own Geological Survey quoted as an authority, and the work originated on a similar basis to this United States report, although yet in its infancy, can be made to prove as valuable ultimately to Canadians, as the report now reviewed is to Americans generally. In conclusion we wish to remark that if all our own Government reports were as fully indexed as the volume before us, their value would be very much enhanced.

Canadian Phosphates in England.

Just as we go to press we are in receipt of a special cable from London stating that "Canadian phosphate deposits are receiving much attention among the agricultural classes, here in view of the threatened exhaustion of the Guano beds of Peru and Chili. The *Times* and *Morning Post* are drawing special attention to Ottawa County phosphates, declaring that the phosphate industry is only in its infancy in Canada, and urging British capitalists to provide for their further development.

LETTERS TO THE EDITOR.

We invite Correspondence upon matters consistent with the character of the REVIEW.

Be as brief as possible. The writers name in all cases required as a proof of good faith.

One dozen copies of the issue containing his communication will be mailed free to any correspondent on request.

We do not hold ourselves in any way responsible for the opinions expressed in this section of the REVIEW.

Rand Drill Test.

NEW YORK, January 9th, 1889.

The Editor

THE CANADIAN MINING REVIEW:

SIR,—In your issue of December, we observe a letter addressed by our aggressive friends the Rand Drill Company, in which, under the heading "Comparative Drill Test," they present a table giving the results in detail of a power drill test at the Ludington Mine.

In the first place, permit us to say in answer to your comments, that we will assume that the test was thoroughly made, that the air supply was accurately measured, and that the figures given in the table are true; but we must protest against the inference which might be drawn, and which your correspondent evidently intends that your readers should draw from his figures. By an analysis of the table, we are brought for results to the last column, in which the consumption of air per inch of hole drilled is given for the "Rand" and the "Sergeant" drills respectively, under two conditions, one where the drills are mounted on columns, and the other on tripods. Now, our aggressive friends evidently desire that your readers should see very clearly that in both of these tests the "Rand" drill was bigger than the "Sergeant," and that the unthinking reader should hold up his hands in amazement that so many claims have been made for the "Sergeant," when a big "Rand" drill consumes less air per inch of hole drilled than a little "Sergeant." Is it fair to make a comparative test of the consumption of air per inch of hole drilled, between two drills, one of which has a larger diameter, hence a greater area of pressure; and a heavier piston, hence a greater momentum and force of blow than the other? On the contrary, can anyone dispute the claim that when boring hard granite boulders, a strong blow is required in order to make progress, and does anyone question the fact that a big machine will hit a harder blow than a little one? Can we not easily imagine a small drill pegging away at a hard granite boulder and consuming several hundred cubic feet of free air per minute without progressing a single inch, while a large drill of precisely the same construction would make considerable progress with an equal consumption of air. The comparison may be illustrated by a man and a boy at work driving railroad spikes. The boy may accomplish less, but will expend more breath per spike than the man.

It seems to us that the figures prove two things very clearly. In the first place, that a big drill will consume less air than a little one per inch of hole of same diameter drilled, when operating in hard material (a fact well understood heretofore). And in the second place, that a "Rand" drill takes more than twice as much air per inch drilled, when working horizontally than when working vertically or downward (due to the cushioned blow—a dis-

tinctive defect in the "Little Giant"), while with the "Sergeant" the proportion is very much more uniform. These facts furthermore prove that a test on the consumption of air per inch of hole drilled between drills of different sizes, has no practical value.

INGERSOLL ROCK DRILL CO.,
W. L. S.

The Utility of Waste Sawdust.

Owing to private reasons "Engineer" declines to answer Mr. F. D. Taylor's letter in our last issue asking for information as to where and how waste fuel is utilized in the United States.—EDITOR.

Steam Pump Practice.

NEW GLASGOW, N.S., 21st Dec., 1889.

The Editor

THE CANADIAN MINING REVIEW:

SIR,—In your November issue there appears an article under this heading, reproduced from the *American Machinist.* Such articles are no doubt interesting to your readers, but the one in question, while advancing some thoroughly practical ideas, is somewhat in error regarding the use of the so-called air chamber, which is described as a practical remedy for the evil arising from a suction pipe becoming obstructed or being too small or too long. There seems to be an erroneous idea prevalent, even among practical men, regarding the chamber now largely in use on the suction pipes of pumps. It is commonly mentioned as an *air chamber,* and the fact of it being called such, and its action described in the article in question "as an elastic cushion of air for the incoming water to come into contact with so as not to strike the returning plunger with so hard a blow," tends to confirm rather than dispel the erroneous idea.

The chamber must, correctly speaking, be a vacuum chamber, because, having a direct communication with the suction pipe, whatever be the degree of vacuum required to allow the atmospheric pressure to force the water to the pump affects all parts alike in communication with the suction pipe, and if a vacuum gauge be placed on the chamber it will be found to register the varying degrees of vacuum as the vertical lift is increased; so then the usefulness of the chamber on the suction pipe cannot be as described in this article, but exactly the reverse. It may be described as follows: Let us suppose the lift to be such as requires a vacuum of 10 lbs. to be formed before the water will rise to the pump; then 10 lbs. of the atmospheric pressure must be removed from the pump barrel, the suction pipe and the chamber on the suction pipe, and water in rising up the suction, with a velocity due to the speed of the plunger, passes the chamber and rushes into the pump barrel, where the vacuum is being formed and maintained. Then at every turn of the stroke of the plunger the formation of vacuum ceases, and the water continues its upward flow in the suction pipe to the vacuum chamber until the plunger commences its return stroke or until it destroys the vacuum which first caused it to be put in motion. The so-called "air chamber" on the suction pipe tends to keep the column of water in that pipe in motion while the plunger is turning or changing its stroke, as the air chamber *proper* on the discharge tends to keep that column of water in motion; but the action of each is as opposite as the lifting and forcing of the pump on which they are used, the pressure of the air in the chamber on the discharge being in proportion to the column forced, and the vacuum in the chamber on the suction being in proportion to the weight of the column raised.

I am, &c.,
BRITON.

PHOSPHATE.

In General.

A piece of bad type in our last issue made the total exports of Canadian Poshphate for 1888 read 17,416 tons instead of 17,446.

Mr. James Nicholas, a well known chemist from London, is travelling in the country for the purpose of examining mining properties with a view to purchases for an English Syndicate.

Du Lievre.

One of our correspondents writes: The late mild weather has been a source of trouble to the regularity of the mining operations of our river, once more showing the desirableness of more practicable roads and means of communication between the mines and the C. P. R. line. The sudden closing of the navigation on the 21st November took the managers by surprise; the winter provisions at the mines, and the grinding stock at the mills, were somewhat incomplete in consequence. Nature's river road, which promised so well at the start, began to fail at Chistmas, and on resuming work after the holidays three teams together loaded with provisions, broke through the ice at Priests' Creek, thereby destroying the road at this place. Smith's Point too has been another place where a "portage" was necessary, so that it has been impossible so far, to commence the transport of the supply of "seconds" for the mills at the Basin, and "*habitants*" and their teams are looking hungry for lack of work and provisions. We anxiously look for good ice to promote the normal activity of our river.

We learn that Messrs. Lomer, Rohr & Co. have made arrangements to utilize the grist mill at the Basin for the grinding of the second grade phosphate of that district. It is well known that the pulverization of phosphates in Europe is universally effected by horizontal French burrs, but some are inclined to suppose that our Canadian apatites are too hard to be treated in a like manner. We take exception to this opinion, remembering that several varieties of mineral phosphates, such as come from Aruba, W. I., and the Department of Lot, France, are equally hard as our average "green ore." We therefore congratulate Messrs. Lomer, Rohr & Co. in leading the way to demonstrate that good old-fashioned machinery can often hold its own against the patented complications burdened with heavy royalties, which so often give cause for regret when costly "experiments" are performed in the laboratory of industrial enterprises.

We observe that some of the "grinders" now applied to this important and ever increasing industry, give much annoyance from frequent breakages, whereby projected profits quickly transform themselves into heavy losses and disappointment to shareholders.

The Dominion Company is now erecting very complete wharves and loading facilities at their new North Star landing, where admirable arrangements are being made for the storing of ore, and their easy transport to scows by a system of car tracks from each bin. This improvement speaks well for the intelligent direction of this prosperous enterprise. We also understand that the directors are now considering the advisability of putting their own steamboat on the river to tow their scows this coming season.

The Phosphate of Lime Co. (limited) is still enjoying the benefit of its "bonanza" chamber in their old stand-by the No. eleven pit at High Rock, and the work goes on merrily. The enormous quantities of cordwood being now piled up and drawn in from the remote points of their limit, gives cause for reflection that our timber supplies will evidently play out long before our phosphate deposits. Are we to see King Coal supreme and coming to our aid, or will it be our natural water powers, captive and obedient to our will, which shall keep in movement our restless drills and derricks?

The Canadian Phosphate Co. (limited) is benefitting by the mild winter in continuing to run their Beaver-meadow car track without intermission, so that the only difficulty has been to obtain sufficient hands in order to avoid a block by too much material in the cobbing house. The present new company having completed the first year of its existence, held its general meeting in London (Eng.) this month. Several important improvements will have been discussed and disposed of at this opportunity, of which we hope to furnish the report in our next issue.

The works for the construction of the new locks at the Little Rapids have completely blocked the portage road at this point. The mining companies above the Rapids, and all interested in the winter transport on the river, have just cause to demand that an efficient portage should be immediately provided, otherwise the passage of heavy teams will be quite impracticable.

We have received from Messrs. Stewart & Spittall, Ottawa, a very favorable report by an experienced Geologist on their phosphate locations on lots 1, 2, 3, 4, 5 and 6, in the 4th range of Bowman, and lot 6 in the 10th range of Portland West, in all about 700 acres.

Perth District.

Mr. Peter McLaren has commenced work on his phosphate property on lot 4 at Otty Lake; this property was worked a few years ago and several thousand tons were taken from surface shows; preparations are now being made for deep mining on a large scale, and so far the indications of favorable results are very satisfactory. Mr. McLaren has also purchased a new phosphate property in Bedford, near Fermoy. This location was discovered about six weeks ago by T. R. Taggart, of Westport, and has good prospects of becoming one of the best productive properties in Ontario. One of the veins shows phosphate 30 feet wide on the surface. Operations on both these lots are now being pushed forward under the able superintendance of Mr. E. Watts, of Buckingham, a miner of considerable experience, in the working of phosphate locations.

The Anglo Canadian Phosphate Company are having improving results at the Otty Lake mines, some wide and persistent seams having been discovered that promise steady work for the winter. At the Bobb's Lake mines the success is regarded as phenomenal; one of the oldest Canadian phosphate miners, now at work there, states that in the region of a mile's extent there is not a space for twenty feet without a seam of phosphate, and an experienced mining engineer, who has just surveyed the property, reports that he examined 67 different veins of phosphate which had been opened since June last and out of which 99 piles of phosphate had been taken, amounting to over 700 tons, done by a force averaging less than 15 men all told. He says " he never saw anything like it;" states that in one pit the men are sinking on a seam of 5 feet wide of solid phosphate, while in a drift from the same pit they are in a bed of phosphate measuring 18 feet by 8 feet and its extent not yet known; there is not a great deal of impurity to separate and the phosphate is being placed on the pile ready for shipment at a cost of not over $2 a ton.

Kingston District.

Mr. Jas. Foxton and Messrs. Smith and Lacy are putting out ore, and Mr. Foxton's mine is said to be looking remarkably well. Some enterprising Americans are tunnelling a hill on one of Capt. Moore's properties in Sydenham, with a view to the profitable working of phosphate veins that have been discovered higher up the hill. Capt. Moore expects to have about 400 tons from his properties by spring.

MINING NOTES.

We shall be greatly obliged to mine owners and superintendents for such authentic reports of their operations as may concern shareholders and the public.

Nova Scotia.

L. E. McKam, accompanied by a Mr. Leslie, of Philadelphia, is at Springville looking over the iron properties for a syndicate of American capitalists. Mr. Leslie, who is an expert, speaks highly of the ore and thinks there is unlimited quantities of it.

The output from the Intercolonial Coal Company's mines, Westville, for the past year to 30th November, reached 152,400 tons. The sales by land and water to same date were 138,000 tons.

We learn that the New Albion Mine at Montague, known as the DeWolf gold mining property, has been sold to a New York syndicate, by Charles Annand, for the handsome price of $60,000 in cash.

We understand the "Westfield" gold mine in Queen's County, has been purchased at a fair sum by Capt. Nicholls, for some of his English friends. It appears the property was bonded several months ago, and considerable prospecting done since on the "Jumbo" lode, which ranges from 20 to over 75 feet wide. A shaft has been sunk some 40 feet deep in one of its widest places, and the yield far exceeds anticipations. Free gold is prominent, but its chief value lies in the concentrates which are abundant. No doubt this pioneer mine on such large leads will cause much stir in the locality, and also call attention to some of the other large leads of the province.—*Critic.*

Over three quarters of a million tons of coal were shipped from Cape Breton mines last year, and the output was only limited by the ability to secure vessels to carry coal to the upper provinces.

The annual general meeting of the shareholders of the Cumberland Railway and Coal Company will be held at the Company's offices, Chesterfield Chambers, St. Alexis Street, Montreal, on Wednesday, 13th February next, at 3 30 in the afternoon. The transfer books will be closed from the second day of February, exclusive, until after the meeting.

The Coxheath copper mine, owned by the Eastern Development Company (Limited), is quietly but vigorously pushing development work with a force of 100 men. Compressors, drills and boilers to increase the Rand power drilling plant to ten drills, left New York December 28th., and will reach Sydney about January 9th. A winter's supply of dynamite has been put in store. New miner's dry house, carpenter shop, and saw mill completed, and an ore dressing house 60 feet square is in process of erection, to be heated by the exhaust steam from the boilers. Underground, the main cross-cut at the 190 foot level has been driven 221 feet south and 303 feet north of the shaft, a new ore-body has been cut 180 feet north of the 10 foot vein (vein B), which dips south towards the main vein. A working cross-cut from the shaft to vein B., from the 140 foot level, is in 30 feet, and will reach the vein about February 1st. Sinking the shaft will be resumed this week. Assay of sample ore-body in west drift of vein C, gave: Copper $14\frac{56}{100}$ per cent, and $16\frac{3}{4}$ ounces silver. Sample of fines made by crusher in running through some 300 tons of ore gives 12·4 per cent copper and 5 ounces silver. Samples of fines and clean up from hand-picking tables gave 2·88 copper and $4\frac{1}{2}$ ounces silver. Several tons of these low-grade fines have been sent to Humboldt & Co., Germany, for experimental treatment. Work on the Argyle mine, which is the western extension of Coxheath, has heretofore been confined to the surface. It is the intention to sink a prospecting shaft on the property during the winter. The company is also erecting boring apparatus on its coal property at Little River, and will put down a test hole in expectation of striking the basis of the veins which crop out vertically on the same areas. The Government railroad through Cape Breton, which is located within a third of a mile from the coal shaft and within five miles of Coxheath, is being pushed by the contractors, and will probably be running at the close of 1889, thus enabling the company to ship its outputs during winter months.

The case of Putnam v. Hurdman, now before the Supreme Court, is attracting great interest in gold mining circles. The plaintiff claims to be in partnership with the defendant in gold mining operations at Oldham under the style of "The Olham Gold Company." The case occupied four days before the jury at the October sittings of the court and was continued to allow the defendants to amend their pleadings. The present application is for the appointment of a receiver, pending the final decision of the case, an extraordinary remedy only granted in cases where co-partnership is denied, as in this case, when a fraud and misconduct are shown. The plaintiff, who resides at Exeter, N.H., in his affidavit alleges the grossest fraud and misconduct on the part of the defendants. He claims to have supplied all the money employed in the purchase of the mining property and in the opening and development of the mines, amounting to $15,000, and that afterwards when the mining operations had become profitable, defendants attempted by false representations and fraudulent conduct to deprive him of all participation therein and of all rights in the co-partnership. Many of the plaintiff's allegations are denied, and others explained by defendants, who have filed a voluminous affidavit in the matter. Judgment has been reserved.

Quebec.

The owners of the Lake Temiscamingue silver mine, Messrs E. Wright, Geo. Goodwin and G. P. Brophy, have made arrangements to take out ore next season. There are 4000 tons of ore now on the dump. A smelter has also been procured.

The Bristol Mining Company are erecting a new Calcining Kiln at their mines, and expect to have it completed in about two weeks. If this kiln works satisfactorily it is the intention of the Company to erect several more. The Branch Railway connecting the mines with the Pontiac Pacific Junction Railway is ready for the ties which are contracted for. The steel rails will be imported by the first steamer to the St. Lawrence in the Spring.

At the annual meeting of the Lake Huron Silver and Copper Mining Company held at Montreal the following officers were elected: Messrs Thos. Wilcox, president; Strachan Bethune, vice-president; Alexander Mitchell, R. M. Esdaile and Lorn S. MacDougall, directors; F. W. Barlow, secretary-treasurer.

The mines of the Excelsior Copper Company at Harvey Hill are working full time with about 120 men in all. The shafts are reported to be developing splendidly, and the veins are becoming wider and richer as work proceeds. The company is shipping now the high grade ore to Vivian & Sons, Swansea, and the low grade ores are going to New York. From 4 to 5 car loads of ore leave the mines per week. The company will put up a large quantity of machinery on the property, and it is expected that it will give employment to between 500 and 1000 men before July. The mines are doing as well as could possibly be expected.

Ontario.

A report from St. Catherines says that while drilling on the experimental gas well on John H. Broderick's farm, a short distance west of that city, a pocket of natural gas was struck at a depth of 312 feet. The find caused a sensation. The vein will be immediately piped, but the drillers have decided to bore deeper as they feel confident a large flow will be found.

The Imperial Oil Company of Petrolea, who operate with a capital stock of $500,000, have a very extensive and complete plant that includes over forty-six acres of land at Petrolea and over ten acres at London. They have their own wells, their own steam cooperage, where they make their own barrels, and are owners of machinery for the manufacture of patent tin cans; thus placing this company in position to place the products they manufacture into barrels or patent tin cans made by themselves, insuring uniformity of the oils, and also of what is of great importance, good, sound, uniform and regular packages of every kind.

The Sarnia Oil Company, Sarnia, Ont., has been incorporated with a capital stock of $250,000.

The gas well at Thorold, Ont., is now emitting about 60,000 cubic feet of gas per day.

Boring operations for natural gas will be begun in a few days at a point about a mile from Ottawa.

Sudbury District.

Last month we reproduced from the *Engineering and Mining Journal* of New York some particulars regarding the management of the Canadian Copper Co.'s mines, which a late dispatch from our correspondent states to be in some particulars incorrect. Capt. Andrews is not general superintendent as stated, but is simply mining captain, and is governed entirely by Dr. E. D. Peters, jr., the able metallurgist and manager of these well equipped mines. Captain Jones, who has been with the company from the first, is superintendent of underground workings, and his thorough knowledge of this work is evidenced by the very systematic manner (all by contract) with which operations under him are carried on. It is safe to say, that without Captain Jones, the workings of the company would not have been so far advanced as they are to day. Mr. J. D. Evans, civil engineer, (also connected with the Central Ontario Railway) has had charge of the erection of the immense trestles and smelter building, as well as the laying out and putting through of the different branches of railways from each mine to smelter. Mr. John Grigg is master mechanic, and Mr. F. L. Sperry late of Yale College, is chemist and assayer. Mr. MacArthur, from Montana, is in charge of the smelting branch, and on him in large measure depends the success of this important work. This energetic officer is constantly at the works, both day and night, looking after the feeding and tapping of the ore, and lately, your correspondent is informed, he has been on his feet throughout five nights without sleep. Under his superintendence the smelting is conducted very economically. Smelting operations are carried on day and night, the ore being hauled from each mine daily by a standard guage engine and cars belonging to the company. The roasting of the ore has turned out a decided success.

Another correspondent writes:—The Canadian Copper Co. is very nearly ready to make a start with their smelting, and the interested public look anxiously forward to see how great a success Dr. Peters will make of the treatment of these enormous deposits of copper and nickel ores. The Sudbury plant is merely preparatory, and as the ore is easily smelted, and is self fluxing, the work to be done there is comparatively simple. After a cupula smelting of these mixed ores, the resulting matter, containing 30 to 35 per cent. of the mixed metals, will for the present be shipped elsewhere for treatment, whether to Swansea or to some part of the States the management do not tell us, but it must be handled by those familiar with the separation of copper and nickel, a process for which Dr. Peters has invented and patented. About twenty piles of ore are burning on the temporary ground. These are in various stages, from thirty to ninety days of burning. They will probably average 350 or 400 tons per pile. New piles are being built on a carefully prepared permanent burning ground, over which a tramway runs from the dressing floors. This trestle is about half a mile long, with a maximum height of about twenty-five feet, and runs over the roasting piles into the cupula shed above the level of the charging floors, where it discharges ore, fuel, etc., into bins. The cupula is in place, and fixtures on the spot. The several mines are turning out considerably over one hundred tons per day, but this does not represent their capacity; the addition of a few more miners would easily double the production, as there is ample room to accommodate an extra force mining in good ore. The present force is about 250 men, comprising miners, smelters, construction men and labourers.

The workings at the Vermillion Mining Co. are completely shut down and left in charge of a brother of A. G. Duncan. Very recently Ranger, Stobie & Tough have sold out their stock to wealthy influential parties, so that with new blood we may look for an intelligent *resume* of operations, which will doubtless prove this property one of sterling worth.

Your correspondent has before mentioned the brothers Simpson, of Cranston, Ill. One or both of them has spent most of the time since May 1st in Graham Township, (lots 10 and 12, Con 2) and on these two lots have opened shafts on five different veins. These shafts are 10 feet deep on a 14 inch vein; 10 feet deep on a 30 inch vein; 25 feet on a 33 inch vein; 17 feet on a vein of 42 inches on the suface, widening to seven feet, and eight and a-half feet on a small vein of four inches. This latter is the most recent discovery. Attention was attracted to it by a show of free gold on the surface. At a depth of four feet a sample was taken of the fines made by blasting, and it yielded $460 to the ton, with some little silver. The vein is clear quartz with copper and iron pyrites. On the 33 inch vein a 7 x 7 foot shaft is sunk. At 15 feet they struck another vein one foot wide increasing to 16 inches, Your correspondent has found $220 in gold from one sample from this property.

Port Arthur District.

Mining operations are in a very satisfactory and progressive state, owing partly to the excellent state of the roads in the silver region, the extraordinary richness of the ore at present being produced, and likewise to the various mining companies who have already purchased outright or secured options on the most promising properties in the market. Some of the activity, especially in iron, is doubtless due to the recommendations which the Royal Commission on Ontario's mineral resources, are likely to make to the Legislature at the opening of Parliament this month. There is every reason to believe, that the commissioners will suggest that large tracts should not be locked up by mere speculators, but that a certain amount of development per acre per annum shall take place. It is also possible that an increased price will be placed on the valuable lands taken up for mining purposes.

The Badger mine still keeps the lead in the production of bonanza ore. It is almost impossible to over estimate the capabilities of this mine. It is an almost every day occurrence to see ore from this mine going several thousand dollars to the ton and not selected specimens by any means. The stamp mill will probably be in operation in a few weeks to operate in the low grade ore.

The Beaver Mine superintendant has been on a visit to his directors, and it is now announced that Governor Alger and General Hecker have purchased Mr. Peters interest in that property, and consequently have the whole control. Sufficient headway having been made in ore output, the roar of the stamp mill will again resound through the comparatively silent valley and hills.

The Elgin Mine, controlled by the same company still continues to develop satisfactory, and four English companies having bonded the Porcupine, Beaver West, Silver Creek and Big Bear properties in the same range of hills it is more than likely that no less than seven mines within a radius of three miles or so will be making things lively before spring in that vicinity.

The Silver Mountain Mines, both East and West are presently doing remarkably well. The rich strike in the East at the 380 foot level still continues, and a new shaft is now being sunk as fast as the drills and air compressors will admit, within 250 feet of their West limit. They are likewise going down steadily with No. 3 shaft where the vein is 13 feet in width.

The Wolverine and Silver Fox Mines further to the west are still in their infancy, but getting along nicely; the latter somewhat under a cloud owing to a lawsuit *re.* a title to part of the claim.

Iron lands to the north and west of the latter, as well as at the Kaministiquia station, near Port Arthur, are being explored and taken up rapidly.

Several mining properties have changed hands at a considerable advance, in anticipation of railway facilities.

During the last few months mining in this section has received a great impetus, and the more recent reports describe veins of nearly pure silver, too rich to stamp with the ordinary machinery, and almost too massive to blast out, yielding in some instances as much as 24,000 oz to a ton of ore. This has caused considerable excitement at Port Arthur. One mine alone is making a daily output of $30,000, or about £160,000 a month. This property is among the pioneers, while numerous others shew very large returns from ore running as high as $1,000 to $30,000 to the ton. The Americans are foremost in the field, owning pretty well all the mines now working. Capitalists are flocking into the country, new mines are being opened up, others are about to be developed, and new trails and roads constructed, while everything points to a veritable silver boom.—*Financial, News London.*

Rat Portage District.

It may not be generally known that among the properties whose titles are in dispute is the famous Sultana Island, ores from the gold mine of which have recently furnished such rich assays. The Dominion title to this land is held by Mr. Ham. G. McMicken and his associates in his mining business; but there is another claimant to this property, in the person of Mrs. Snow, daughter of Mr. R. Gerrie, of Winnipeg, who holds the Ontario title to four hundred acres of the island, including the mine.

Manitoba and North-West Territories.

The Manitoba Oil Company, operating in the Lake Dauphin district, has suspended operations after reaching a point 743 feet below the surface. After penetrating the limestone the drillers struck a second strata of salt, and below this a

red sandstone. The salt strata "caved," and the sand pump was lost in the "cave." The soft red sandstone was penetrated 200 feet, and it was then feared that without casing the sand pump would work across the well and stick the tools, and consequently work was suspended until casing could be procured. The American oil men who had charge of the work returned home, but the company will resume operations in the spring.

Notice is given that application will be made to the Parliament of the Dominion of Canada, at its next session, for an Act to incorporate the Saskatchewan Railway and Mining Company, with powers to lay out, construct and operate a double or single line of railway with steel rails from a point at or near Dunmore Station, on the Canadian Pacific Railway, thence northerly to a crossing at the South Saskatchewan River, at or near Downing Ford, thence across the Red Deer River near its mouth, thence by the best route to a crossing on the South Saskatchewan River at or near Saskatoon, thence in a generally north-easterly direction to Fort La Corne and a junction with the Hudson's Bay Railway or to a point on the Nelson River, with power to the said Company to vary its line a distance of twenty-five miles to the north or south of the said course, and with power to acquire, sell and work coal and other mines, and that said Act shall contain all necessary clauses for the purchase of lands, the acceptance of bonuses in land or money, or securities for money, the building of bridges, and wharves, the navigation of adjacent rivers or lakes, the construction, lease, purchase or charter of steam or other vessels for the purpose of transport of their traffic on the said navigable waters, the construction and equipment of telegraph or telephone lines, or both in connection with the railway, the erection of stations and the making of traffic or other arrangements with other railway companies, and all other usual clauses and privileges necessary for a company with such objects and purposes.

British Columbia.

Despatches from San Francisco state that Messrs. Dunsmuir & Sons, of the Wellington Collieries, have made a reduction of $4 in the price of coal to dealers there. It is expected that this will cause a similar reduction all round.

It gives us pleasure to state that the Canadian Anthracite Coal Co. resumed operations on the 26th ult., upon an extensive scale at their mines at Banff. Mr. Winwood is the mining engineer in charge; Mr. A. Pugh, general manager; and Messrs. Ramsay and Reese, mining contractors. At present 150 men are employed. Chinese labor is employed to advantage on the breaker, and in picking coal, but none are permitted to work in the pits. Up to date, but one cargo has gone west, but we are informed that it is the intention of the company to increase the output to 500 tons per day very soon. A very satisfactory arrangement has been made with the C. P. R. as to freight.

34,393 tons of coal were shipped from Nanaimo for month ended 31st December last, as follows:—

R. Dunsmure & Sons,	11,110	Tons
East Wellington Company	3,209	"
Vancouver Coal Company	20,074	"
Total shipments for December	34,393	"

1,050 tons of iron ore were shipped from the same port during December, ex steamer Ferndale.

Following is the coal output for the year 1888; a very satisfactory increase:

	Tons.
R. Dunsmuir and Sons	200,000
Vancouver Coal Co	259,432
East Wellington	35,809
Total	495,241
Output of 1887	410,573
Increase	84,668

Mr. Robert Scott, for many years an overman of the Wellington Collieries, has been awarded the contract for sinking a shaft for the Vancouver Coal Company, on what is known as the Company's North Field, and continguous to the Wellington Colliery property. Mr Scott severs his connection with the Wellington Collieries at the beginning of the year and in about ten days time will commence the sinking of the new shaft. It is expected that the coal will be reached in about 250 feet from the surface—*Nanamo Free Press.*

The No. 6 Shaft of the Wellington Collieries is now down to a depth of 170 feet. It is expected that the coal will be reached at a depth of 250 feet. The shaft is therefore about half way down to the coal.

The miners at the Wellington Colleries decided, at a meeting held on 2nd instant, that unless the men engaged in getting out pillars received an increase in their present rate of pay they would go out on strike. The mines were consequently shut down. At time of writing we have not heard whether any arrangement has been come to.

The following figures will show the output of coal from the Wellington collieries for the past fifteen years:—1874, 81,000 tons; 1875, 110,000 tons; 1876, 139,000 tons; 1877, 154,000 tons; 1878, 171,000 tons; 1879, 241,000 tons; 1880, 268,000 tons; 1881, 228,000 tons; 1882, 282,000 tons; 1883, 213,000 tons; 1884, 394,070 tons; 1885, 365,000 tons; 1886, 326,636 tons; 1887, 413,360 tons; 1888, 487,784 tons. It will thus be seen that the output from these mines was not only far in excess of any previous year, but that 74,424 more tons of coal were taken out than in 1887.

Commenting upon the strike at the Wellington collieries the Nanaimo *Free Press* of 11th says: The situation at Wellington during the past 36 hours has assumed somewhat alarming proportions and it now appears as if the present attempts of an amicable settlement would end in a failure. The miners at their meeting yesterday afternoon refused flatly to accede to Mr. Dunsmuir's propositions as reported by the committee who interviewed him on Wednesday last in Victoria. This is certainly an unfortunate state of affairs and it is to be deplored by all parties as "strikes" and "lock-outs" are not only detrimental to the miners and the mine owners but it affects all classes in the city and district, and already its deleterious influence is beginning to be felt. Nor is that the only bad aspect of affairs for this morning comes the news from Victoria that Mr. Dunsmuir has instructed Mr. Bryden, Superintendant of the mines, to serve the miners with an order to vacate the company's houses, nor will they be paid for last month's work until they conform to the general rule of removing their tools from the mines and deliver them to the store-keeper.

The following are the shipments of gold from this province for the past year as reported by Messrs. Garesche Green & Co.:—

1888.	Bank of British Columbia.	Bank British North America	Garesche, Green & Co.
January	$ 5,580 44	$ 580 00	$ 2,100 00
February	12,346 80	2,521 60	1,983 90
March	9,445 35	.....	4,930 00
April	20,712 43	1,880 00	5,487 00
May	18,117 35	2,215 00	6,393 00
June	26,841 53	5,616 88	10,445 00
July	29,771 53	4,158 00	13,045 00
August	29,500 13	5,950 00	18,308 88
September	41,019 03	6,644 80	15,305 04
October	35,230 55	4,619 00	15,949 00
November	36,292 93	13,419 00	25,813 00
December	22,564 98	3,960 00	13,695 00
Total	$287,423 05	$51,564 28	$ 133,454 82

RECAPITULATION.

Bank of British Columbia	$287,423 05
Bank of British North America	51,564 28
Garesche, Green & Co	133,454 82
Total for 1888	$472,442 15
Total for 1887	578,924 52
Decrease	$106,482 37

From the above it will be seen that the export by the banks has fallen short by a considerable amount. It is not owing to a decreased output, for Cariboo furnishes a somewhat larger sum than in 1887, and reports from other sections are said to be equally good. The apparent deficiency is rather thought to have been caused by the shipment of gold by other channels than those which have heretofore monopolized the field.

The Petroleum Fields of Ontario.

ROBERT BELL, B. A., S.C., M. D., L.L.D.

(*Continued from December Issue.*)

The drift clay of Petrolia is so impervious that tanks excavated in it and lined with wood are found to be capable of holding the oil, and large quantities of it are stored in this way. These receptacles are circular in plan, and the largest are forty feet in diameter by fifty and sixty in depth, but those of the average size are thirty feet in width by thirty five feet in depth. They have a total capacity of 600,000 barrels. The largest of them are owned by tanking companies. On November 1st, 1886, ten of them were full, and Mr. W. K. Gibson informed the writer that the aggregate of oil which they then contained was 415,000 barrels. The same gentleman gave me the following as the stocks of oil on hand on December 31st, 1885: in tanks at the wells, 36,000 barrels; in the tanking company's tanks, 373,504 barrels; crude oil and its equivalent at the several refineries, 38,372 barrels, or a total of 447,876 barrels. At 85½ cents per barrel in the tanks, which was the actual mean rate at which crude oil was sold during 1885, this would represent $382,934. The average selling price of the illuminating oil in 1886 was 14½ cents per gallon. Formerly the crude oil was sent to London (Ontario), Sarnia, Montreal, and elsewhere, to be refined, but now the whole of it, except about 5 per cent., is treated at Petrolia, in nine distilleries and refineries. The stills are great elongated cylinders, the largest

of them capable of holding from 275 to 300 barrels of petroleum. The six stills at the Producers Works, when in operation contain 1,600 barrels, or 266 each. These are arranged side by side, to the number of six to twelve or more, on a brick "bench," so that the fire can reach their whole length beneath. The fuel consists of water and the refuse tar, strongly injected together from a nozzle. Mr. James Kerr, who is thoroughly versed in the chemistry of petroleum, and acts as inspector for the refiners, gave me the average commercial constituents, per cent., of the crude oil of Petrolia, as follows :—

Naptha	7.72
Burning oil of the Government standard	49.50
Gas oil	14.74
Lubricating or paraffin oil	9.65
Intermediate oil	4.00
Paraffin wax	1.41
Hard coke	3.75
Soft coke and waste	9.23
Total	100.00

During 1886, the average number of pumping engines at work in the district was 75, or one to every 35 wells. They had an average of 18, and a total of 1,350 horse-power. About 30 engines, with an average of 15, or a total of 450 horse-power, were employed in drilling. In addition to these, the refineries, shops, lumber-mills, etc., connected with the oil industry, employed about 50 more engines, with an average of 40 and a total of 2,000 horse-power, to say nothing of the locomotive power required on the railways, etc., to transport the products. Large numbers of horses are used in hauling the crude and refined oil, the machinery, lumber, and supplies of all kinds required in the business. The total number of men and boys employed in connection with the oil industry of Enniskillen is about 2,000, and these would represent a population of about 10,000 dependant upon it. The town of Petrolia and its suburbs contain about 6,000 inhabitants. Besides the above, about 200 more men and boys are employed in connection with the refining, etc., of the crude petroleum sent elsewhere; and in a less direct manner, the products of the Ontario oil-field help to swell the general volume of the carrying and other trades of the country. It would be difficult to give a correct estimate of the capital employed in the business, but it must amount to several millions of dollars. The wages of experienced well-borers and distillers are $1.50 to $2.00 per day, while labouring men receive from $1.25 to $1.50. All the operations are carried on by native Canadians, who have, by their own ingenuity, developed each branch of the business to its present perfection, by carefully studying the necessities of the case. This has afforded an excellent mechanical education to a large number of intelligent men, whose services are now sought for in every oil-producing country in the world. We hear of them directing the boring, pumping, storing, and other operations connected with the petroleum business in Galicia, Russia, Afghanistan, Belochistan, India, Burmah, California, Australia, etc., where their skill and knowledge are highly appreciated.

Excelsior Copper Company.

The first ordinary general meeting of this company was held on Monday, 10th December, at the Cannon Street Hotel, Colonel Malleson, C.S.I., presiding.

Mr. Geo. Roe Fenwick (the secretary) having read the notice convening the meeting,

The Chairman said that since the formation of the company the board had determined to send out Colonel Gay to the mine to extend and develope it. At the same time they ordered the amount of machinery necessary to turn out 100 tons per day. Colonel Gay arrived on November 12th, and he had sent home reports of a highly satisfactory character. He stated that the mine was in excellent order, and although the machinery at his disposal was comparatively imperfect, he had been able to ship consignments of ore regularly. The company had received on the first shipment 33 tons of ore, on the second shipment 40 tons, and on the third shipment 56 tons. It was not, he thought, an unsatisfactory feature, as indicating the appearance of the mine, that the tonnage had advanced on each shipment. They had gone from 33 to 56 tons, and Colonel Gay's letters encouraged the board to hope that future shipments of ore, when the improved machinery was put up, would be of much larger tonnage. (Hear, hear.) In every way the reports from the mine were therefore satisfactory, especially when it was borne in mind that at present it was only the debris left by former miners that was being worked. The company had about 30 tons of ore banked, which was being sent rapidly to the station. All the letters received from Colonel Gay were of the same character, and if there was one feature in which they differed, it was that each succeeding letter gave a more promising account of the mine than its predecessor. (Hear, hear.) It appeared that the lodes were extremely well defined, and the quality of the ore excellent. Messrs. Vivian & Son, who received the first shipment of ore, wrote to-day: "Concerning ours of Saturday, we have just received a telegram from our Swansea friends, advising us that the reason they have not been able to send account sales for the ore, as expected, is that they have been unable to obtain reference assays which they were having made as a check on their own. These have been made this morning, and are as follows :—12 bags, 31⅞ per cent. of copper; 45 bags, 49 per cent. of copper; 46 bags, 12¾ per cent.; 22 bags, 13½ per cent ; 240 bags, 14½ per cent.; 32 bags, 51¾ per cent.; 55 bags, 31⅜ per cent.; 90 bags, 40¼ per cent.; sweepings from the above, 18¼ per cent." Considering the ore shipped home was the debris or mixed with the debris left by previous miners, the return was very satisfactory. (Hear, hear.) In a short time the company would be obtaining richer ore, and he had no doubt that it would be received in England in the quantities mentioned in the prospectus. He would be happy to answer any questions that shareholders might think fit to ask.

Mr. Simpson asked what proportion of the £50,000 had been subscribed, and as to the machinery sent out.

The Chairman said that the company went to allotment on £15,000, that being sufficient, according to estimate, to provide the necessary machinery to make returns, and shareholders would agree that no time had been lost in making those returns. (Hear, hear.) The value of those already made was some £3,000 or £4,000. With regard to the machinery, £500 worth had been sent out in the first place, and finally £1,000 worth. The board had sent out exactly what was requisite according to estimate.

Mr. Simpson further inquired whether the board were corresponding with the mine manager each week.

The Chairman said that up to the present time they had received letters always once a week, and sometimes twice, in addition to cablegrams. A cablegram to hand that morning stated that a further consignment had been despatched, and that another would follow on Wednesday. (Hear, hear.)

Mr. Simpson asked if he might assume from that that almost daily shipments were being made.

The Chairman said that they were being made, if not daily, at all events twice a week. In fact it was impossible for the mine to present a more satisfactory aspect than it now did. It had begun to give returns at once, and those returns were increasing weekly. (Hear, hear.)

This terminated the business of the ordinary meeting, and an extraordinary meeting was convened.

The Chairman said that the company had been formed under Table A, and while that table gave certain powers to the directors, those powers were too indefinite, and it had been deemed advisable to draw up a fresh code of the constitution of the company, which would give the directors definite powers to act without coming to the shareholders for every detail. (Hear, hear.) Copies of the new articles had been sent to the shareholders, and he proposed that they be substituted for those now existing.

Mr. T. H. Scarborough seconded the resolution, which was unanimously carried.

This terminated the formal business of the meeting, and

The Chairman said that the board were so satisfied with the character of the letters received from Colonel Gay, that they were open to the inspection of any shareholder. It was impossible for any member of the company to read those letters without sharing in the enthusiasm with which they evidently were written. (Hear, hear.) Colonel Gay had seen the mine before he was connected with the company, and was so impressed with its value that he had staked his whole future on its success. He had given up a very lucurative business in England to go out and manage the mine, and had put what money he could spare into it. Those were facts which spoke volumes. (Hear, hear.)

A shareholder asked if Colonel Gay had had any previous experience of mining.

The Chairman said he believed that Colonel Gay had been formerly engaged in mining in California.

Mr. Simpson proposed a vote of thanks to the chairman, which was unanimously carried.

The Chairman, in acknowledging the vote, said that the interest of the directors was that of the shareholders, and he felt that, judging from the successful commencement under Colonel Gay's auspices, the company would achieve a very great success indeed.

Quartz Mining in British Columbia.

If placer mining is on the decline, or rather stationary, it is not so with quartz mining. The signs of the times are that this Province will soon hear the hammer of many stamps pounding out the precious metal, and see the glare of the furnaces smelting the base from the pure. In all sections of the province the miner and prospector have been at work, and many known claims have been developed sufficiently to show that they will repay practical working, while the number of gold, silver, galena and copper deposits which have been brought to light for the first time, will mount up into the hundreds. In Lillooet, Nicola, Okanagan, Rock Creek, Cherry Creek, and other districts, and especially in the large district of Kootenay a great amount of practical work has been accomplished.

The country bordering on Kootenay Lake has been shown to possess gold, silver, copper and carbonate deposits of amazing richness, and several carloads of ore, which were shipped with difficulty and enormous expense to Helena and Butte smelters, have returned handsome sums to the hardy and enterprising shippers. Enough has been done during the year just passed to show that in the Kootenay region there are mineral deposits which bid fair to rival in richness the mines which have made Virginia City, Nevada, famous. Hundreds of men are now in the region, and it is assured that many thousands will visit it during the present year. Capitalists have also travelled the rough trails to inspect the mines, and it is gratifying to know that several have made investments, and will open up the mines acquired. There is also good reason to believe that the Ainsworth & Co's charter for a railway connecting Kootenay Lake and Columbia River will be carried to completion by the C.P.R. The Manitoba road, which is pushing westward from Helena, is also likely to pass within a few miles of the British Columbia boundary, and this will furnish cheap and easy access to and from the mines, and of shipment of ores to smelters at Helena and Butte.

The mines at Field have already begun the shipment of ore to the smelter at Vancouver, and the silver and copper mines of Jubilee Mountain are being opened up as quickly as the means of locaters will permit. In many other sections of Eastern and Southern Kootenay quartz has been paid considerable attention to, and the prospects are bright indeed for rapid advancement towards the production of bullion.

At Illicillewaet, in the Selkirk range, also in the Kootenay district, this year the work has been altogether confined to the opening out of the silver mines located there. The Selkirk Mining Co. have run in several tunnels at various levels, and have determined a permanent vein of ore averaging over $100 per ton. The Corbin & Kennedy claims have been further opened up and are developing to the thorough satisfaction of their owners. A road is being built by the government up the north fork of the river, and when this is completed it will enable the cheap carriage of ores to the railway track.

At Stump Lake, in the Nicola district, the Nicola Mining Co., composed of English capitalists, have carried on considerable work in developing their mines. Several shafts have been sunk to a depth of two hundred feet, and cross-cuts run at the fifty and one hundred foot levels. The shafts are to be sunk to a depth of three hundred feet. A tunnel has also been run in on one of the ledges, tapping it at a depth of one hundred feet. The ledges are from two to three feet in width. and the ore, which is of a paying character from the surface, improves in quality as depth is attained. As soon as the company is thoroughly satisfied with their permanency and value, the ledges owned by them will be worked on an extensive scale. Other mines in the neighborhood have been worked, one company shipping a quantity of concentrates to San Francisco. However, the means

employed to save them were on such a limited scale that there was no profit in the transaction. There is no question, though, that if worked on a business basis the mines would return a fair profit. They are adjacent to wood and water in large quantity, situated in a country where a wagon can be driven to any of the mines, and within reasonable distance of the C. P. R., which company will likely build a branch line into the district if mining is proceeded with on a large scale.

At Rock Creek the permanency and richness of the ledges there have been fully established, and one company at least will proceed with the work of reducing the ore to concentrates. It is partly free milling. A carbonate deposit also exists near the gold leads, and ore is now being shipped from this to a smelter. A new discovery was made twenty-five miles from Rock Creek, near Okanagon Lake, of gold, silver and copper deposits, which give promise of being good properties.

In Lillooet district a large amount of prospecting work has been done, and several claims are being opened up with good prospects. Several extensive ledges of free milling ore were located during the summer, and these will be thoroughly investigated during the present year. One on Anderson Lake, exposed on the steep side of a mountain, is especially promising, being rich in gold and readily worked.

In Cariboo district, and especially in the neighborhood of Barkerville, a good deal of attention has been bestowed upon the quartz ledges. One small stamp mill was erected, and is now working free gold ore in Black Jack Gulch. A test smelting works, erected by the government, is just completed. It has been built for the purpose of treating ore in quantity from the mines which are being opened out in order to determine their quality. The disadvantages of being nearly three hundred miles from a railway line has prevented the shipping of ore, and it is expected that the government works will fill a want long felt. They have not been erected for commercial purposes, but simply to aid in the development of the innumerable ledges which exist in the hills surrounding the famous Williams creek and its tributaries, and which are known to be rich in mineral. The treatment of a number of tons of ore from any ledge will, it is thought, prove whether it is worthy of extensive development. This determined, capitalists will be induced to turn their attention to Cariboo, which has sent out so many millions of dollars from its placer mines. It is, with good reason, believed that the quartz ledges will, in the near future, produce greater wealth in bullion than ever was taken from the alluvial deposits.

On Vancouver and Queen Charlotte Islands, in the Archipelago and along the coast, ledges containing gold, silver and copper have been slightly developed, but there has been so far no great discovery. Ledges containing rich deposits of mineral are believed to exist, but the luxuriant vegetation prevents their easy discovery. Time and the elements and fortunate accident may yet unearth mines that will prove of astounding richness.

Altogether the outlook of the quartz industry is very cheering, and before 1889 has sped it is confidently hoped that bullion in no mean quantity will have been produced. British Columbia possesses the mineral. All that is needed is capital, and even that, somewhat tardily, it is true, is coming to us.—*Colonist.*

The Port Arthur Mines.

[Manitoba Free Press.]

The Silver Mountain group comprises a number of veins situated about the eastern extremity of Jack Fish Lake, in the Township of Lybster, and along by White Fish River, the principal vein in this group being Silver Mountain vein itself, on which work has been going on for some years. It is worked at both the east and west end, known as Silver Mountain East and Silver Mountain West, the locations being a mile apart. It is a strong vein throughout, but yielding far larger returns to the west end company than to the east. Both mines are well equipped with machinery, and a good road constructed by the Government leads to Murillo Station, twenty-five miles distant. While the west end mine is turning out the best ore, it cannot be expected that the east end, owing to its position, will long undervalue it. This mine is contracted by an English company. In the Beaver and Badger group the veins number about a dozen, all lying within a radius of about three or four miles. Four of these—the Badger, Porcupine, Silver Creek and Little Pig—are located within a mile and a half stretch of country along the west bank of Silver Creek, at the foot of a bluff or trap-covered ridge. The first mentioned of these, the Badger, is at present a bonanza mine. It has only been in operation for one year, but in that time has yielded big returns to its company. It is controlled by an American company, as indeed most of these mines seem to be. Heretofore the development has been going on very slowly, the Company, chiefly a directorate of merchants, being very cautious, but an increase in men and machinery has lately been made, and the mine is now assuming a business-like air more in accordance with its yielding capacity. Some sixty or seventy men are employed, while the whole location number about one hundred people. During the past summer the clearing has been largely extended, and now a clear plot of two hundred acres in the forest stretches from the head of the vein to Silver Creek. A number of substantial log houses have been put up, a supply store and a stamp mill awaiting its machinery, a large part of which is already on the ground. Sinking has been carried on pretty steadily here, and they are now about one hundred and fifty feet from grass. The silver ore was struck, when the vein left the trap overflow, ten feet of which covered the slates here, and it has continued wonderfully rich to the present time, when it now looks as if the Bonanza had reached its end. However, this is still a mere speculation and it remains to be seen what further blasting will bring to light. The vein continues a good width, being three feet or more in places and though the pay streak has diminished to three or four inches, further sinking may show the rich zone still strong. Drifting has been quite extensively carried on also, three levels or galleries having been driven some distance east-west of the shaft, the two upper levels being air levels, or drifts, as technically called, opening into day at the east side, the slope of the valley. Steam twisting gear has been put in, and forty or fifty car-loads or more can easily be lifted to the bank in ten hours. The main rock is then trammed from the upper level out to the rock house; the slate which is picked out underground is also hoisted and dumped along the trestle. The pay ore, when it has reached the rock house, is carefully picked over, being first washed with hot water carried in pipes from the boiler, so that the silver may be readily detected. Two classes of ore are made; the first class, known as smelting ore, is carefully cobbed and and graded into three grades, the first grade assaying from fifteen hundred upward to ten thousand dollars per ton; the second averaging three or four hundred to nine hundred dollars; while the third class is made up of ore carrying Galena i. e. lead, and which the smelters prefer in a separate lot for the convenience of reduction. The rich ore is then disposed of, while the balance, known as mill-rock, a stamp-rock constituting the lean or hungry portions of the vein, and assaying from fifteen to a hundred dollars or more per ton, is trammed to the mill to be there crushed, concentrated and amalgamated. It is no exaggeration whatever to say that wonderfully rich ore has been taken out of this mine. Nuggets of black sulphide of silver, weighing from one to six pounds, I have myself handled, and are knit through and through with fine wires of native silver, so that the "gangue," or accompanying rock, could scarcely be discerned is not at all uncommon. The rich ore is then assayed, great care being taken that the sample will fairly represent the average yield of the vein, barrelled and shipped to the States to be smelted. One shipment of forty barrels was recently made which yielded a return of nearly forty thousand dollars, and at the time of my leaving another shipment was in readiness. The smelting ore so far yielded by this mine is alone sufficient to wipe out expenses and pay a very respectable dividend to the shareholders. It is proposed to put the mill in running order in the spring, when the three or four hundred tons of stamp-rock already on the dumps will be disposed of at the rate of ten or twelve tons per day. This mill will not be the customary stamp crusher, viz.: a set of five, ten or twenty stamps, but one large sized stamp working in a mortar, which will be open all round the bottom to allow for the passage of the crushed ore. This contrivance, I was given to understand, is quite a recent innovation in milling machinery, but from the satisfactory accounts given of one already in operation in the Calumet and Hecla mines of the South Shore, it is to be presumed that this will work equally well. In this mine, as yet, there has been no occasion for artificial ventilation, since the air levels form a draught with the shaft acting as a flue, a strong current of wholesome air is kept continually circulating. So far as timber is concerned the poplar wood answers for house building, while a saw mill at the Beaver mine, a mile and a half distant, furnishes lumber; but a difficulty to be overcome in the mining engineering is the lack of pine or tamarack timber of sufficient girth and strength for stoping purposes and timbering the shaft, much of the larger timber having to be carried several miles. At present a large gang of men are employed underground, working alternating shifts of eight hours each; but as development proceeds, I am informed that their force will be largely increased.

Adjoining the Badger property lies the Porcupine mine, which was at one time in full blast, as a large clearing, some shanties and a shaft-house indicate, but, owing to financial difficulties, at present it is shut down. The vein is two or three feet wide at the surface, and though I had no opportunity of going underground, the levels being closed and the shaft full of water, the stamp rock on the dumps looks very promising. The man in charge of the location showed me some of the best ore which had been stacked in the shanty close by, and it can safely be said this vein will prove, when fully developed, one of the best mines in this district. A company, composed of Canadians, and headquarters in Port Arthur, I believe, is about to begin operations on this mine very soon. It has two veins a little to the north of these, the Silver Creek, and Little Pig, which have been tested by trial-pits and proved satisfactory, and only await the necessary capital to begin sinking. This last mentioned is an unusually strong vein, and one on which, owing to its position along the side of a bluff, a stone-throw from the Government road, would be easily mined.

The Beaver mine, already famous among silver mines, I had the opportunity of spending a week at, seeing both its surface and underground equipment. This mine is an excellent instance of what an enterprising mining company may do in this region. It is now three years since this mine was opened up, and it has worked unceasingly since that time. The mine at first yielded a big bonanza, which naturally played out, but sinking was continued till rich ore came again in sight. Now that it has experienced some of the difficulties to be contended with in this region it has developed into a settled organization—working, yielding and paying. It has changed management and mining captains several times, but this has not for a moment impeded the work. At one time this mine employed two hundred men. Its machinery is of the best, and its mechanical appliances throughout, both on surface and under ground, good. There is a large mill with a capacity of 30 tons per day on this location, but at present it is inactive. I am informed, however, that crushing is to begin in the spring, sufficient stamp-rock being at present on the dumps to keep it constantly at work crushing for three years. This vein intersects a mountain, in some respects making it easily mined. While, however, there was plenty of opportunity to run air-levels, and thus make easy ingress and exit for the men, it necessitated sinking the shaft in the summit, while all the hoisting plant had to be placed at the foot of the mountain. This required a thousand feet of cable to run up the mountain side and on to the shaft-house to lower and raise the "cage," but all has been successfully accomplished, and the mine works with thorough system day and night. The inflow of water, a difficulty so often met with in mining, has not been a serious one to contend with here, nor has it been to any extent so in any of these mines. They are three hundred and fifty feet from "grass" in this mine, have driven five levels, three of which are air levels, *i.e.*, opening into day, and are at present sinking the shaft or drifting on the sixth level. While richer zones than the one they are at present working in have been passed through, it is not impossible, in fact it is quite probable, that a bonanza streak may be again encountered. As it is, however, the ore coming out is of excellent quality, showing in liberal quantities both sulphide of silver and the metal itself. This mine is fully equipped with air drills controlled by a powerful compressor. The wages here, as in the other mines, run from one dollar and a half to three dollars per day. The miners employed in these mines are of all nationalities, a large number of Cornishmen. who are capital miners, being employed as well as Swedes, Finlanders and Italians. These latter, however, I am informed, are objected to sometimes by the other workmen on the ground that they are willing to work for less money. This should not, however, deteriorate their services in the eyes of their employers. Drinking has been forbidden on these locations, but this does not prevent an occasional spree at Port Arthur or the Half-way House, which indiscretion, however, seems to be occasionally allowable in miners the world over. When in full working order a location presents the appearance of a small village, with its dwellings, boarding-houses, general store, butcher shop and school. Indeed, it may be called an incorporated community, having, in place of a reeve and councillors, a manager, with his sub, the mining captain, controlling underground work, the master mechanic, assayer, etc., at whose beck and nod the regulations and funds are doled out. It was during my stay at this mine that I took the opportunity of visiting the Rabit Mountain Mine, located about three miles to the southeast, and reached by a trail through the woods. This location discovered by an Indian some five or six years since lies in a hollow between two trap bluffs which almost exclude the light of day, and in winter I have heard that the sun only shows himself for two hours during the day. A group of shanties lies about the shaft along with a mill and a hotel, the latter bearing the pretentious name of the Windsor House. It was through the proprietor's kindness that I was furnished with most of my information concerning this mine. No work is going on here at present; a full supply of mining and mill machinery, all set up, stands silent, and the shaft, some two or three hundred feet deep, is full of water. This vein showed an unusual width on the surface, and continued wide and regular throughout the sinking, being when abandoned seven feet in width. The rock, however, I am informed, was good average mill rock, but a sudden decrease in assay returns shook the faith of the St. Paul Co. and it was dropped. The plant, a most ex-

cellent one, consisting of engines, compressor, with a capacity of nine drills, first-class pumps and a full mill plant of five stamps, vanners, and concentrators, and sufficient room to increase the crushing power to ten stamps if needful, stands waiting for an energetic company to oil up with sufficient grit and capital. About a mile distant from this mine lies the Caribou and Big Bear locations, both promising mines, I am informed, and on both of which sinking has been carried on to some extent. As regards the third group of mines situated at the margin of Lake Superior, I am not prepared to make any definite statements. The Jarvis Id. mine, under the management of an English company, has been shut down, but that the character of the ore fully warranted it I do not know. From personal observations I have concluded that this region must eventually take a prominent part among silver mining regions. My reasons for so believing are these: First, the nearly universal excellence of the ore—while much is rich, it is all good average stamp-rock; second, the close proximity of the ten or twelve veins in the middle group (all within a radius of three or four miles) leads one to believe this belt has plenty of outcrops still awaiting the prospector's pick; third, as the depth increases the value of the ore does not necessarily decrease, as the richest ore is in zones or "pockets," liable at any moment to come into view; fourth, it is as yet a new mining region, and but awaits the thorough and satisfactory trial of one or two mines to ensure the success of all; fifth, the geological indications are favorable—the veins are all north-west and south-east, being true fissures. I have already mentioned the difficulties to be overcome so far as I know. What seems to be needful are companies, comprised in part at least of mining men, with sufficient capital to push the work when threatened with a decrease in returns.

The Treatment of Ores.

NOTES ON THE SELECTION OF A PROCESS.

I.—Free Gold Milling.

(Mining Journal.)

The difficulties attending the selection of the best process of ore treatment being dependent in most cases upon local circumstances, and upon the intricate and complicated composition of the ores, it is not possible to lay down exact rules covering all cases; but the following notes will serve to indicate the principles of the processes most commonly followed, and will furnish a guide for general application.

Free gold milling is essentially applied to ores containing gold in the free state; but as a preliminary process it is commonly employed on ores in which the gold exists, partly combined with pyrites of copper or iron, the free gold being first extracted, and the auriferous residue subsequently treated by a more suitable process. The successful treatment of ores containing gold in the semi-free state necessitates, however, such extremely fine crushing that in many cases it would be more economical to adopt a smelting process at once instead of passing the ore through a preliminary process. Gold milling is of all the most simple method of gold extraction, but its application is limited to the treatment of ores containing gold wholly or partly in the free state, and is not suitable for the extraction of the precious metal when chemically combined with the other metals of the ore.

In free milling the ore is first crushed wet under stamps or rolls, and in cases where the gold is disseminated in fine particles the ore is afterwards pulverised. The pulp is then passed over copper plates whose surface is quicksilvered, the gold attaching itself to the quicksilver in the form of amalgam, which is collected at intervals and retorted. The process is not only the most simple but is by far the cheapest, ores containing not more than $2, or under 2 dwts. of gold per ton, having in well arranged mills and under favorable circumstances, just paid the cost of treatment, and in the Black Hills ore yielding $6 or less than 8 dwts. per ton (calculating the value of retorted gold at 75s. per ounce) can be worked to a profit, including the cost of mining as well as of milling. This, however, would not be an absolute guide as to cost, the minimum cost of working this process being of course, contingent on local circumstances such as cheap water power and labor. The adaptability of this process can be easily and expeditiously tested by panning down a finely crushed sample, when the gold, if free, will be at once made visible, and after concentration may be amalgamated with mercury and distilled out. In most cases, however, auriferous ores contain other metals generally in the form of sulphides, principally those of iron and copper, rarely of lead or zinc, and occasionally various tellurides, notably those of silver with small quantities of gold such as sylvanite and hessite, and of lead, as altaite and nagyagite. The presence of these metals renders necessary a modified method of treatment, In the first place the sulphurets must be concentrated and rendered clean from the gangue of the ore. This may be roughly done by passing the finely crushed ore over blankets or hides, collecting at intervals the deposited sulphurets, but it is a crude and imperfect method entailing much loss in the form of fine mineral carried away by the necessarily strong stream of water, and imperfect separation by reason of portions of the gangue being mechanically arrested in the crevices of the blankets or hides. The minimum gold contents in sulphuret ores that will pay to extract by subsequent methods, such as chlorination or smelting, and leave a margin to cover the cost of these operations and of the concentration, will depend in almost an exclusive degree on the perfection of the dressing machinery employed. It is quite impossible to lay down any rule which would be a guide in this respect. It is quite evident that no one machine can be adopted to the numerous classes ot ore of distinct physical properties; for instance, the ore may contain minerals of nearly the same specific gravity as the gangue; again, the precious metals may be contained in minerals of varying densities; and again such minerals may be of different hardness and cannot be pulverised to any equal degree, which is one essential condition to satisfactory concentration.

The most suitable method of treating the freed sulphurets will depend mainly on local circumstances. Where the concentrates are rich and the cost of transport not heavy, it becomes a question whether it would not pay best to send the ore direct to the smelting works, for such ores—auriferous sulphurets—always command high prices on account of their co-agency as a flux (after calcination) in the treatment of other ores of the precious metal. In California the concentrated sulphurets are chlorinated (after roasting) by exposure to chlorine gas whereby the gold (rendered free by the roasting) is converted into a soluble chloride, and afterwards precipitated. The cost varies in this district from 30s. to 40s. per ton of concentrated ore, but this cost is, perhaps, exceptionally low, and would be little guide for other districts where the expense of labour, fuel, and chemicals may be higher. In such case the better mode of treatment would be by roasting and amalgamating or smelting, the latter especially when the auriferous ore contains copper, or where lead ores are available, in either of which two metals the gold may be concentrated with but little loss. This process cannot well be used on ores rich in silver. In such cases the silver is best extracted by the Mexican "Patio" process, the "Augustin" process, the "Ziervogel" process, or the "Pakra" process, in all of which the silver is converted into a chloride by the agency of common salt, and afterwards dissolved out. A detailed description of each may be found in any good work on the metallurgy of the precious metals.

(To be continued.)

Mine "Booming" Extraordinary.

(MINING JOURNAL.)

America, as we all know, is the land of "big things," and there should be no doubt in the mind of its admirers as to the ability of its inhabitants to "lick creation" in any direction the genius of its people may suggest. If our cousins claim this as an universally applied truism, we should hesitate to allow the contention, but in mining matters we will not contest the claim. In this direction they have fairly outdone themselves in 'cuteness. In what way, our readers will not take long to discover from the *expose* of the Arkansas mining frauds which has been recently made in American papers. The story of this remarkable mining boom, which commenced in 1885 and was told in American papers at the time, will profitably bear repetition. For some years past there appears to have circulated amongst the good people of Arkansas a legend that the country was immensely rich in mineral wealth, that this wealth had once been drawn on by its former inhabitants, the Spaniards, who, on their ceding the country to France, managed to obliterate every trace of their mining exploits. The belief in this absurd story appears to have been pretty generally held, for it was carried down to the present day. In particular, the story seems to have received most credence in its relation to a certain mine called the Louisana, which was the envy of the mining world when in the hands of its discoverers, the Spaniards, which is more than can be said of it to-day. The subsequent discovery of this old mine would be more remarkable than the legend itself, were it not that to be sceptical on the one would imply disbelief in the other.

Its history is this: Some thirty years ago, an adventuresome band of proselytes to the legendary faith, who appear to have had more confidence, than either brains or money, commenced a campaign of exploration to discover this abandoned, and concealed mine, but they soon gave up the task although it was believed at the time and subsequently that they were "on the track." However cupidity came to the rescue of incredulity once more, and the legend was again revived in its most attractive form. Whether through faith in the legend, or using it merely to work on the credulity of others, a new band of adventurers determined to seek for the Eldorado of the Spaniards, and soon gave out to the world that they had found it. A company, called the Lost Louisiana Company, was at once incorporated under the laws of the State, with a modest capital of 1,000,000*l.*, out of which the adventurers pocketed 600,000*l.*? The excitement which followed this supposed discovery was immense, and the country became a huge mining camp. "Every unfamiliar rock (says the State geologist) was regarded as a valuable ore, or as an 'indication' of something." Within three years the total capital stock of new companies incorporated in the State amounted to $111,000,000. Most of these companies, however, turned out such miserable failures that State intervention was sought, and the State geologist called upon to furnish a report on the mines. After describing the origin and progress of this remarkable boom, the report goes on to state:

"The authors of this excitement have persuaded people, whether honestly or fraudulently makes but little diffierence, that the ores of this region are 'peculiar,' and only required some new process to get gold and silver out of them. This delusion has been kept alive by assayers, some of whom were perhaps sincere, but some of them certainly fraudulent."

So persistently was this theory advocated that it became a question of life or death to the mining industry of the State—at least, so far as the precious metals were concerned—and in order to test the contention, a trial of the Lost Louisiana ore was carried out in the public sampling rooms of the St. Louis Sampling and Testing company, the operations being conducted under the watchful eyes of two officers of the company, Messrs H. A. Wheeler and Arthur Thacher, who were to be enlightened as to the proper method of obtaining gold and silver from this "peculiar" ore. And enlightened they were! The Arkansas assayers were Mr. A. M. Beam and "Professor" Augley. Altogether 19 assays were made from samples taken from 46 lbs. of the Lost Louisiana ore. In two cases gold was found to the extent of 8 and 11 6-10 ozs. respectively, and the remaining tests showed only traces. But the funny part of the *expose* which followed is this—that Mr. Thacher has certified that Prof. Augley omitted to put in the ore when the first result was obtained, and Mr H. A. Wheeler has certified that the second result was obtained from a sample composed of a mixture of iron ore, litharge, soda, coal and charcoal, which had been purposely substituted for the roasted Lost Louisiana ore! We give full copies of these interesting documents:

St. Louis, Mo., May 1, 1888.

This is to certify that I, A. M. Beam, have been experimenting for the past three days on a certain lot of ore from the Lost Louisiana mine, Bear Mountain mining district, Montgomery County, Arkansas, by the herein below given formulas. After making ten assays with these formulas I have been unable to obtain more than a trace of gold. Every facility was offered for the execution of this work.

Crucible Assay: One-half A.T. ore, one-half A.T. borax glass, one A.T. baking soda, one A.T. test lead, five millegrams silver foil, salt cover. Melt to fusion, and add one-half A.T. test lead. When in quiet fusion take out of furnace, scorify and cupel.

Gives best results: One-half A.T. ore (roasted as before), one-half A.T. litharge, one-half A.T. soda, one-tenth A.T. argol, one-tenth A.T. nitrate of ammonia, one-twentieth A.T. chloride of barium. Salt cover. Melt to fusion, and add one-half A.T. test lead, and treat as before. When melted down stir in each case. These are the formulas I have successfully used in Arkansas, and got fifty ($50) per ton.

(Witnessed.) A. M. BEAM.

ST. LOUIS, Mo., May 4, 1888.

This is to certify that we, Samuel Aughey and A. M. Beam, on May 2nd, 1888, made three assays of the "Lost Louisiana" ore, Bear Mountain mining district, Montgomery County, Arkansas, and got only a trace of gold. On May 3rd, 1883, we made two assays of the aforesaid sample and got a trace of gold in No. 1, and eight ounces of gold per ton in No. 2. On May 4th, 1888, we made four assays of the aforesaid sample and obtained traces of gold in the first three assays, and got eleven and six-tenths (11·6) ounces of gold per ton on the fonrth assay. We got the result of 8 ounces per ton in assay No. 2, May 3rd, by the following formula "A": ¼ A. E, ore; 1 A. T. soda; ½ A. T. litharge; 1 gram ammonia nitrate; 1 gram barium chloride; 2½ grams argol; 10 grams potassuim cyanide; 5 grams borax; 14 millegrams silver; salt cover; ½ A. T. test lead. We got the result of 11·6 ounces gold per ton of assay No. 4, May 4, 1888, by the following formula:—"B": one-half A. T. ore; ½ A. T. soda; ½ A. T. litharge; 3 grams argol; 1 gram ammonia nitrate; 1 gram barium chloride; 10 grams pottasium chloride; 5 grams borax; 10·9 millegrams silver; ½ A. T. lead.

These results we obtained entirely by our own determinations, and they are satisfactory to us. Every facility was afforded us for making these assays. (Signed)

SAMUEL AUGHEY.
(Witnessed.) A. M. BEAM.

St. Louis, Mo., May 4, 1888.

I hereby certify that I, Arthur Thatcher, was present on May 3, 1888, while Prof. Aughey weighed out charge No. 2, *and that he omitted to put in the ore.*

(Signed) ARTHUR THACHER.
(Witnessed.)

St. Louis, May 4, 1888.

I hereby certify that I, H. A. Wheeler, on May 4, 1888, after Prof. Aughey had roasted his ore charge, *changed it for a mixture of iron ore, litharge, soda, coal and charcoal, and I hereby certify that all four assays executed by Prof. Aughey on May* 4, 1888, *were made from this mixture.* That these materials did not contain more than a trace of gold is proved by the result of Prof. Aughey's first three assays.

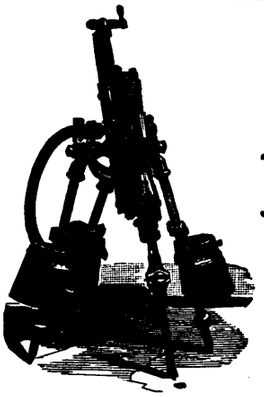
(Signed) H. A. WHEELER.
(Witnessed.

The words in italics have been so rendered by ourselves. Against these, to say the least, very suspicious results and which the State Geologist has no hesitation in attributing to "salting," the company promoters, according to the reporr of the State Geologist from which we quote, produce and set-off the certificates of some of the most eminent assayers in the States, but they fail to produce any proof that the samples from which satisfactory results have been obtained by such responsible assayers, came actually from the localities they are represented to have come from, and such assayers themselves disclaim, through the State Geologist, any responsibility beyond the chemical accuracy of their tests.

In the interest of legitimate mining it is an unbounded pity that such gigantic frauds are not exposed earlier. They do incalculable mischief to the industry far and near, and it will be many years before their prejudicial effect on the development of the really good claims in Arkansas, of which there are many in coal, iron, manganese, antimony, and possibly zinc, will have passed away.

If any indirect good result from this exposure, it should act as a warning to the allurements of legendary mining, and should serve at the same time to dispel the misapprehension among many people about the value of specimens or samples in determining the value of mining properties. Assayers do not undertake to vouch for anything beyond the accuracy of their tests, and, however conscientious the owners of valuable but undeveloped property may be, it is quite impossible to obtain samples which may be relied on to represent with absolute accuracy the future turnout of the mine. Yet it is unquestionable that hundreds of mining companies are floated on no other recommendation than that of an assay made on samples which can give but the slightest evidence of the value of the bulk of the workable mineral. If the Arkansas frauds do no other good than to draw attention to this, there will be some compensation and consolation to legitimate mining. The honorable profession of assaying, in the keeping of honest men, should not suffer, but rather be the more respected, by this exposure.

The Largest Flume in the World.—The flume that conveys the water from the mountains to the reservoir at San Diego, Cal., is 25 miles long, and is made of redwood. In the course of the flume there are 315 trestles, the longest of which is 1700 feet long and 85 feet high. This is the Los Cochos trestle. The Sweetwater trestle is 1200 feet long and 85 feet high. The main timbers used in these trestles are 10 by 10 and 8 by 8. They are put together on the ground, and raised to their positions by horse-power. There are eight tunnels in the course of the flume, the longest of which is 2,100 feet in length. The tunnels are 6 by 6 in size, with a curved roof. Each mile of the flume required on an average 250,000 feet of timber for its construction, and the redwood used in the box is all 2 inches thick. The San Diego flume is said to be the largest yet constructed.



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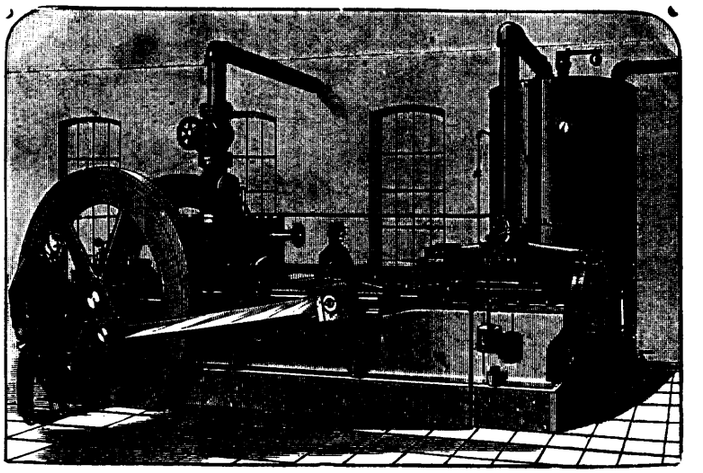

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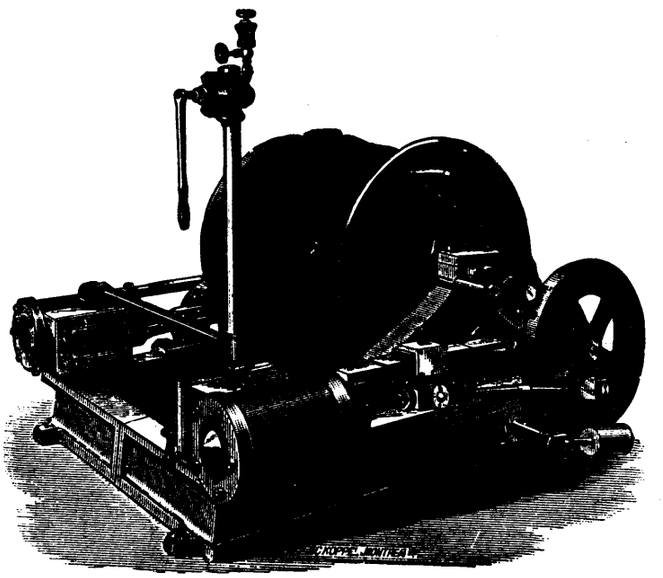

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Mining Regulations

TO GOVERN THE DISPOSAL OF

Mineral Lands other than Coal Lands, 1886.

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

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

QUARTZ MINING.

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

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

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

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

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

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

IRON.

The Minister of the Interior may grant a location for the mining of iron, not exceeding 160 acres in area which shall be bounded by north and south and east and west lines astronomically, and its breadth shall equal it 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 fradulently, 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 quarts 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 Dominian 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.