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The Canadian Mining Review

Established 1882

Vol IX.—No. 6. 1890.—OTTAWA, JUNE—1890. Vol. IX.—No. 6

PROVINCE OF NOVA SCOTIA.

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

— AND —

PRECIOUS STONES.

Titles given direct from the Crown, Royalties & Rentals moderate

GOLD AND SILVER.

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

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

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

MINES OTHER THAN GOLD AND SILVER.

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

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

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

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

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

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

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

THE HON. C. E. CHURCH,

Commissioner Public Works and Mines,

HALIFAX

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Geological and Natural History Survey of anada.

ANNUAL REPORT, 1887-88.

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The Report of the Royal Commission on the Mineral Resources of Ontario.

Canadians have become so used to reading ancient history and obsolete explorations and statistics in Government reports, that it is a genuine surprise to peruse the work that bears the above title, and to find it, in the main, fresh in its data, practical in its investigations and wise in its conclusions. Taken as a whole it might be said that no work has ever been issued of such vital importance to Canada ; for its treatment of the mining industries is so minute in its investigation and far-reaching in its application, that its information and suggestions are capable of yielding untold benefit to the whole Dominion of Canada. To the Government of Ontario is due the credit of instituting this commission of enquiry, and of setting an example of intelligent research which is a model to all Governments, and which even the Geological Survey of Canada might emulate with profit.

As our readers would see from the summary published in our last issue, this Commission held sessions in 37 places, and examined 164 witnesses under oath. The Report derives great value from the statement of the views of these practical men in their own words, giving the reader the opinions of those best qualified to judge of the condition of each industry, while the summarizing of these voluminous and sometimes conflicting statements is performed with admirable skill and wisdom. This work refutes the oft-made assertion that no good can come out of Government undertakings, and that men can only work effectively under the stimulus of trade competition. It is difficult to see how private enterprise could have made more thorough examination of the various subjects treated, or have reached more definite conclusions. In this case certainly the existence of a Government Commission has been justified.

After an important introduction, a fairly valuable condensation of geological knowledge is given in terms suited to the ordinary reader ; then follow descriptions of the various mineral resources of Ontario, and one is amazed at their extent and importance. The list of those specially investigated include iron, gold, silver, copper, nickel, building materials, marble, clay, charcoal, gypsum, phosphate, lead, mica, natural gas, petroleum, platinum, plumbago, salt, zinc and arsenic. Statistics of each industry are given, and the difficulties that each has to encounter are pointed out and discussed. The mining laws of the principal European and other countries are collated in a most instructive manner, and wise deductions are made from their suggestions. The smelting of ores receives attention in a whole section, and the closing portion gives attention to " Measures for aiding and encouraging Mineral Development." Among these are, the establishment of a Provincial Bureau of Mines under control of a geological officer (who must be a practical mining engineer), the founding of provincial and local museums, the collection of mining statistics and technical instruction in schools of practical science. In an Appendix, many valuable papers by eminent writers give valuable information upon the minerals referred to in the Report, with instruction upon methods for their determination and treatment. An exceedingly important paper treats of technical instruction, and gives information about the leading mining schools and museums of the world. This excellent compendium of information closes with a glossary of geological and mining terms, and carefully arranged indexes, giving reference to all the names of witnesses and to general topics. The lion's share of the work in its preparation fell upon the shoulders of the painstaking and hard working Secretary, Mr. Archibald Blue, and the public is largely indebted to him for much of the thoroughness of the compilation.

Elsewhere we notice in detail some of the main features and recommendations of the Commission. Our remarks on the consideration given to our iron ores and interests are however unavoidably held over until a future issue.

The Report on the Mining Laws of Ontario.

Much diversity of opinion existed among the witnesses examined by the Royal Commission on the mineral resources of Ontario with reference to needed changes in mining laws and regulations, but there were a few points of general agreement which deserve notice. It is evidently desirable that the prospector and discoverer of minerals, who is usually a poor man, should have the opportunity to work his finds, and for this purpose the sale of small locations, or the lease of lands upon royalty, is recommended by many witnesses. The monopoly of land by speculators is felt to be a great hindrance to development, and all agree that ownership should involve compulsory working. Men are ready enough to spend money in the expenses of operating mines, but the preliminary outlay of a large sum for the privilege of possessing a location for what is usually a somewhat doubtful experiment acts as a serious deterrent upon enterprise. The evidence given by the representative of the CANADIAN MINING REVIEW sums up the situation in these words : " I think our mineral lands should be reserved by the Crown. I think the present system of selling lands unconditionally is opposed to the development of the country. Development to a certain extent every year should be compulsory. Any mining regulations which permit the acquisition and control of large areas of land upon payment of a merely nominal price is undoubtedly a most favorable arrangement for capitalists and speculators, but it is one which in every sense is opposed to the best interests of the people at large. At present, extensive districts are locked up in a few hands, and no one is permitted to operate upon them unless he can afford to purchase the land at an immense advance upon its cost. If capitalists were permitted to lease upon royalty just so much land as they could work, and only for such periods as they continued to work, and if the poor prospector could lease the area on which he had made a valuable find and be at no expense beyond the cost of working, then we should see a vast increase in mining matters ; the revenue 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."

The Commission deems reservation and royalty impracticable, owing to the influence of the United States system, and the fact that Ontario has already gone so far in the opposite direction. But surely a bad example and wrong practices are not a fair argument against reform. It is in this and a few other features, that the otherwise most admirable Report is least satisfactory. It says : " The best and perhaps the only remedy for the evil would seem to be that which has been adopted in New Zealand and South Australia, viz., the resumption of such unworked lands as are believed to be valuable for mining purposes, upon payment of a reasonable compensation, and holding them for re-sale, subject to developmental conditions.' This applies to lands already sold, but there seems to be no reason why the unconditional sale of mineral lands should be continued. It is a policy at variance with the ideas of nearly all advanced thinkers, who maintain that the land and its treasures belong to the people at large, or, as we say in a monarchial country " to the Crown," and should only be parted with for " occupying use," and on terms that wil give perpetual income to the nation. The Commission has rendered a valuable service in collecting the mining laws of the world, and a careful study of that portion of the Appendix may aid the suggestion of the wisest policy for Canada to pursue.

Attention is given in the Report to the laws relating to underground boundaries, the health and safety of miners and their claims as wage-earners, and to forest fires in mineral districts,—all important matters and worthily considered. The influence of this Report should be mighty in the direction of legal reform and wise legislative enactment.

Aids to Mineral Development.

The conclusions of the Royal Commission, resulting from their comprehensive investigations into the mineral resources of Ontario, must necessarily be regarded with great interest, and are entitled to the respect due to earnest and intelligent effort. The abolition of tariff restric-

tion between Canada and the United States is evidently regarded by them as the great desideratum, but there are many other improvements, which are at once within reach, that would be of vast advantage to the country. The Report mentions four ways in which valuable service may be rendered by the provincial government of Ontario :—

1. By a geological survey of the province with particular reference to its economic minerals.

2. By establishing a museum of minerals and mineral products.

3. By collecting and publishing yearly statistics of the mining and metallurgical industries of the province.

4. By provision for education in engineering, mining and metallurgy.

The purpose of a geological survey is stated to be mainly the development of mineral resources. A general survey of the country is now being made by the Dominion, and the time has come for the province to take up the work in more thorough and systematical detail, and to form a Provincial Bureau of Mines. The object of this Bureau should be not only to collect information to be stored away in its archives, but to diffuse knowledge, give useful advice and secure the promotion of industry. Complaint has been made that the researches of the Dominion survey have been too carefully guarded from the inspection of the public through a dread of favoring individual pursuits, and it seems important that all the knowledge obtained should be made available for every one who has the enterprise to ask for it. The efficiency of this Bureau must altogether depend upon the person in charge of it, who should not merely be a geologist, but also a well educated mining engineer, in possession of thoroughly practical experience in mining matters, well qualified to instruct owners as to the best means of opening their mines, and of utilizing and marketing their products, and also able to recommend modifications and improvements in mining practices—a man of weight and authority who will be respected, not one who will oppress enquirers with an outpouring of technical gibberish, but one who can impart practical common-sense ideas.

Museums of minerals are found to be serviceable means of instruction to prospectors and other persons interested in mineral development, and when in charge of officials able and willing to give information, valuable service can be rendered in the direction of research, and costly mistakes may be avoided. "It has been estimated that in Great Britain the money saved from the indiscriminate and fruitless search for coal alone where there could be no hope of finding it, such as had formerly gone on, has been more than sufficient to pay the whole cost of the exhaustive geological survey of the kingdom." We have record in this report of a cargo of pyroxene having been shipped to England under the misapprehension that it was phosphate. The influence of the Bureau and museum would tend to prevent such occurrences.

By making returns of mining statistics compulsory, and by a prompt and intelligent compilation of them, great service might be rendered. Investment and operation would often be encouraged were accurate information obtainable as to the past and present conditions of industries.

The information collected with regard to schools of technical instrction is one of the most valuable features of the Report, and should stimulate the people of Canada not to be behindhand in the education of their youth in those departments of natural knowledge and technical skill which all progressive countries are now giving attention to. The cultivation of classical learning may be of value in increasing the culture of the wealthy classes, but what the youth of Canada need is not so much to know the mythologies of Greece or the history of Rome as to become aware of the natural resources of the country and the best means of utilizing them. By attention to these recommendations a mighty stimulus would be given to industrial progress, for "the most legitimate means by which people can really enrich themselves is to extract wealth from mother earth direct," and while many natural supplies are destined to decrease, such as timber and fisheries, the minerals furnish an unlimited source of wealth, and it is only by the well directed and intelligent effort that comes from observation and study that economic production becomes possible.

Minerals and Politics.

It would hardly be expected that a treatise on the mining industries of a country would prove to be a medium for political instruction, but the report of the Royal Commission on the Mineral Resources of Ontario contains the most conclusive array of facts and opinions in favour of Commercial Union or Reciprocity with the United States that has ever been presented to the Canadian public. It will wield a powerful influence from the circumstance that its compilation is entirely free from the influence of party politics, and is solely inspired by the earnest and unbiased consideration of economic necessities. The opinions expressed are not those of the Commission primarily, but of the numerous witnesses who were examined throughout the whole range of the country from Ottawa to Rat Portage. The report says: "At every point the Commission met with evidences of the great importance of securing wider markets. Everywhere the witnesses examined either felt impelled to allude to the importance of this matter of securing access to other markets or fully admitted its importance when allusion was made to the subject. Differences of opinion upon the questions of establishing mining schools, granting bonuses to promote iron production, changes in the mining laws, everything else in fact were in all cases developed; but upon the question of the desirability of obtaining free access to the American markets for our mineral productions there existed absolutely no difference of opinion so far as we could judge among men interested in mining enterprises, except in the case of those interested in petroleum, and in one solitary instance in the case of a producer of salt. With the consciousness on the part of the intelligent men interested in mines, whom we met from Ottawa to Rat Portage, that with boundless mineral resources and a market the limits of which were exceedingly narrow, we were cribbed and dwarfed in our attempts to make developments, the cry everywhere was 'Give us the American markets; break down the barriers that separate us from 60,000,000 customers at our very door!' Whether this desire may possess the farmer, the lumberman and the fishermen or not, it certainly awakens the earnest longings of the mining population of Ontario."

The report goes on to show that the two countries are geographically one, and points out the natural conditions favouring commercial intercourse. "The energetic zone of North America may be said to be between the 38th and 48th parallels of lattitude," and Ontario occupies a central position in its midst, with control over means of transit by land and water of incalculable value to both countries. The people of the two countries are essentially homogeneous in blood, and the populations are largely commingled. By restrictive tariffs on both sides Canada is placed in a false economic condition, and her experience under the reciprocity treaty proves conclusively the desirability of removing the barriers of trade. No department of business has experienced more painfully "the effect of commercial hostility and ruthless repression by tariff enactments" than has been done by the mineral industry. In turn each department is surveyed. The stagnation of the iron industry is pointed out, and the glowing picture of its probable develop ment under free trade would arouse the enthusiasm of every lover of his country. Copper and nickel are next shown to be depressed by the United States tariff, by the United States tariff which reduces its price, and by the Canadian tariff that increases the cost of supplies. It is stated that the salt field of Ontario embraces an area of about 1,200 square miles, "the brine is the strongest and purest known, and the quality of salt produced is excellent." "The free admission of salt to the American market with free coal for fuel might speedily double our salt product, and secure continued and rapid increase beyond that point." Mountains of marble and quarries of building stone of great excellence are described, with easy access and cheap transportation to all the cities and towns of the lake region. "The duty alone has prevented the growth of trade in this direction."

After enumerating many of the direct hindrances to trade arising from the exaction of duties, the Report goes on to mention that the measure of repression is not to be estimated merely by the amount of money paid, but that consular certificates, custom house entries, disputes with appraisers combined with espionage

and exactions of officials who need care little for public opinion, constitute a system of vexation more appalling and deterrent to many men of business than are the mere duties levied. The testimony of the practical men who were examined must be read to secure a full appreciation of the vital necessity of free trade with the United States to the full development of our mineral industries.

The Report lays equal emphasis upon the repressive effect of Canadian duties upon mining machinery and supplies, and it is probably owing in great measure to these investigations that the Dominion Parliament at its last session made some arrangements for free importation of mining machinery. This action is the admission of a principle which, if consistently applied, would sweep away all tariff restrictions, and permit our natural resources to seek full development unhampered by artificial restraint.

The Commission carefully avoids vexed questions of party politics not of a purely economic nature, and there is not a word in the Report calculated to offend the loyalist or to give support to the annexationist. But it looks the facts squarely in the face, and deals with questions in a purely practical manner. This section closes with the following remarks: "The vast increase in mineral production in the United States has been pointed out. A state of great activity is the characteristic of the development of mineral resources in that country. In Alabama, Georgia, Tennessee, West Virginia, Virginia, Kentucky, Arkansas, and other States, scores of millions have been recently invested, cities are springing into existence, railway lines are being constructed, furnaces erected and great strides in development made. Why should Canada lag behind in this career of development? Why should the great tide of enterprise and business activity sweep by and leave us untouched? The tariff well serves like a wing dam to direct the current from us. Remove the dam and the current will reach us in full force. To the wealth and the restless activity of the United States we must look to a large degree for the capital and the skill to develop our large resources of gold and silver, nickel, copper and iron. Now we are looked upon somewhat as Siberia is; a land possessed of minerals, perhaps, but foreign and far away. More than one-half of our mining capital is now American, but it represents only a small fraction of the amount that would speedily seek investment in Ontario, if the two countries were commercially one. The influence this change would exert would probably be felt in a more marked degree in the development of the silver and gold mines of north-western Ontario than even in the more seriously tariff-burdened industries of iron, copper, salt and structural material production.

"Examination into the character and extent of the mineral resources of Ontario shows even now, when we are only at the threshold of discovery, that they are practically without limit in extent and value. As to the best means of development, we must pick up the courage to make that considerable degree of progress which present conditions will permit, and we must work and hope for the coming of the day when the war of the tariffs shall be a thing of the past, and we shall be able truthfully to say—

'No pent up Utica contracts our powers,
But the whole boundless continent is ours.'"

Suggested Smelting of Canadian Copper and Nickel Ores in Ohio.

Mr. S. J. Ritchie, President of the Canadian Copper Company stated in his argument, before the Ways and Means Committee, for the free admission of nickel ore into the United States, that if this was done his company was favourably disposed to utilize the natural gas in the neighbourhood of Findlay, Ohio, for the manufacture and treatment of these ores—indeed, he said, "we are contemplating bringing in all our ores to that place to be smelted."

The Canadian Government has treated this company with the utmost liberality, having permitted it to import its machinery and coke for fuel free of duty. And in return what benefit are we to receive from these wonderfully rich mines? Absolutely none whatever, except, perhaps, in the employment of the men engaged at the mines. Large reduction and refining works for utilizing these ores will, according to Mr. Ritchie, be established in Ohio. The duty of the Dominion Government is plain. The American duty of 15 cents per pound upon the nickel contained in the ore and matte imported from Canada, and a like duty on the nickel oxide forced the Canadian Copper Company to establish its smelting works at the mines. Canada must now retaliate and levy an export duty on these products to a similar extent. Before doing so, however, it will be well to wait until Mr. Ritchie's scheme materializes. Perhaps it is only a bluff.

Artificial Foundations and Method of Sinking Through Quicksand.

Paper read Midland Institute of Engineers.

The depth of sand to be sunk through was about 18 feet, and it was wet from the surface throughout. The object was to sink the tubing to the solid metals on which the sand rested without withdrawing the water, so as to avoid subsidence of the various surface erections. Supports for the balks of timber for lowering screws were erected of sleepers in the form of chocks. On these chocks two trussed logs, each 17 inches square and 53 feet long, rested. Four transverse beams, 14 inches square, set in pairs, rested on the main balks, and to these were attached the lowering screws, 3 inches diameter, and four in number, which controlled the descent of the tubing. The water in the pit served as a guide to show any deviation of the tubing from the vertical. If such occured, it was rectified by manipulation of the screws. When the friction arrested the descent of the tubing an excavation was made round the sides, and the sand therefrom thrown to the centre of the pit. When the bottom of the quicksand was reached the water was pumped out, the cutting edge of the tubing was rested on wall plates, and the sinking continued through the water-bearing strata, the bottom of which was reached at 54 yards deep. The water was then tubbed back by a cement lining 3 inches thick behind brick walling. While sinking through water-bearing strata the water was pumped by two pulsometer pumps, suspended in the shaft. The feeders of water gave off more than 1000 gallons per minute. Boiler foundations were formed first of concrete, 7 feet thick, put on in layers 15 inches thick, on a bed of old sleepers. On the top of the concrete, rails of 70 pounds per yard were laid longitudinally and transversely, 4 feet 3 inches apart, and the ends of the rails bent alternately upward and downward, so as to embrace the concrete and stonework above and below. On the top of the concrete was built a layer of stone in blocks, 6 feet by 4 feet 6 inches by 6 inches. The concrete and stonework were embraced by iron rails round and round horizontally, and so bound together as to form a foundation of uniform support. On this foundation was built the brick boiler-seating, with air passages above the stone work, with the object of preventing heating of the concrete and destruction of the cement. The engine-houses and workshops were built on beds of concrete 6 feet thick. No evidence of unequal settlement was observed. The results of a few tests of the strength of pit props are appended, showing very great variations in strength of trees of exactly the same size and length. Props 6 inches in diameter and 6 feet long supported pressures varying from 19 to 61½ tons, while chocks of elm, formed of pieces 24 inches by 6 inches by 6 inches, collapsed under strains of from 43 tons to 60 tons. There is also a short description of a method of sinking pillars through sand, in use at Calais Harbor Works. In forming dock walls there, the plan was to sink pillars in the sand by excavating the sand with water jets, and pumping it out suspended in the water. The pillars, 26 feet square, of rubble masonry set in cement, were built with an octagonal hole, 8 feet in diameter, in the centre, the bottom of which tapered outward and formed a kind of cutting edge. The pillars were built to such a height as was necessary to sink them—about 12 feet to begin with—and when cement was set sinking began. Jets of water, under pressure from flexible pipes carried down each angle of the octagonal central opening, were directed against the sand under the edge of the pillar, care being taken so to direct the jets of water as to keep the pillar sinking vertically. A centrifugal pump raised the water again to the surface, and with it the sand in suspension.

English Colliers at Home.

The best time to get the colliers at home is Sunday, for then is he not arrayed—to his own taste—like Solomon in all his glory? On week days, dirty with coal dust and wet with perspiration, he takes little heed of fine raiment, except perhaps after leaving the mine, to change his grimy working garments for something rather different; but on Sunday, when it may be said he is "at home," the good wife brings out all her man's fairest garments. On a Sunday morning, when the bells of the little Anglican church are clashing out defiance to the band of the local branch of the Salvation Army, you may see Geordie and his mates, ranged in grandeour, squatting in the cramped posture of the miner, with back against some wall not far distant from the public house where swings a brilliant signboard with an impossible lion. His costume, be the day the warmest in summer or the coldest in winter, never varies. He has a rough pea-jacket, thick and substantial, pants of imposing pattern, well shod boots, and, as the special and peculiar grace of his costume, a huge muffler twisted round his neck, tucked under the waistcoat and shooting out at its extremity. With a pipe in his mouth and the familar dog "close handy"—an animal apparently half bull-dog, half Italian greyhound—he is furnished for the Sabbath. A story is told of a northern collier which accentuates the "clothing" aspect of the dog question. There had been a match between some dogs arranged at the town and a great deal of interest in it was excited among the miners. One sportsman was noticed to be absent, and, subsequently a friend meeting him, inquired the reason, "Now, Geordie, ha' ye na been ta toon." 'Nay and ha na been ta toon, dawgie is deed, an a man looks so naked like gan to toon wi'out a dawg." But he who would see the pitman in his glory should see him and his 'missus' at a feast. One gains from such an experience a new conception of human possibility in the matter of consumption—liquid and solid. The preparations for such a banquet are on the grand scale; their bread and butter has no place in such a Brobdingnagian feast. The cake, plummy and solid, takes rather the form of an ornamental tile than a "genteel slice"; tea, brown and strong, flows by the quart. "Ye mun fill thyself afore thee gets oop," says a brawny collier to his wife as he passes her the thirteenth cup of tea. And she does. There is no affectation among the good people; they mean to have a feast and a feast it is. A favorite form of entertainments in these parts is a "ham tea," where ham, harmony and religious addresses are combined. One of the most original of these quasi-religious gatherings occurred not long since in a little colliery town up north where the entertainment extended over two evenings. The first evening a grand performance of the Parable of the Prodigal Son was given. In order to make the representation thoroughly realistic a live calf was brought on the stage preparatory to being slaughtered in celebration of the return of the Prodigal. As the calf, bleating innocently and wholly unconscious of its approaching fate, was led off the stage, the chairman of the gathering come forward and announced that on the following evening a grand "veal and ham tea" would be held as a supplement and sequel to the parable.—*Cassel's Journal.*

Our Portrait Gallery.

[A series of portraits and biographical sketches of Canadian mining engineers, mine managers. inspectors, geologists, explorers, etc.]

No. III.

The Late William Plummer, Mine Manager of the West Canada Mining Company.

In the death of Mr. William Plummer, M.E., on the 18th ult., Canada loses one of her most prominent pioneers in the progress of mining in this country. His name is probably unfamiliar to many of the younger generation of mining engineers, owing to his having retired some years ago from all connection with the profession; but it is still a household word in the district of Algoma, the scene of his most active endeavors in the development of Canada's mineral riches, and its mention still meets with warm recognition in many an out-of-the-way corner of the continent by those who were amongst the "gang"—now scattered far and wide—who worked under him at Bruce Mines.

Mr. Plummer was born in 1819 at Mary Tavey, near Tavistock, in the County of Devonshire, England. This pretty little village is situated near to the line which divides Devon from the famous mining district of Cornwall.

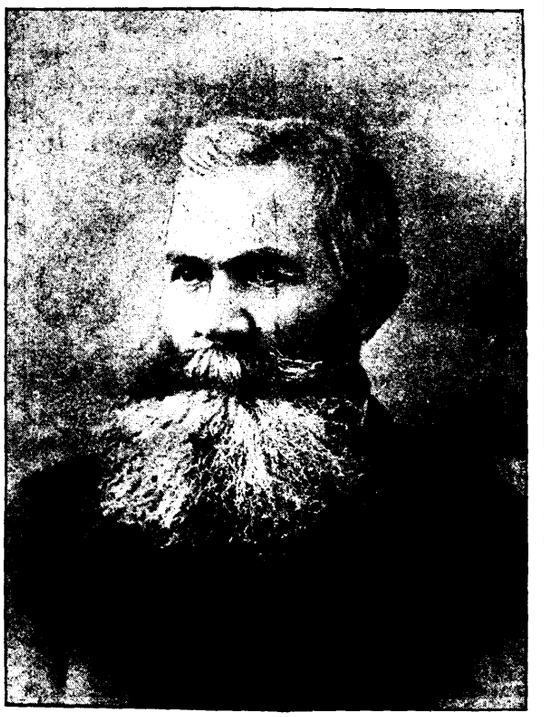
On his mother's side he was connected with one of the old mining families of that district, which fact probably influenced him to early turn his attention to the subject, so that he studied his profession under the most favorable auspices in that classic district, famous all over the world since the time when the Phœnecians traded there for tin, and which has ever since been the cradle and training school of some of our best and most practical mining engineers and miners.

Here he served a thorough apprenticeship to his chosen subject, not only studying the scientific principles which underlie it, but by practice becoming adept at their successful application to the solution of the manifold and varied problems constantly confronting the mining engineer, and that in a district where the experiments and experience of centuries had brought the art to a high pitch of perfection, and where might be studied fully the characteristics of mineral veins and deposits as laid bare by the most extensive workings and thorough exploration.

Having thus acquired the necessary training and experience, he early in his career became connected with the well-known London mining firm of John Taylor & Sons, with whom he remained actively associated until he finally abandoned mining, and for whom he successively managed a number of mines in various parts of the British Isles before coming to this country. His first independent charge was at Castleward Mine, County Down, Ireland, and subsequently he had charge amongst others of the Goldscope Mine near Keswick, Cumberland, Eng., and of the Lackamore mine in County Tipperary, Ireland.

In 1859 he came to Canada as manager for the Wellington Copper Mining Co. (subsequently reorganized and known as the West Canada Mining Co.), bringing with him a wide experience of mining operations and mineral deposits. The veins which had been acquired by this company were adjacent to and a continuation of the group on which the old Bruce Mines had been operated for some years previous by the Montreal Mining Co., and were known as the Wellington and Huron Copper Bay properties.

Here he found many difficulties to be encountered in addition to those naturally incidental to the opening up of new mines. These were due to the wild and unsettled nature of the district in those days. Communications with the far distant settled parts of the country were only by water, and were, of course, therefore only available for the summer half of the year, and besides were even then bad and uncertain. So that not only was there constant difficulty in shipping away the product of the mines, but their supplies of material and provisions were also often jeopardized by the sudden and violent lake storms, so that at times the question of daily bread was often a cause of the greatest anxiety. At one time the whole winter's supplies failed to arrive, calling for the most desperate efforts to meet the difficulty, whilst at another a bush fire swept away nearly the whole of the prosperous village which had grown up round the mines. Further, if after the close of navigation any necessity arose for a visit to the outside world of civilisation, a tramp with dog teams and on snoeshoes of some 250 miles around the shores of Lake Huron had to be faced, all combining to produce a state of things the full inconvenience of which can hardly be realised at the present more favored time.



THE LATE WILLIAM PLUMMER,

Mine Manager of the West Canada Mining Company.

Notwithstanding all this, owing to Mr. Plummer's experience and indefatigable exertions, extensive mining operations were inaugurated and carried on for years. The Company subsequently acquired the adjacent property of the Bruce Mine, so that all three mines were carried on under the same management, and at the zenith of their prosperity gave employment to a force of over 370 men and boys, whilst it was then estimated that the operations supported directly or indirectly some 1,800 people, of whom 1,500 resided in the village adjacent to the works.

After a period of some nine years of anxious and arduous effort Mr. Plummer began to find his health giving way under the strain, and resolved to take the position, offered him by the Government, of Visiting Superintendent and Commissioner of Indian Affairs for the Western District, so resigned his charge at the Bruce Mines in 1868. For five years he remained in his new position, residing on Manitoulin Island, being however moved to Toronto in 1873, where he was given the Superintendency of the Central District. In this new sphere also, in his treatment of the of the Indians and their affairs, he met with the same success that had characterised his former career, several kindly tokens testifying to the regard they had for him. In 1883 he was removed from Toronto to Ottawa to take the position of Commissioner of Indian Lands which he held until 1887 when his rapidly failing health, the seeds of which had been sown at Bruce Mines, forced him to seek superannuation. After two years of well earned rest he passed away on the S S. Orinico whilst returning from Bermuda, whither he had been in search of alleviation.

The influence the operation of so extensive and long-continued an undertaking as the "Bruce Mines" group would have on the development, both mineral and otherwise, of a new district can hardly be over-estimated, and in this connection as well as in his later career Mr. Plummer rendered signal service to the land of his adoption, in whose progress he always took the keenest interest and an active part. He reported on and was instrumental in bringing into notice a great number of mineral deposits, all the way from the silver district of Port Arthur to the Eastern

Townships of Quebec, many of which are now known by names familiar to all Canadian miners, his reports being notable for good judgment and that spirit of fairness characteristic of all his actions. He leaves behind him a large family to carry out the traditions and motives he inculcated, so that the name is already connected with success in banking, commerce and other lines in Canada, whilst one son, by his eminently successful career as a mining engineer in the United States, still keeps up the credit of the name in connection with our beloved profession.

Although not actively participating in mining matters Mr. Plummer kept up his interest in it till the end, one of his last actions being the giving of valuable evidence before the recent Royal Commission of Enquiry into the Mineral Resources of Ontario.

His connection with the early political events at and subsequent to Confederation caused him to be widely known amongst the prominent men of Canada, amongst whom he had many warm friends, and in his death Canada loses a skilful miner, a loyal citizen and a kind and true-hearted gentleman.

Our portrait sketch of Mr. Archibald Dick, Inspector of Mines, Nanaimo, held over to the death of Mr. Plummer, will be published in our next issue.

A Trip to the Lievres Phosphate Mines.

(By Capt. Robert C. Adams, Montreal).

It is considered a fortunate circumstance when business and pleasure can be combined, for business is usually drudgery, and pleasure that has not the element of service soon palls. There are few better opportunities of realizing this desirable condition than that which falls to the lot of one who has occasion to visit the phosphate mines of the Lievres River. Here nature has heaped together attractions which would make the fortune of any similar locality in Europe; and the industries of man have formed interesting centres amid the beautiful framework.

An afternoon in Buckingham affords hours of rare enjoyment. Walking to the riverside one comes to the saw mills of Messrs. Ross Brothers. There can be seen the great logs that have been cut during the winter 150 miles away and have floated down the stream, through cascades, down slides around the fall, and finally been gathered within the boom where, when their hour for transformation has come, they are guided on to the grip of the endless chain that carries them up to the mill on to a travelling platform that moves them to the circular saw or the gang saws, changes them into boards and deals, and they float away down a narrow chute for three miles to be piled up to dry and await shipment. Across the river are the mills of James McLaren, Esq., where similar work proceeds; and near by is his elegant mansion and attractive grounds overlooking one of the finest cascades in America. Between these mills is stretched an artificial dam over which the water pours in a clear sheet; but for a short distance only nature has here erected barriers of rock that break up the torrent, which thence rushes with tremendous roar and indescribable confusion through a narrow gorge. Such a tumultuous rush of waters is rarely to be witnessed, and it is hard to repel the fascination that would tie one for hours to the spot watching the ever varying forms that the cataract assumes as its torrents pour into the deep rocky gulfs and boil up again leaping aloft in myriad sprays.

Half a mile higher up the river is another dam and a cascade of great beauty, which, but for the majesty of the first would be deemed a sufficient attraction. Here has been erected a pulp mill. The spruce logs being cut into short lengths are held against a revolving plane that takes off the bark; after which they are pressed against grindstones flooded with water and are ground to pulp. This being fed to a paper machine is pressed into sheets and folded up ready for sale to the manufacturer of paper. Thus trees, brooks and stones combine to aid literature, fulfilling in another sense Shakespeare's words:—

> "And this our life, exempt from public haunts,
> Finds tongues in trees, books in the running brooks,
> Sermons in stones and good in everything."

This beautiful spot has its charms dimmed by tragedy; for the villagers tell how twenty years ago a minister, burdened with the support of a crippled sister, tied a stone to her leg and drowned her through a hole in the ice.

The steamer *Agnes* is under command of Capt. George Bothwell, a skilled veteran in the intricate navigation of the Lievres River and the possessor of a genial disposition which is greatly appreciated by the passengers on this river omnibus, who require to get on and off at all sorts of odd places where the boat must run her nose into the bank or drift broadside to the shore while the passengers skip to and fro on the perilous shifting plank. Starting on the *Agnes* in the morning a most interesting trip up river awaits the visitor. The stream is narrow, and at first the country is undulating and of a good farming character; but further on the rugged hills arise and tell of stores of minerals awaiting the search of the adventurous prospector and the toil of the hardy miner. These woods skirt the banks and cover the hills, save where the farmers' clearance or the forest fires have made their mark. For picturesque beauty there are few river panoramas that will vie with this stretch of 25 miles, which culminates in one of the most attractive scenes on this continent—the High Falls.

About 8 miles above Buckingham the first sign of the phosphate mines appears in the new wharf of the lately opened Squaw Hill Mine, where English capital is being intelligently applied by Mr. Smith, who has come out from London to superintend operations. The Emerald Mine then comes in sight with its many signs of activity and enterprise, buildings, derricks, tunnels, tramways and great rock dumps testifying to the vigorous work that has been done, and suggesting the thousands of tons of phosphate that have been sent to Europe from this famous hill. The Little Rapids Mine is passed, and the slow progress of the canal, building on contract for the government, is commented upon with the remark that the work is indeed *little rapid*. Next appear the new buildings of what is locally called "the London Company," where Mr. Pielsticker has made an enterprising start which deserves good success. The landing for the famous North Star Mine, that cleared $30,000 last year, is now passed, and upon enquiring if the sale to English investors, reported six months ago, is completed we are told "the mine is sold but the sale is not finally consummated," an expressive statement of a condition familiar to all who have tried to dispose of mining properties. Now the bare Ross Mountain looms up and we are told that the adjoining Lot has just been bought by some eminent Dominion Legislators. Crown Hill and High Rock landings are passed, and on the opposite bank are seen the piles of white mica and feldspar from the Villeneuve Mine. This feldspar through the sagacity of Mr. J. Keith Reid has been brought to the notice of the pottery makers and is pronounced the highest quality found on this continent. The river being high with the coming down of the north water, the steamer proceeds on the unwonted passage of the long rapids. With a full head of steam and an axe on the safety valve she struggles against the impetuous stream and after an uncertain conflict slowly gains ahead and wins her way to smoother waters. Landing at the Portage, the visitors clamber up and down hill to the foot of the High Falls, but are interrupted by a timber chute down which torrents of water are passing and through which shower baths are falling. Only a few adventurous men and boys endure the ducking and gain the best viewpoint. Some of the ladies, deterred by the precipice, give up the effort to get full sight of the cataract; but a few people ascend the rocks, climb rotten ladders and scale the old timber slide. At last a point is reached too perilous to be ventured upon and all return save one couple. A rotten and slippery timber stretches over a deep ravine having jagged rocks at its bottom. The lady's heart beats violently and she fears to cross; but her escort going in front reaches his hands behind and with fervid clasp her faltering steps brave the fearful danger. A few thrilling moments of peril that seem to involve ages are followed by a bound to the solid rock and the fervid clasp is changed in direction and increased in intensity. Though the Lievres has its tragedies it also has its romances! Standing alongside this immense cataract with throbbing heart and pulsing view, contrasting conscious safety with the rareness of deadly peril, one gazes upon the wild waters rushing down into the great calm basin encircled by almost impenetrable forests and realizes that words fail to convey the emotions and impressions and is content to say with Moore:

> "How fair though art let others tell
> While but to feel how fair be mine."

Only a year ago another tragedy cast its shadow upon this marvellous scene. A highly esteemed young minister, in spite of warnings, ventured near the rapids and was drawn towards the falls. Finding escape with the boat hopeless he was seen to plunge into the water in a vain attempt to swim, but the remorseless torrent bore him to destruction. The body was afterwards found with not a bruise visible upon it.

A party of four decided to stay over at the phosphate mines and explore the famous range of hills that has yielded the great bulk of Canada's export of the fertilizing rock. On her return down stream, the *Agnes* dropped the party at Crown Hill, and they toiled up the tramway to a height of 350 feet, but the city man declared it was 15,000 feet measured by effort. Here are the mines of the Canadian Phosphate Co. and a hearty welcome is extended by its representatives, Mr. Thomas Lyons, superintendent, and Mr. Merrill, shipping clerk. After a good supper, the comfortable chairs in the sitting room received the wearied forms and amid a cloud of smoke the ear is regaled with the facts and legends of the mine. As the frogs set up their evening refrain the superintendent tells of the Irish lady, who after her first night at the mine went to the frog pond with a big stick in her hand "to hit them little ducks when they put their heads out." Wire mattrasses afforded unwonted luxury in a mining camp, and the next morning found the visitors ready to explore the mines. It was Sunday, and the superintendent most kindly devoted his leisure to the edification of the party. The various pits were visited and descended. It was found that they were worked with small boilers and hoists placed at each pit, the mining was done with steam drills and in some wet pits steam pumps were used. The ore as it came out was placed in cars and drawn by horses to the cobbing house, where a complete system of separation was well provided. The ore when ready for shipment was drawn to the brow of the hill and thence lowered in cars down the steep incline by a wire rope over 2,000 feet in length, made in one piece without a splice. All the arrangements were pronounced to bear the impress of skill and good judgment. Telephones transmitted orders to distant points and saved the expense of messengers; and every economical device that could be readily applied seemed to have been thought of. But it is not enough to have a well equipped mine; minerals are a desirable feature in a mining property, though sometimes not duly considered by speculators, who, if they can sell a mine, have no concern for its future. It was with interest therefore that the existence of large deposits of phosphate was observed and it was seen that the extensive preparations for handling the ore were warranted by its presence. The green apatite was found to occur in irregular bunches all through the rock, so that the whole mass was more or less permeated with it and the hillside must be quarried down, the amount of phosphate now being proportionate to the tons of rock removed. "It's all through the rock," said Mr. Lyons. "Sometimes you'll put a shot into bare rock and the pit will be all strewn with phosphate and you wonder where it comes from. But," he sadly said with candor, "sometimes it works the other way and you don't see as much as you expected to!" After Crown Hill had been explored and approved by the self-constituted inspectors, the party drove and rode to Star Hill, three miles distant, the famous mine formerly operated by the Union Co., but now owned and worked by the Canadian Phosphate Co. The big pit that has yielded so many thousand tons of ore has been abandoned and the immense rock dump testifies to labor in vain and sinking of capital. But other pits have been successfully opened and large surface shows are being worked. A good output is being secured and a prosperous future seems certain. After dinner had been provided by the courteous manager, Mr. Cameron, who has charge here under Mr. Lyons' general superintendence, a charming walk was taken for two miles through the deep forest, verdant with the freshness of spring, and as yet unvisited by the baneful mosquito or black fly, two mysterious plagues whose existence if satisfactorily explained by the theologian might unravel the riddle of the universe. New workings are seen a mile away, proving that the deposits of phosphate occur all along this mountainous range; and the walk is terminated at the Central Lake mine, where a great cutting has been made showing the same rich green streaked rock that characterizes all the workings of the district. The enterprising owner, Mr. S. P. Franchot, also manager of the famed Emerald mine, has brought a steam boiler and hoist upon the scene, a striking intrusion of civilization upon savagery as it stands in in the midst of the seemingly inaccessible wilderness. It will doubtless bring to the surface large quantities of ore and demonstrate the richness of the ground.

Some pits showing good veins of phosphate were then visited on the adjoining Lots of the Anglo Canadian Phosphate Co. On the highest hill, at a little distance, their lofty derrick stands in the weird solitude awaiting the slowly approaching completion of the *little rapid* canal, which will permit steamboats to come to these lots by the drowning out of the Long Rapids, when supplies can be brought and phosphate transported more cheaply and work can be profitably resumed. Here is a wonderful view of hills and vales covered with deepest forests, except in one direction where a German colony has made clearance in a valley and secured prosperous farms and comfortable homes. Amid the wildness of nature this glimpse of mans' effort and supremacy brought feelings of satisfaction and cheerfulness. Getting back to Crown Hill in a drenching rain, arrayed in borrowed

garments, fed on the succulent baked bean, cheered by strains of banjo and fiddle, enlivened by the dance (until a visitors head is punched by the hanging lamp), warmed by gymnastic tricks and with circulation quickened by slaps from a miner's bootleg, this energetically spent "day of rest" ends in a night of repose. Monday morning the electric bell summons the outsiders of the party to rally at breakfast and a walk is taken up hill for half a mile to the justly renowned High Rock Mine, which year after year turns out its five or six thousand tons and like Tennyson's brook sings :

Seams may come and seams may go,
But I go on for ever!

The great dog Mousequetaire, an immense St. Bernard, accompanies the party, but the High Rock collie thinks he belongs to the best mine and pluckily insults the Crown Hill intruder. A terrific dog fight ensues, soon joined in by a Newfoundlander, and the three dogs are mixed up in an indescribable medley and uproar of tumblings and yells. Now Mouse has Collie by the neck, then Collie has Mouse. by the lip and the advent of the black dog on the top of the heap occasions a new diversion. The row stops at last, nobody knows how; the combatants are collared and are told that phosphate dogs should not delight to bark and bite.

Mr. Twidell the clerk of the mine now politely takes the visitors in hand. The three bears in the great cage are visited and caressed and are found to agree better than the dogs. Then the seven drill Rand air compressor is seen to be working well, saying in its puffs, so miners assert, "a dol-lar a min-ute." The Cap Rock pit is descended, where a great vein has been followed to a considerable depth and large bunches of ore are to be seen here and there all along the lead at the back of the hill; being lowered down in the tramcar, the famous No. 11 Pit is visited, and here is seen a real mine with its tunnel, shaft and drifts in which the air drills with unearthly roar pierce the rock. Wonderful bunches of phosphate are examined and the verdict is passed that High Rock is good for many a long year. The cobbing house is visited and all the transport system surveyed by which the ore is hoisted up the hill in tramcars, which then run by gravity for two miles down the hill and dump into the barges. The party are told that a 12-drill Ingersoll air compressor is to be placed at the river for the sake of cheapness of fuel, and the power is to be carried in pipes two miles to the workings. The pipes above, it is said, will cost $6,000. May the day of electric mining be hastened when a little wire will carry the power!

After dinner at Crown Hill and a general boot blacking the party are lowered down the incline which the city man declares is much shorter one way than it is the other. Then the *Agnes* appears and steams into a floating raft to receive the wanderers. They depart, profuse in their expressions of gratification of the courtesy received and the enjoyment experienced, but yet loudly complain at the exorbitant charges, for when asked for "the hotel bill" the superintendent replies, "A thousand dollars and I won't take a cent less!" Of course no such sum is to be found in the pockets of the visitors, and they are generously and trustfully allowed to depart without any seizure of their gripsacks for security.

The trip down river with the current is quickly made, in spite of numerous stoppages for passengers and goods. But the sights of the region have not been exhausted. The next morning a walk is taken in the slides along the river for three miles. The water having been turned out to permit repairs, a dry plank walk is afforded through pleasant groves and near rushing cascades until the Basin is reached, where the Lievres pours tumultuously down its last rapids to mingle with the waters of the Ottawa. Here are three mills for grinding phosphate. The latest, owned by Messrs. Lomer, Rohr & Co., of Montreal, has a new system of separation, devised and erected by the Messrs. Taylor, father and son, who politely explain its workings. It appears that the long-felt need of mechanical means of removing the rock from the apatite, in place of the slow and ineffective methods of hand cobbing, has been in a measure realized and a great impetus is likely to be given to the phosphate industry by the ingenuity of the inventors and the enterprise of the owners.

Mr. Fred Wilson's team of handsome blacks now awaits to drive to Mr. Wm. McIntosh's successfully opened mine in Templeton, with a range of further possibilities of visits to famous mines most tempting to the explorer and excursionist. One who visits this region need fear no limitation of opportunities for research and enjoyment. Rod and gun have their mission abundantly provided for, and as evidence of the treatment the wayfarer may expect, it may be mentioned that taking refuge from a shower in the little log house of Mr. Robert Corner, the party was made to partake of dinner, for which compensation was refused, and the money left upon the table was brought to the carriage with the earnest remonstrance, "God forbid we should take anything for giving a body a bit to eat."

Such is a phosphate trip up the Lievres River and such is the hospitality and simplicity of the people. Surely nowhere can the lover of nature, the seeker for adventure and the inquirer into mining industries and resources find a better field for an outing.

The Early History of Copper Mining on Lake Superior.

E. B. Borron, M. E. Collingwood, Ont. *

It would appear from what are called Indian diggings that the existence of native copper on both shores of Lake Superior must have been known to some of the inhabitants of this continent in very remote times. The only localities where these diggings have been found on the north shore are, so far as I know, at Cape Mamainse and upon Isle Royal. Although the occurrence of native copper on both sides of Lake Superior was mentioned a century before in the narrations of the Jesuit missionaries, it was not till the year 1770 that we hear of any active mining operations by Europeans. We learn that some three years before that date one Alexander Henry, an Englishman, engaged in trading with Indians, had passed the winter on Michipicoten Island and reported the existence of lead at Mamainse and of the grey ore of copper at that and various other places. In the year following, 1768, Captain Carver hazarded the prediction that "in future times an advantageous trade in copper will spring up." So far, taking in both shores, the gallant captain was a prophet; but in view of the magnificient canal and locks since completed, how primitive were his notions as to the best way of accomplishing this? For he goes on to say, "The metal will be conveyed in canoes through the falls of Ste. Marie, and thence in larger vessels to the falls of Niagara, and after being carried by land across the portage will easily be transported to Quebec." In 1770 Henry formed a company, in which the Duke of Gloucester and other prominent Englishmen were partners, to work mines on Lake Superior. They had a shipyard, it is said, at Port aux Pines, about six miles above Ste. Marie, where they built a sloop of 40 tons. A party of miners were in the first instance sent to Ontonagon river on the south shore, where it would seem to have met with no success. The force was then transferred to the north shore, somewhere it is thought about Pointe-aux-Mines or Mica bay. Here they sank thirty feet in the solid rock, but the vein, which at the surface was four feet in breadth, had, it is said, contracted in the bottom of the shaft to four inches, and under these discouraging circumstances further mining operations were abandoned. In one narrative it is stated that the shaft caved in and killed some of the miners, and that this, together with the difficulty and expense of transporting supplies, led to the abandonment of the enterprise. From other sources we learn that the drift which the miners were driving in soft ground caved in, owing to them neglecting to timber it properly. It is unlikely that such an accident would occur to a shaft sunk in the solid rock and not more than thirty feet deep. This circumstance, taken in conjunction with the fact that many other veins presenting a good appearance at the surface, in that section of the country, have subsequently been found to fail and become worthless at a comparatively shallow depth, leads me to think that the first account is the a true one. Henry remarks that it was partly in hopes of finding silver in sufficient abundance to make the speculation profitable that the works were commenced. To Dr. Douglas Houghton, State Geologist of Michigan, belongs the merit of being the first to explore, and in his report for 1841, to make known the leading features of the region on the south side of Lake Superior, and to give reliable and definite information with regard to the rich deposits of native copper. With the enterprise so strongly characteristic of our neighbours, no sooner had the Indian Title been extinguished (1843) than a vast number of applications were made for tracts of mineral land, and the work for both exploration and development was carried on with great vigor, and in some instances with remarkable success. From the year 1773 till 1845 no mining whatever was done, as far as I know, on either the north shore of Lake Superior or Lake Huron. About the latter date, however, the attention of Canadians having been roused by the richness of some of the veins discovered on the south shore, they began to form companies with the view of exploring for and working the mineral deposits on the north shore, which it was thought might prove as rich as those on the American side. Among others was the Montreal Mining Company. The first steps towards the organization of this enterpising company were taken, I believe, in 1845, for I find on reference to a few rough notes taken from the annual reports that Mr. Forrest Sheppard left Montreal with a small party on May 2nd, 1846, for Lake Superior to explore for and locate mineral land for that company. This was followed by another and larger party on the 8th of that month. The whole, when ultimately assembled on Lake Superior, numbered between eighty and ninety persons, and were under the charge of Mr. Sheppard, who had been highly recommended as well qualified for the position. The coast from Sault Ste. Marie to Pigeon river, upwards of 500 miles in length, was surveyed and more or less carefully explored. That the company were very sanguine as to the importance of the results of this costly expedition, and the great value of the mineral tracts thus acquired by them is evident from the first annual report of the trustees, wherein the north shore is described as "a region abounding in mineral treasures requiring only the hand of the miner to convert it into a source of perhaps inexhaustible wealth." Mr. Sheppard selected eighteen tracts, or mining locations, as we call them. Each tract was, in terms of the Crown Lands regulations of that day, five miles in depth by two in width, and contained ten square miles of land. These, with one or two exceptions were all obtained from the Government. The price then charged was I believe, £150 Halifax currency paid down for each location, and 4s. or 80 cents an acre, payable by instalments. I think, however, that the company obtained their land for 20 cents an acre. In 1847 the company's operations were confined to a re-examination of the locations on Lake Superior and to testing the veins upon several of them, in addition to which the coast of Lake Huron was explored from Sault Ste. Marie to Lacloche, and several other mining locations applied for, which, however, were subsequently abandoned. The company was greatly disappointed with the results of both the re-examination and the work done on their Lake Superior locations. They had failed to realize the hopes raised by the explorations of the previous season, and the directors naturally, but somewhat hastily, as it appears to me, blamed Mr. Sheppard for his selection, and the men who were employed to test the veins on the locations, for their supposed incompetence.

In justice to Mr. Sheppard it is only right to mention that twenty-one years later the celebrated Silver Islet vein was found to be included within the limits of one of the locations selected by him, and for aught we know other veins quite as valuable may be found in other locations. It was in this year that rich copper veins were discovered on what were afterwards known as the Bruce Mines and Copper Bay locations. The Montreal company, by the advice of their manager, Captain Roberts, an experienced miner who had been brought out from the United Kingdom, purchased the Bruce Mines location. So strongly was Captain Roberts convinced of its value that he recommended the directors to pay as much as £100,000 sterling, if it could not be obtained for a smaller sum. The amount actually paid was, I believe, about £40,000 Halifax currency. The company had previous to this completed its organization and obtained a charter but after the purchase of this property the stock was raised from 40,000 to 60,000 shares of £5 currency each, and the whole energies and means of the company were thereafter concentrated on the Bruce mines. In the three following years, 1848-49-50, work at the mines, both underground and upon the surface, was prosecuted with great vigor. Dwelling houses sufficient to accommodate several hundred persons, with offices, stores, warehouses, wharves, etc., suitable for mining on a very extensive scale, were built; a powerful engine and ore dressing machinery put in place, and large copper-smelting and refining works erected. Shafts had been sunk, levels driven, and a large quantity of ground stoped, the ore or produce of which was for the most part lying at the surface at midsummer, 1850. A great sum of money had been spent and no returns as yet obtained in a tangible form or shape from the mine. The ore, estimated to contain 6½% copper, as it came from the mine, owing to the expense of transport, was not marketable until dressed or separated from a portion at least of the rock with which it was intermixed. In order to do this a powerful engine and suitable machinery were necessary. These had arrived at the mines from England, together with an engineering expert, in the fall of 1848. This man very imprudently built an engine house of rough or imperfectly hewn stone in the winter, and before spring most of the machinery was in place. The consequence was that as soon as the spring thaw set in this large and costly building fell down. This misfortune, and a severe visitation of cholera, in 1849, delayed the completion of the ore dressing machinery and the possibility of obtaining returns until the summer of 1850. The company had now arrived at what may be regarded as the most critical period of its existence. The stockholders had been led to believe that the veins were extraordinarily rich, and that there was sufficient rough ore already mined and at the surface to yield when cleaned some 5,000 tons of dressed ore, worth at least $200,000 or $250,000 net. The opinions, estimates and reports upon which these sanguine beliefs rested were, now that both the ore dressing machinery and smelting works had been completed, to be tested by practical results. In order that nothing might be wanting to ensure success, the president of the company, the late Hon. James Ferrier, went to England and brought out a mining captain, a copper refiner and three furnace men. He also selected a gentleman for manager so highly recommended that the board of directors made an agreement with him for five years. Not-

* Evidence before the Royal Commission of Ontario.

withstanding all these precautions the result of the following years operations were a sad disappointment to all concerned. The ore dressing machinery was found to be incapable of crushing and cleaning properly more than one-half the quantity of ore the engineers had said it would do. The ore on the surface was found to yield when dressed little more than half the quantity and value that it had been estimated at, and the smelting of the ore by the Welsh process had proved a complete failure. Under these circumstances the anger of the unfortunate stock holders would seem to have fallen on their officers, all of whom either resigned or were dismissed the following year, 1851. In 1852 I was myself appointed manager of the Bruce mines. The mining captains still continued to report that the stopes were producing from two to three and in some instances four tons of 15 per cent. copper ore per fathom. Careful comparison of the total quantity of ground stoped or otherwise excavated, with the number of tons of dressed or marketable ore actually obtained therefrom, convinced me that the veins had not upon an average yielded more than one and a half tons of 15 per cent. copper ore per fathom. Hitherto the miners had worked under what is known in Cornwall as the "tut-work" system. Under this system they are paid according to the quantity of ground cut, but have no interest whatever in the ore. The other system is that under which the miners are paid so much a ton of the dressed ore. In Cornwall it is called working on tribute, and the system under other names and with modifications is adopted in many mines elsewhere. The "tributer" is deeply concerned in the richness of the veins; and while it is his interest in common with his employer to avoid all waste of ore, it is not his interest unnecessarily to excavate or stope away the wall rock or barren and unproductive portions of the vein. This system I determined, if possible, to introduce.

The miners were accordingly offered prices which would have enabled them to have earned considerably higher wages than under the former or tut-work system, if the estimates and reports of the mining captains in reference to the productiveness of the various stopes or pitches had not been excessive. All except a few refused to take bargains on the terms offered, and many left the mine rather than do so, most of them asserting that the estimates in question were too sanguine, if not greatly exaggerated. Some twenty miners, however, consented to take contracts in the richer portions of the veins under a modified form of the tribute system, at prices based upon our own estimates. By thus reducing the mining expenditure within narrow and safe limits, and at the same time keeping the ore-dressing machinery fully employed cleaning up the poor ores and waste, of which there was a considerable quantity, especially in the form of skimpings, or skimmings thrown off in the process of jigging, it appeared to me quite feasible to make returns which would for several years at least exceed the expenditure. This policy I concluded to carry out with the approbation of the President, then Mr. Hugh Allan, hoping that in the meantime some improvement in the mine, increase in the price of copper or reduction in the cost of producing and transporting the ores to market, might enable us to render a favorable balance permanent. Expectations were so far realized that in 1853 the directors felt justified in declaring a small dividend, followed by a larger one in 1854. In this the board, as afterwards appeared, acted precipitately, being moved thereto rather by what was hoped for and expected than by what had been really accomplished. I was myself sanguine that the returns in these first years of my management would exceed the expenditure, and although I did not advise that step, my reports may unintentionally have led in some measure to its being taken. In 1853 and 1854 the price of copper was exceedingly high, and I was strongly urged by the president to increase the output of the mine to its utmost capacity. To do this we were obliged to resort to the tut-work system again, as a limited number of miners only were willing to work on tribute. The result was agaiu most unsatisfactory, and a serious loss was sustained in 1854 and 1855. This loss was owing to the necessity we were under of working the poorer stopes, and to the very high wages we were obliged to pay both miners and laborers in consequence of the demand for men not only at the mines on the south shore of Lake Superior, but at Sault Ste. Marie, where the canal was at that time under construction. It was, however, greatly aggravated by the total loss of the company's steamer late in the fall of 1854, with very nearly all the materials and machinery required for mining and ore dressing operations during the winter—a loss which could not be fully replaced before the next summer. It may be proper to mention that in 1853 I began to fear that the veins were becoming poorer, and that if they fell off generally as much as they had done in several of the deeper shafts they would soon become unworkable. These opinions were represented to the president, and I urged him repeatedly, in the interest of the stockholders, to sell the mine if anything like a reasonable offer could be obtained for it. This at length he attempted to do, but the price asked was so high that no one would even look at it. It was perhaps in anticipation of being placed in a better position to dispose of the mines on good terms that the president was led to advise the payment of a dividend in 1854.

In the summer of 1885 the tribute system was again adopted and the mining operations on a limited scale were thus carried on without much loss I think till about 1864 or 1865 when the whole location was sold to the West Canada Mining Company, who had for ten years rented the western portion of it. In 1870 the Montreal company sold the whole of their immense Lake Superior property, inclusive of Silver islet. This unlucky sale was, I believe, brought about partly in the fear that the silver ore, of the existence of which they were fully aware, was a superficial or surface show only and would not go down to any considerable depth, and partly in the belief that situated as the vein was below the water of Lake Superior it would be exceedingly difficulty if not impossible to work it, and that at any rate a large sum would have to be raised and expended and might possibly be lost; in addition to which they were threatened with law suits in regard to their title. Still if the patience and the means of the company had not been exhausted by twenty years of unsuccessful effort at Bruce mines they would undoubtedly, I think, have retained and worked Silver islet and been, if the reports of the working of that mine are to be credited, amply compensated for their previous losses and disappointments. In view of the fact that its directorate has included many of the shrewdest and most upright and honorable merchants and professional men in the City of Montreal, and that its officers have been men of at least average intelligence and experience, results so disastrous to the stockholders and discouraging to others call for explanation. There are several reasons why, in my opinion, the Bruce mines failed to realize the sanguine expectations of the company. The veins on the surface were large and showy, containing more or less of the rich grey and purple ores of copper in addition to the common yellow ore. The gaugue of the veins, throughout which the ore was distributed was a pure white quartz, and the whole doubtless presented, a very fine appearance. Captain Roberts on first seeing the location reported as follows: "This vast deposit of copper ore at the outcrop of the veins is incalculable and almost unparalleled. It exceeds anything I have seen or heard of in Europe." Whether from a failure in the richness or in the quantity of the ore, or in both, we find that Captain Roberts one year later had modified or changed his opinions. There is no doubt that the rich grey and horseflesh ores gave place to the poorer yellow ore at a very insignificant depth, and it is probable even that in this short time the veins in some of the stopes had become less productive. A very careful examination of the mine by the late Sir William Logan at this time (1848) went to show however that the veins were still so rich that on the assumption that these was no further falling off in their productiveness, and that all the copper could be obtained in a marketable condition, a large profit might in his opinion still be realized from the mines. But it was in these very assumptions that the chief obstacles to the realisation of the profit lay. So intimately blended was the ore with the matrix of the veins, and so inconsiderable the difference of specific gravity, that by no ore dressing machinery or process of separation by water then known was it practicable to obtain in a marketable state anything like all the copper contained in the rough ore or vein stuff as brought from the mine. In attempting to dress the ore to yield 15 per cent. of copper or upwards, not less than two-fifths of it I believe was lost in the deads, or skimmings, and in the slimes. Again as as regards the deterioration of the veins, there can be no question whatever that they became poorer and less productive in depth, and that at a relatively shallow depth, as compared with veins in other mining countries, they ran out or became so poor as to be no longer worth following. Very little work has really been done below the 35-fathom level, and the deepest shaft at the Bruce mines was only about 50 fathoms. Thus, without attributing to the managers and other officers of the company either incompetence or deliberate misrepresentation, we find in these two facts, namely: (1) the failure of the veins or lodes in depth, and (2) the impossibility of obtaining in a marketable form much more than three-fifths of the copper actually contained in the veins, sufficient explanation of the almost unbroken succession of over-sanguine reports and estimates on the one hand, and of disappointed hopes and expectations on the other. In 1853 Mr. Sampson Vivian, a miner of Cornwall, England, who had spent some years in the United States, obtained from the Montreal Mining Company, at a royalty of one-twentieth of the dressed ore, a fourteen years' lease of the eastern part of the Bruce mines location. Several veins had already been discovered, and some little mining done by the Montreal Company, but the ore produced being poorer than that got in the eastern part of the location they had not been worked for several years. It was doubtless under the impression that the Bruce mines had been so named in honor of the Scottish patriot, instead of the Earl of Elgin, at that time Governor General of Canada, that Captain Vivian called his mine the Wellington mine.

The ensuing year the lease was assigned to an English company which he had succeeded in forming. It assumed the name of the West Canada Mining Company, and the general management was entrusted to the well-known firm of John Taylor & Sons, of London. Had the company's operations been confined to the lodes or veins of the existence of which they were aware when they commenced, I am persuaded that they would soon have abandoned the enterprise. It was not very long after they had started, however, when a teamster, named George Clarke I think, in searching for strayed cattle accidentally stumbled on a vein previously unknown. A recent bush fire had burned off the moss and vegetable matter, and left the lode exposed at one or two points where it had previously been hidden from view. When uncovered or stripped, this vein and another with which it formed a junction some distance from where it was first discovered, proved not only to be much larger and richer than those the company were then working, but far better than those at the Bruce mines, which the Montreal Company had retained in their own hands. As the uncovering of the veins was proceeded with it became evident to the managers of the West Canada Mining Company that they would, if they kept their course, cross the western boundary. They accordingly very judiciously secured a lease of the adjoining Huron Copper-bay location. I can only say, generally, in regard to this enterprising company's operations, that they were, so far as I had an opportunity of judging, carried on in a miner-like manner; such engines, machinery and ore-dressing apparatus as the large experience of the London managers suggested as being calculated to ensure successful results, were sent out and erected at the mines. So great were the difficulties, and so heavy was the cost of starting and opening up the mines, that notwithstanding the richness of the veins no dividends were, I believe, declared for the first six or seven years. In the next seven years, however, under the energetic and judicious management of their local agents, Mr. James Bennett and Captain William Plummer, several dividends amounting in the aggregate to a large sum were paid to the shareholders. In view of the early termination of their lease of the Wellington mine the company in 1864 or 1865 purchased the whole location, including the Bruce mines, from the Montreal Mining Company. The same difficulties which had been found insurmountable by the Montreal Mining Company and its managers, and under which they had been obliged to succumb, together with lower prices for copper, began to tell with increasing severity on the West Canada Company; and in 1867 or 1868 it would appear that the results had not been satisfactory, for at that period Mr. John Taylor, jr., of London, was sent out to examine and report on the property. He spent six weeks at the mines and his report, which was rendered on the 12th of September, 1868, is remarkable not merely for its ability, but for its general fairness. Mr. Taylor clearly apprehended the chief obstacles to the profitable working of the mines when he says:—"It is evident that the three main points you have now to contend with are (1) the very heavy cost of dressing; (2) the great loss of copper under the present system of washing; and (3) the high rate of freight from the mines home to England." He made two suggestion calculated in his own opinion to reduce the expenses and economize the waste of copper. These were, (1) to smelt the ore on the spot; (2) to reduce the copper by what is commonly known as the salt process. He himself favored smelting, but as in both the copper would be obtained in a metallic state, he estimated the saving in the item of freight alone would not be less than £7,000 or £8,000 sterling per annum. In addition, however, to the three points specially mentioned, another circumstance only slightly alluded to in Mr. Taylor's report must have began before this time to exercise an adverse influence on the returns from the mine. No one who saw the size or richness of the veins at or near the surface in 1855-56 could fail to perceive, on perusing that part of the report which describes their appearance in the bottom of the various shafts and stopes in 1868, that there had been a great falling off both in the size and the richness of the veins at the depth of 40 or 50 fathoms. Mining operations continued to be carried on till 1876, when in consequence I presume of the continued unsatisfactory results, work was suspended and has not since been resumed. During the mining excitement of 1846-47 a number of other locations were taken up on the north shore of Lake Huron. Among them there was one near the mouth of the Whitefish river, on which at least one shaft had been sunk to the depth of 10 or 15 fathoms, so far as I could judge from the quantity of stuff produced, for I did not see it when open. It was known as the Wallace mine, and owned by the Upper Canada Mining Company. The vein contained copper pyrites and ore of nickel, but not in sufficient quantity apparently to justify further expenditure. I am inclined to think this company had a location on Michipicoten Island, where considerable work was done on a vein of native copper. Some mining was done at the Emerald mine on the Rankin location, near Sault Ste. Marie. The ore was the yellow ore of copper, and in such quantity that had

it been solid, and not so dispersed throughout the gangue of the vein, it would probably have received a more thorough trial. Several locations were also taken up by the late Mr. Killaly and others near Echo lake, on which there were good sized veins.

On two of these shafts were sunk, but which I think did not exceed five fathoms. It was the yellow ore in a gangue of white quartz, but so far as I can recollect it would not yield more than 2 per cent. of copper. Some work was also done at the Begley mine on the north side of Batchawana Bay, where the yellow ore of copper was found in good quantity but of low grade. At none of these mines, so far as known to me, was any copper dressed and sent to market. The Quebec mining company was a bona fide Canadian company organised about the same time as the Montreal Mining Company. The locations of this company were all situated on the north shore of Lake Superior, and on Michipicoten Island, at Point aux Mines or Mica Bay. Misled by surface appearances, and to say the least by the imprudent advice of their manager, they appear to have commenced operations with great spirit, or rather recklessness; a large number of substantial and comfortable dwellings for officers and men, and other buildings such as storehouses, offices, blacksmiths' and carpenters' shops were erected; a good overshot water wheel and ore dressing machinery were also put up; and to complete all one or two copper smelting furnaces were built. From the large force employed at the mine I should think that a good deal had been done under ground as well as on the surface, in the two or three years during which it was worked. In the fall of 1849 the mine was taken possession of for a short time by the Indians, who were dissatisfied because a treaty had not been made with them for the surrender of their rights; but a treaty was concluded in the following year, and no further trouble was occasioned by them. About this time the company tried to sell the mine in England, and an expert was sent out to examine it. He reported, I have been told, unfavorably. At all events the mine was not sold, and in 1850 or 1851 operations were suspended and have not since been resumed. The Quebec company must have expended more than $100,000, and I have heard that only enough ore was got out to make three or four tons of copper. It is probable that there might be more or less poor ore that would not pay the expense of dressing and smelting. Be this as it may, for I only speak from hearsay in regard to operations prior to 1852, the returns obtained from the mine were unquestionably very small. Some work was done, I believe, on Michipicoten Island, but the result was not encouraging and operations were abandoned there also. About the same time a company called the British North American, I think, did some mining at Princess Bay.

The object of their search was also copper, but I was told by some of the miners who had worked there that it appeared to them more promising for silver than copper. It was also abandoned about the year 1850. I omitted to mention that in 1856-57 the Montreal Mining Co., on my recommendation, made a cautious trial of their location at Point Mamainse, on the north shore of Lake Superior. The veins so far as discovered were neither large, regular, nor well defined, but the display of ore on the surface was tempting, consisting as it did of native copper, grey and yellow ores of copper and galena or lead ore. In this last there was some twelve ounces or more of silver to the ton, and native silver was found associated with the native copper. As little as possible was spent on the surface, pending the result of the contemplated mining operations. Considerable prospecting was done and five shafts were sunk to depths varying from 14 to 60 feet on the most promising mines. From one shaft, which was sunk at a point where there had been an Indian digging, about 1,400 pounds of native copper was obtained. The largest piece weighed nearly 600 pounds, the biggest mass that had been got on the north shore up to that time, if not since. The vein, from the first small and without regular walls, ran out almost entirely at the depth of 10 fathoms, and as it was costing nearly $200 a fathom to sink the shaft it was stopped at that point. Three other shafts were sunk on different veins on the same trap range as that which produced the native copper, but only grey and yellow copper ores were got, and these not in sufficient quantities to pay, even had there been ore dressing machinery on the spot. The fifth shaft was on a native copper vein on another range of trap some 150 fathoms to the east of that last mentioned—a strong bed of conglomerate being interposed between them. It produced at first some nice pieces of native copper, but at 25 feet in depth the vein was barren of metal, although still ten inches in width and carrying good mineral soils and spars. The vein of silver lead was too small to warrant the expense of sinking more than a few feet on it. In view of the company's financial condition, and of the fact that a large sum would be necessary to thoroughly test the mine without assured profitable results, operations were suspended in 1857, the amount thus expended being about $5,000. I am under the impression that the Silver Islet Company have, since their acquisition of the Montreal Mining Co.'s Lake Superior property, done some work on this location, but with what results I am unable to say. Two English companies have engaged in copper mining on the north shore at a comparatively recent date. One of these properties is situated at Cape Mamainse, upon a location immediately adjoining that I have just described. The other is on the Island of Michipicoten. A large sum of money has been, I believe spent on both mines, but especially upon that at Mamainse. The shipments of copper have been relatively insignificant. That the results have been unsatisfactory, to the shareholders at least, may be inferred from the circumstance that at both these mines operations have now been suspended.

Of the copper mines at Sudbury I am unable to say anything, as I have not seen or examined them. This history of copper mining on Lakes Superior and Huron really includes all or nearly all that has been done in the Province. At least I am not aware of any other part of Ontario where copper mining has been carried on to any extent worth mentioning. That these enterprises have, almost without exception, resulted disastrously cannot be denied, however conflicting may be the reasons given by different parties before the Commission. Nor can it be denied that it would have been very much better for the stockholders in the various mines if the three million dollars worth of copper obtained therefrom had still remained buried in the bowels of the earth, and the four or five millions worth of gold, or its equivalent, expended in searching for and mining this copper, had remained in their pockets. Other parties may have benefitted, but the men, for the most part Canadians, who furnished the capital clearly have not. But should anyone infer from the uniformly disastrous results of these premature mining operations that the mineral resources of Ontario, so far as copper is concerned, are unimportant if not worthless, I must beg decidedly to differ from him. In the district of Algoma, from the mouth of French river on Lake Huron to Pigeon river on Lake Superior, upwards of 400 miles in a straight line and nearly double that distance following the sinuosities of the coast, and from thence northward to the height of land, there is, I believe, no considerable area in which copper-bearing rocks do not occur. All along the coast, wherever these rocks are exposed to view, strings or veins carrying more or less copper may be found at short intervals. East of Goulais Bay the copper, so far as my experience enables me to speak, is always found in the form of sulphurets, chiefly copper pyrites, commonly known as the yellow ore. West of Goulais Bay we find the same ores, together with more or less native copper. On almost every considerable lake in the interior indications of copper may be seen if the copper-bearing rocks on the shores be examined carefully, and not unfrequently good sized veins are met with, which, under more favorable conditions, would be considered if not rich at any rate worthy of trial. Supposing this belt in which copper-bearing rocks at least predominate to be no more than 50 miles wide, we have an area of 20,000 square miles of what may be termed copper-bearing country in the district of Algoma alone. It is true that many of the strings or veins are small and irregular, and contain so little copper as to be unworthy of attention, that many in which the appearance at the surface is promising fail at a trifling depth, and that even those veins which have been the largest, most regular and the richest in copper at and near the outcrop, have fallen off greatly both in size and regularity, as well as in the quantity and quality of the ore, at a depth of from two to three hundred feet. Nevertheless, we are confronted by the fact that a small strip of this copper-bearing country, two miles in length by about half a mile in breadth, or one square mile in all, has actually produced between 40,000 and 50,000 tons of dressed copper ore, worth in the English markets two and a-half and three millions dollars. Nor are the mines on this single section of land, though of course poorer, by any means as yet nearly exhausted. It is not pretended that deposits such as those at the Bruce mines, the Wellington mines and at Sudbury are to be found everywhere in this mineral belt, nor, in view of the extent and depth of the loose material under which the veins are in most parts entirely hidden, can it be expected that such discoveries will be of very frequent occurrence; but it is safe to assert that in all human probability a great number of such veins or deposits of copper ore do exist in this belt, quite as rich as, if not richer than, any of those already discovered, and that from time to time, as the country is settled, many of them will be found, accidentally or otherwise. I hold therefore that this field of the mineral resources of Ontario is immensely important and valuable; where so much copper in quantity and value has been obtained from such a limited area, how much may not be reasonably expected from the whole of this copper-bearing belt. It may be said, and with some show of reason, that, granting many millions of tons of copper ore may be contained in the rocks of this mineral belt, of what possible importance or value can it be to the province if it is so distributed, and the difficulty and expense of mining it be so great, that when obtained the cost of getting the copper shall be found to have exceeded its value. Now, although in a sense this may and doubtless does hold good, in regard to the present value of the copper in this belt, the prospective value to the province may nevertheless be very great.

Were we compelled to mine, dress and send to market this copper under the unfavorable conditions which have hitherto prevailed in this country, experience has demonstrated that it could only be done at a loss. But under the more favorable conditions that will surely obtain in the future it is morally certain that many of these deposits of copper may and will be worked most profitably, and thus prove a source of incalculable wealth to the province. In order to make this clear, let us suppose the Bruce and Wellington mines to have been situated in England, and we shall see how much more favorable the conditions would have been. The wages of the miners and the laborers would have been less than one-half, and the cost of mining would have been reduced in like proportion. The dressing of ores, which in England is done almost entirely by young women and boys, would have not been more than one-third of the cost of that operation in Canada. The expense of transportation to market would not, I consider, have been more than one-tenth of the sum paid for the freight of the ore from Bruce mines to Liverpool or Swansea; in addition to all which it would not have been necessary to bring up the ores by dressing to more than 8 or 9 per cent. of copper instead of from 15 to 20 per cent., thus saving not only expenses but a very large quantity of copper unavoidedly lost in the process. Then again, machinery and all kinds of stores and materials, timber excepted, would have been very much cheaper in England. From all these circumstances I am convinced that had the vein at the Bruce mines and the Huron Copper-Bay locations or others of the like character and richness been situated in Cornwall, or almost any other part of Europe they would unquestionably have yielded the fortunate owners very large profits. Now the point I wish to make is this: If our Canadian copper mines be such that if situated in Europe they would have realised very large profits and been considered very valuable, it necessarily follows that to soon as those favorable conditions arrive in Ontario, then at all events, if not before, will copper-mining in this province become profitable, and the vast deposits of that metal in the copper-bearing belt north and west of the great lakes become in the fullest sense of the term valuable. The conditions most necessary to profitable mining, whether in respect of labor, of materials, or of transportation, are being surely, if not rapidly, evolved in the district in which the mines are situated. No one who has noted the growth of the district of Algoma in population and otherwise during the last 30 or 40 years can fail to perceive that fact. But on broader grounds I hold it to be absolutely certain that sooner or later all the disabilities under which in the past copper mining has labored will be removed, and that this country will stand in just as good a position as England herself in regard to the economical and profitable working of her mines. In addition to cheaper labor than was obtainable on the first opening up of the country, much may be expected from the employment of labor-saving machinery in our mines. The use of rock drills, worked by steam or water power, the substitution of dynamite and other more powerful explosives for gunpowder, the employment of galvanic batteries or electricity to discharge simultaneously a number of blasts so placed as to produce the greatest possible effect, are all calculated to greatly diminish the cost of mining, even if wages should remain the same. It is possible also that improvements may be made in the smelting or reduction of copper from its ores. In concluding my remarks as to our copper deposits, I would like to add a word of warning to all engaged or about to engage in mining enterprises, especially in districts where the character of the veins at a considerable depth has not been proved. Not a dollar beyond what is absolutely unavoidable should be expended on the surface, however promising the appearance of the outcrop may be, until one or more shafts have been sunk to a depth of at least fifty fathoms and levels driven each way. This is especially necessary where former experience goes to show that the veins frequently become smaller and poorer, if not altogether barren, at a very trifling depth. Surface expenditure is utterly wasted and becomes a dead loss when the mine itself fails. The fewer failures and the greater number of dividend-paying mines, the more attractive will be the industry to capitalists.

The Canadian Iron Bounty.—The Dominion Parliament has agreed to a proposal, submitted by the Government, for an increase in the bounties that are at present paid upon pig iron manufactured in Canada, with a view to further encouraging the industry. In 1883 a bounty of 1 dol. 50c. per ton (of 2,000 lb.) was granted for three years, and 1 dol. per ton for another three years afterwards. The bounty of 1 dol. 50c. was, however, renewed in 1886, the 1 dol. per ton being made to apply from 1889 to 1892. Under the new arrangement the present bounty will continue until 1892, but from that year it will be increased to 2 dols. per ton for a period of years.

Note on the Friction of Mine-Car Wheels.*

By R. Van A. Norris, Wilkesbarre, Pa.

The following tests were made, during 1889, for the Susquehanna Coal Company, to determine the relative efficiency of several styles of mine-car wheels in use at their collieries at Nanticoke, Pa.

The wheels experimented upon may be divided into two classes: The "old style" (Figs. 1 and 2), which are oiled at every trip; and the "new style" (Figs. 3, 4 and 5), which require oiling about once in two to four months.

Fig. 1 shows a section of a plain cast wheel, with patent annular oil chamber. This is held in position on the axle by a square, split cotter-pin. Fig. 2 is a similar wheel, with a patent cast bushing, which is readily replaced when worn. The lubrication is effected by a simple oil-hole, but the oil is delivered a little inside of the gauge-line of the wheel, where it is most needed. Figs. 3, 4 and 5 are sections of a "new style" patented, self-oiling wheel. In this, the outer end is cast closed, and the wheel is fastened to the axle by a spring cotter-pin, passed through one of the plugged holes. Dirt is prevented from entering the open end by a cap, with faced end and packing-ring, fitting over the end of the hub. The lubricant is introduced into the oil-chamber through one of the plugged holes in the hub.

When the wheel is in motion, the lubricant is thrown by centrifugal force away from the axle, enters the two ports shown, and is carried through spiral channels into contact with the axle, the surplus oil being carried back to the oil chamber again. The lubrication appears to be effected by oil adhering to, and being swept back and forth along the axle, in the open zig-zag slit, when passing through the ends of the oil channels away from the oil-chamber, where the section and height of the channel are smallest, the back of the oil-channel being conical with the largest end out, and the radial height of the channel from the axle decreasing as it recedes from the oil-chamber.

All the wheels are of the loose outside type, 16 inches in diameter, mounted on 2½-inch steel axles, with journals 5¼ inches long. The axles pass loosely through solid cast boxes, bolted to the bottom sills of the cars, and are not expected to revolve.

Tests were made on the starting and running friction of each style of wheel, under the conditions of empty and loaded cars, level and grade track, curves and tangents. The instruments used were a Pennsylvania Railroad spring dynamometer, graduated to 3000 pounds, with a sliding recorder, a hydraulic gauge (not recording) reading to 10,000 pounds, graduated to 25 pounds, and a spring balance, capacity 300 pounds, graduated to 3 pounds. All these were tested and found correct previous to the experiments.

Most of the observations on single cars were made with the 300-pound balance. The two types of "old style" wheels were found to give results so nearly alike that they have been classed together in the table. Each car was carefully oiled before testing, and several of each type were used, the results being averages from the number of trials shown in the table.

In the experiments upon slow start and motion, the cars were started very slowly by a block and tackle, and the reading was taken at the moment of starting. They were then kept just moving along the track for a considerable distance, and the average tractive force was noted—the whole constituting one experiment.

The track selected for these experiments was a perfectly straight and level piece of 42 inches gauge, about 200 feet long, in rather better condition than the average mine-track. The cars were 41¾ inches gauge, 3½ feet wheel base, 10 feet long, capacity about 85 cubic feet, with 6-inch topping.

To ascertain the tractive force required at higher speeds, trips of one, four and twenty cars, both empty and loaded, were attached to a mine-locomotive and run about a mile

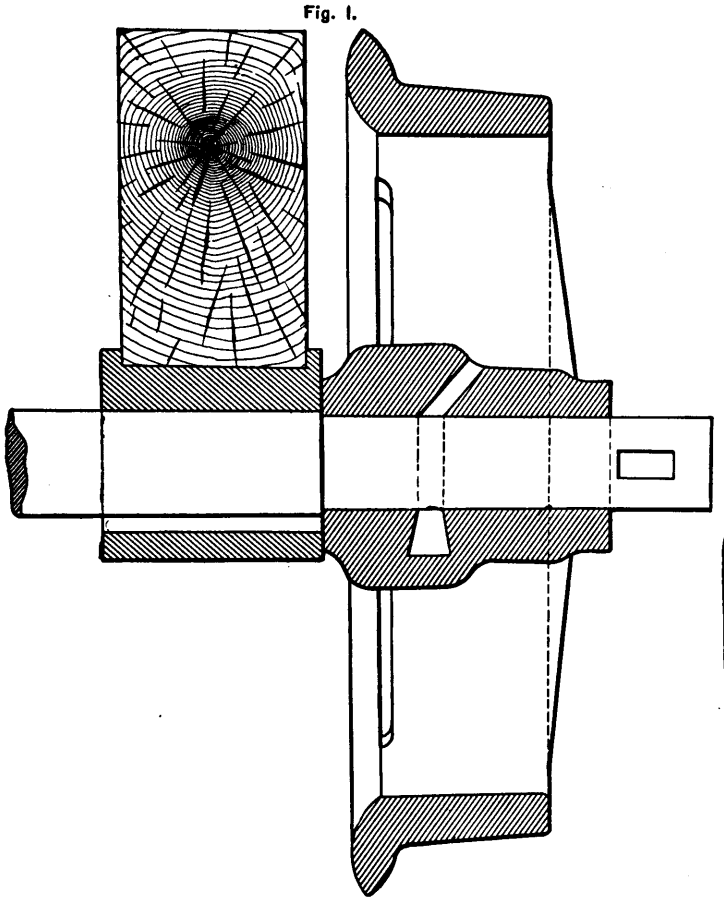
Summary of Friction-Tests on Susquehanna Coal Co.'s Mine-Cars, April, 1889.

DIMENSIONS OF WHEELS. 16 in., diameter of tread. 2½ in., diameter of axle. 5¼ in., length of journal.	OLD STYLE WHEELS. Empty. Weight of car.	Tractive force per car.	Tractive force due to gravity.	Trac. for. p'r car due to friction.	Trac. for. p'r ton due to friction.	Percentage of weight.	Loaded. Weight of car	Tractive force per car.	Tractive force due to gravity.	Trac. for. p'r car due to friction.	Trac. for. p'r ton due to friction.	Percentage of weight.	Number of Tests. Empty.	Loaded.	NEW STYLE WHEELS. Empty. Weight of car.	Tractive force per ton.	Tractive force due to gravity.	Trac. for. p'r car due to friction.	Trac. for. p'r ton due to friction.	Percentage of weight.	Loaded. Weight of car.	Tractive force per car.	Tractive force due to gravity.	Trac. for. p'r car due to friction.	Trac. for. p'r ton due to friction.	Percentage of weight.
	LEVEL.														LEVEL.											
Average slow start	2240	100	....	100	100	4.46	8500	325	....	325	85	3.80	16	12	6	20	2415	66⅔	....	66⅔	62	2.78	9125	200	....	200	49	2.20
" slow start	2140	83	....	83	86 9/16	3.88	7885	357	....	357	101 4/16	4.53	63	53	82	48	2415	62	....	62	55 6/16	2.48	8160	193	....	193	53	2.36
" motion 50 ft. pr. min.	2140	54	....	54	56 6/16	2.52	7885	205	....	205	58 3/16	2.60	54	60	81	72	2415	40	....	40	37 1/16	1.66	8160	133	....	133	36 6/16	1.63
" " 1000 ft. per minute, 1 car	2140	62	....	62	64 3/16	2.89	7885	262	....	262	74 4/16	3.32	17	74	6	39	2415	36⅔	....	36⅔	33 9/16	1.48	8160	158	....	158	43 3/16	1.93
" motion 1000 ft. per minute, 4 car	2240	62½	....	62½	62¼	2.80							3	...	6	...	2415	37½	....	37½	34⅜	1.56						
" motion 1000 ft. per minute, 20 car	2240	47	....	47	47	2.20	9000	117	....	117	29	1.30	6	18														
" starting jerk 20 cars.	2240	96	....	96	96	4.29	9000	175	....	175	44	1.95	3	7														
" starting jerk 2 cars rope-haul	2240	630	....	630	630	28.12							10															
	GRADE.														GRADE.											
" slow start 12°	2140	550	445	105	110	4.90	7885	1950	1639	311	88 4/16	3.94	2	2	2	2	2415	600	502	98	90 9/16	4.06	8160	2000	1696	304	83 9/16	3.73
" motion 50 ft. per min., 15°	2140	510	445	65	68	3.18	7885	1800	1639	161	45 8/16	2.00	10	16	6	12	2415	540	502	38	35 1/16	1.56	8160	1825	1696	129	35 6/16	1.58
" motion 1000 ft. per min., 1¾°, 1 car	2140	125	65	60	62 8/16	2.80							10		6	6	2415	100	75	27	25	1.12	8160	400	249	151	41 6/16	1.85
" motion 1000 ft. per min., 1½°, 1 car							7885	425	205	220	62 5/16	2.79		12		16							8160	350	212	138	37 9/16	1.69
" motion 200 ft. per min., rope-haul, 2°	2240	140	78	62	62	2.80	Cars pulled from side.						15															
" motion 200 ft. per min, rope-haul, 2°30'	2240	183	98	85	85	3.80							15															
" motion 200 ft. per min, rope-haul, 5°10'	2240	315	202	113	113	5.00							15															
" motion 200 ft. per min, rope-haul, 6°10'	2240	353	240	113	113	5.00							15															
	CURVE.														CURVE.											
" slow start, 85 ft. radius	2240	125	....	125	125	5.58	8500	400	....	400	106	4.70	10	10		8							9125	275	....	275	67	3.00
" slow start, 11 ft. radius 1½° grade							8700	819	227	592	152	6.80		8		7							9125	564	239	325	80	3.60
" 20 cars 1000 ft. per min., 350 ft. radius	2240	62	....	62	62	2.80	9000	143	....	143	36	1.60	5	7														
" 20 cars 1000 ft. per min., 450 ft. radius	2240	50	....	50	50	2.23	9000	126	....	126	32	1.40	5	7														
" 4 cars 1000 ft. per min., 350 ft. radius	2240	100	....	100	100	4.46							2		2		2415	75	.....	75	70	3.10						
													Total number of tests,		276	286	197	230	Equals 989 tests total.								

J. H. Bowden, Chief Engineer.

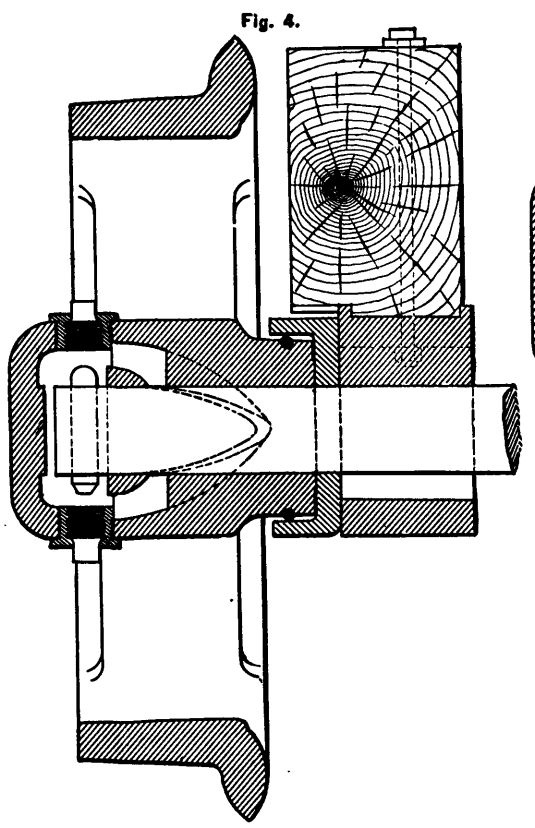
Tests made by R. Van A. Norris, E.M., Assistant Engineer.

Fig. 1.



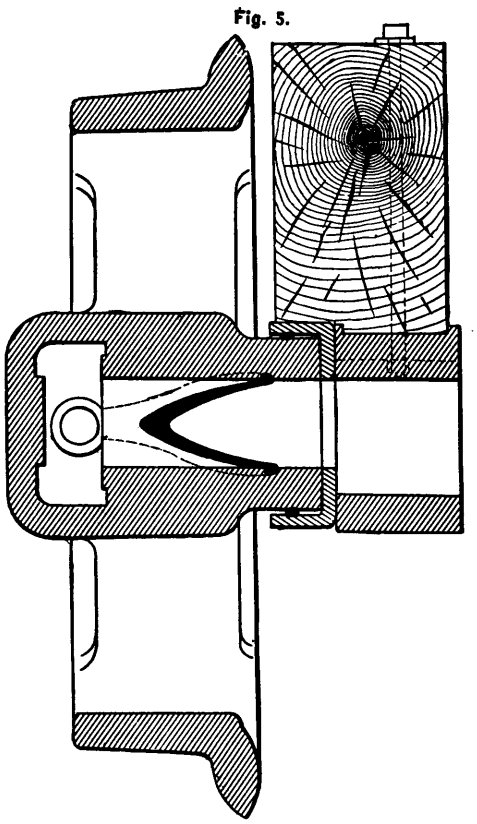
Hamlin Wheel, with Annular Oil-Chamber.

Fig. 4.



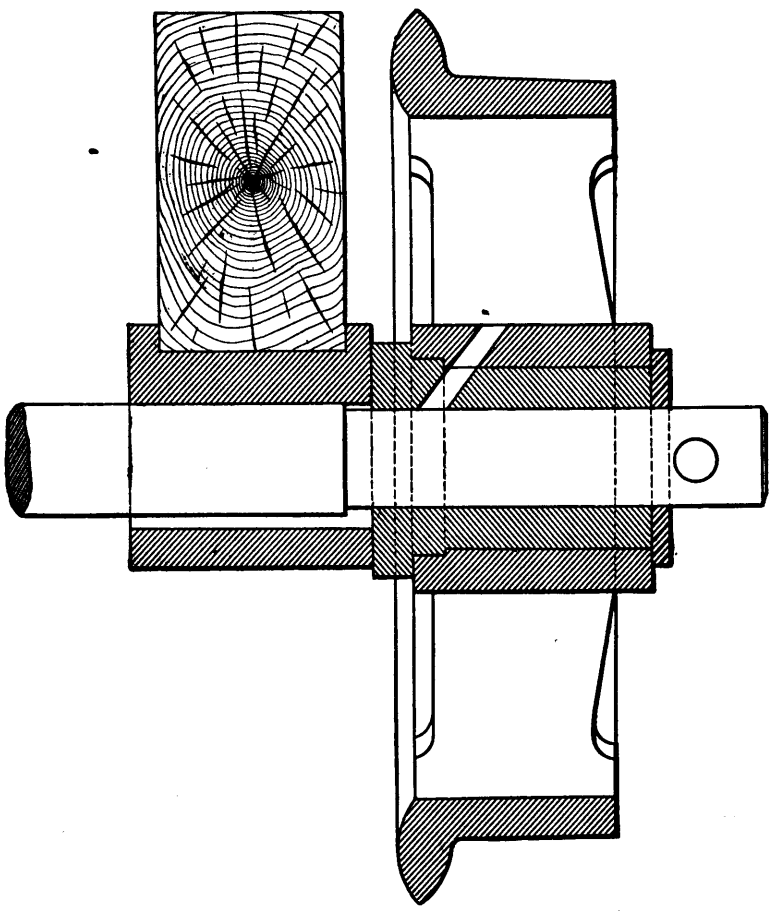
J. H. Bowden's Patent Self-Oiling Wheel.
Section through Oil-Ports.

Fig. 5.



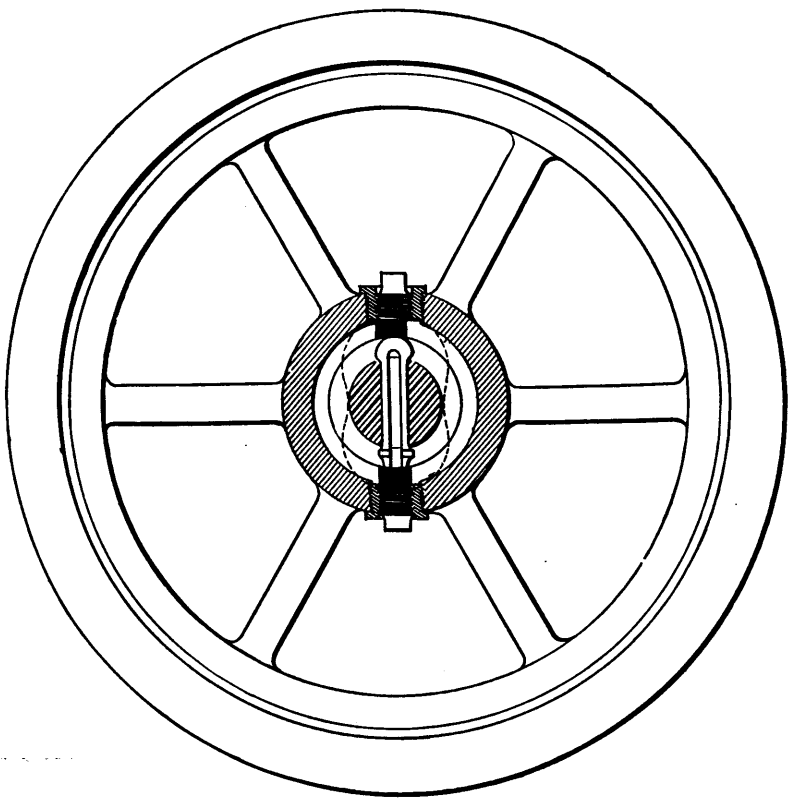
J. H. Bowden's Patent Self-Oiling Wheel.
Section showing Oil-Grooves.

Fig. 2.



J. M. Norris's Wheel, with Patent Removable Bushing.

Fig. 3.



J. H. Bowden's Patent Self-Oiling Wheel.
Section through Hub.

for each test, the resistance at various points on the track, where its curve and grade were known, being noted, and care being taken to run at a constant speed. Unfortunately, only four of the "new style" cars were available on the tracks where these trials were made.

The remarkably low results for the twenty-car trips are attributed to variations in the condition of the track, and the fact that the whole train was seldom pulling directly on the locomotive, the cars moving by jerks, so that correct observations were impracticable. The hydraulic gauge was used for these twenty-car tests, and the needle showed vibrations from one to four tons and back. The mean was taken as nearly as possible. The gauge was rather too quickly sensitive for the work, and the Pennsylvania Railroad dynamometer was not strong enough to stand the starting jerks and the strain of accelerating speed.

The tests marked "rope-haul" were made on an empty-car haulage-system, about 500 feet long, with overhead endless rope running continuously at a speed of 180 feet per minute, the cars being attached to the moving rope by a chain, a ring at the end of which was slipped over a pin on the side of the car. The increase of friction on the heavier grades was due to the rope pulling at a greater angle across the car. Correction was not made for this angularity at the time, and the rope has since been rearranged, so that the correction cannot now be made.

There were not enough curve-experiments to permit the deduction of any general formula for the resistance of these cars on curves.

The experiments on grade agree fairly well with those on a level, the rather higher values obtained being probably due more to the greater effort required in moving them and the consequent jerkiness of the motion than to any real increase in resistance. As the experiments on all styles of wheels were made in an exactly similar manner, the comparative value of the results is believed to be nearly correct, the probable error in each set of experiments, as computed by the method of least squares, varying from about 4 per cent. for slow start and motion to 12 per cent. for the rapid motion and twenty-car trips.

The general results, showing an economy in friction of nearly 40 per cent., led to the adoption of the "new style" wheels by the company. These results, obtained as carefully and accurately as the circumstances permitted, are now offered as showing the approximate frictional resistance of such wheels under the ordinary working conditions.

Comparison of Running Friction of Cars with Old and New Style Wheels on Straight Road, Level and Grade, under Similar Conditions. Average of 807 Tests.

	PERCENTAGE OF WEIGHT.			COMPARISON OF FRICTION.		
	Old style	New style.	Difference.	Old style per cent.	New style per cent.	Difference per cent.
Speed, 50 ft. per min...	2.57	1.61	0 96	100	$62\frac{6}{10}$	$37\frac{4}{10}$
" 1000 " "	2.92	1.68	1.28	100	$57\frac{5}{10}$	$42\frac{5}{10}$

*Transactions of the American Institute of Mining Engineers Washington meeting, February, 1890.

A Miner's Miraculous Escape.—A remarkable fall of a miner down 100 metres of a shaft (say 333 feet) without being killed, is recorded by M. Remneaux in the *Bulletin de l'Industrie Minerale.* Working with his brother in a gallery which issued on the shaft, he forgot the direction in which he was pushing a truck; so it went over, and he after it, falling into some mud with about three feet of water. He seems neither to have struck any of the wood debris nor the sides of the shaft, and he showed no contusions when he was helped out by his brother after about ten minutes. He could not, however, recall any of his impressions during the fall. The velocity on reaching the bottom would be about 140 feet, and time of fall 4.12 seconds, but it is thought he must have taken longer. It appears strange that he should have escaped simple suffocation and loss of consciousness during a time sufficient for the water to have drowned him.

Coal Production of the United Kingdom, 1889.—The official returns of the number of miners, the production of coal and the cost of life in that production, in the United Kingdom have been made known. Last year 176,916,724 tons were produced, some 6,000,000 tons more than in the preceding year. It is gratifying to notice the diminution in the loss of life—the general average being one life for every 178,227 tons.

PHOSPHATE.

Ocean Shipments.

The following are the official returns of shipments, per ocean freights, from the Port of Montreal to date:—

Date.	Name of Ship.	Destination.	Shippers.	Quantity.
May 10..	SS Vedra.....	London ..	Lomer, Rohr & Co	120
" 14..	Cremon.....	Hamburg.	Millar & Co	215
" 15..	Dominion.....	Liverpool.	Lomer, Rohr & Co	250
" 17..	Michigan.....	do ..	Millar & Co	200
" 23..	Heathfield	London ..	Lomer, Rohr & Co	300
" 27..	Amarynthia...	Glasgow..	do [bags	100
" 28..	Toronto	Liverpool.	do ..	200
" 28..	Ashburne.....	Glasgow..	do ..	210
" 29..	Bonnington....	London ..	do ..	185
" 29..	do	do .	Millar & Co	60
" 31..	Oxenholme....	Liverpool.	Wilson & Green...	348
" 31..	Osmanlie.....	do ..	Lomer, Rohr & Co	150
June 2..	Sts.of Magellan	do .	Wilson & Green...	475
" 3..	Alcides	Glasgow..	Lomer, Rohr & Co	200
" 4..	Sarnia	Liverpool.	do ..	100
" 6..	Maritana	London ..	do ..	150
" 7..	Kehrweider ...	Hamburg.	Millar & Co	300
" 7..	City of Lincoln	Liverpool.	do	700
" 11..	Lamington....	London ..	Lomer, Rohr & Co	225
" 19..	Tynedale	London ..	do ..	225
.....	Oregon	Liverpool.	do ..	200
.....	Dominion.....	Liverpool.	do ..	200
			Total tons	5,013
			" bags.....	100

SHIPPERS' RECAPITULATION.

	Tons.	Bags.
Lomer, Rohr & Co.....	2,715	100
Wilson & Green.....	1,475	
Millar & Co.....	823	
Totals.....	5,013	100

RECAPITULATION OF EXPORTS.

	Tons.	Bags.
To London	1,265	
Hamburg	515	
Liverpool	2,823	
Glasgow,.....	410	100
Totals.....	5,013	100

Templeton District.

The Blackburn mines, under the management of Messrs. Lomer, Rohr & Co., are being worked with much vigor, and an average output of 500 tons per month is being made; 100 men are employed. Five pits are under operation. As a great deal of development work has been done on the property, it is hoped to materially increase this output at an early date. Twenty-five teams are kept steadily at work hauling ore from the mine.

At the property of the McLaurin Phosphate Mining Company work is going on steadily on four different pits; a very large deposit on Lot 8 in the 17th is also being developed. Arrangements are being made to haul the ore to a shipping point immediately. The company expects to place at least 1,500 tons on the market this year.

Lievres District.

We are informed that Mr. Fred Wilson, Buckingham, has transferred his interest in his phosphate Lot adjoining the Ross Mountain to the Hon. J. C. Abbott and Hon. C. C. Colby, the consideration being $8,000 cash.

Messrs. Lomer, Rohr & Co. have a gang at work picking over the dumps at the Emerald, and although the quality of ore thus obtained is necessarily of low grade, we understand that this enterprising firm are making a good thing out of their venture. Mr. S. P. Franchot who is now, we believe, the sole owner of these the oldest worked mines in the district, has a largely increased force at work underground, and from the quantities of ore being raised we should judge that he is again in bonanza.

Mr. J. B. Smith, M.E., manager of the Squaw Hill and Aetna mines has a force of some sixty men at work. The old "Grant" pit has been cleaned out and a number of promising pits uncovered. Mr. Smith is arranging for the construction of a tramway and the erection of a compressor and other mining plant. About 500 tons of excellent quality are ready for shipment.

At the Little Rapids mines, where operations have been mainly on the nature of development, and only a small force is employed, some good quality of ore has been raised, and about 300 tons are now ready for shipment.

Immediately adjacent to the Little Rapids are the operations of the Dominion Phosphate Company (of London) under direction of Mr. Gibbs. This enterprising company has erected suitable buildings and equipped the mines with an excellent working plant.

About 130 men are employed at the pits of the Phosphate of Lime Co. at High Rock under Mr. Walter Pickford. The yield to date has, we believe, been somewhat in excess of the figures reported during the same period last year. The extensive additions to the plant, including 12-drill Ingersoll Compressor, boilers and hoisting gear, will reach the mine by the end of the month, and when in working order will greatly increase the productiveness of these well equipped mines. By the way we regret very much to learn that Mr. P. C. Smith the genial mine manager at High Rock is under the weather again. For some time Mr. Smith's health has been anything but good, and he is now reluctantly compelled to seek a much needed rest and change. We are sure we join with all our phosphate readers in wishing Mr. Smith a speedy recovery and return to the mine, where his services are invaluable.

As stated in our last issue, the operations at the North Star are comparatively inactive owing to negotiations pending the transfer of the mines. The output, consequently, is not as large as last season, but Capt. Williams hopes to fill all existing contracts by the end of the shipping season.

Mr. S. P. Franchot has put up a large hoist and boiler, new Ingersoll drills, steam pumps and other gear at Central Lake. A tramline 2½ miles will also be built, but until this is completed the shipments from this mine must be merely nominal as hauling can only be done during the winter months.

The Messrs. Poupore, contractors on the new Locks at Little Rapids, are now making rapid progress with the construction of this important undertaking.

The grinding mills at Bassin-du-Lievres are running night and day turning out low grade stuff for the U.S. market.

Perth District.

The Anglo-Canadian Phosphate Co. is vigorously prosecuting day work at the Otty Lake mines. These pits have been put into operation and more will be opened. In six weeks, 110 tons of high grade phosphate, and 12 tons of seconds, were mined with an average force of less than twenty men. Thirty men are now at work and the number will be increased as fast as pits can be prepared. This property has been worked a good deal by contract and has over three hundred productive openings exposed. It was thought that most of the surface shows had been found, but recent efforts have discovered a number of new seams. Capt. Adams reports that his experience of contract mining is unfavorable. The men have every inducement to produce low quality and generally yield to the temptation, while their manner of working the pits is slovenly and injurious to the property. Henceforth the system of day's labor will be followed, for, though the output may cost more, the higher quality secures a better financial result.

Kingston District.

Summer hauling from the pits of the Foxton Mining Company at Sydenham has begun, and quite a number of teams are steadily employed in this work. Pit No. 1 has reached a depth of 190 feet, and the quality of the ore is found to continue first-class. Several new deposits are also being developed on the property.

Active operations have been begun on the pits of the Kingston Phosphate Mining Co. and the steam hoist and steam drills are now at work. A good output is expected from these pits. Kingston will be the shipping point for the ore from this mine.

Little or no work has been done at the Blake mines (Lot 11, 9th Con., Loughboro) since last summer, but operations were again resumed on the 21st ult., a small force being employed. The outlook is reported promising.

The Rock Lake mines, (Lot 21, 11th Con., Storrington) operated by Messrs. Bell and Claxton, on which a small force was employed during the latter part of last year have increased their working force to 30 men. About 500 tons have been raised to date. The ore is being hauled to a shipping point on Lake Opinicon, quarter of a mile distant from the pits. This is reported to be a most promising property, and the owners confidently expect to produce at least ten tons per day. The phosphate occurs in true veins—not in the "pockets" so characteristic of the mines of the district.

Messrs. Jas. Richardson & Son, Kingston, are working in a small way at their Orser mine (11 in the 11th Loughboro). This is a new property giving favorable indications of being a producer in the near future.

The Sydenham Mica and Mining Co. has resumed operations with a small force at the Eel Lake mines, Township of Loughboro.

Among the other parties mining phosphate in this district are :—Messrs. Swan Bros. at Gould Lake ; the Gould Lake Mining Company (Grant & McLatchie) and Capt. Hibbard on Lot 10, 8th Con., Loughboro. An average number of 10 men is employed on these properties.

MINING NOTES.

Nova Scotia.

Miscellaneous.

The next regular meeting of the Gold Miners' Association of Nova Scotia will be held at the Halifax hotel on Thursday afternoon, 3d July, at two o'clock.

It is expected that the new railway from the Pictou coal field to Oxford on the Inter-Colonial railway, near Springhill, will be open in a few days. The saving in distance amounts to about 10 miles for coal going to Quebec as compared with the present route.

Work at the Cape Breton and Nova Scotia collieries continues good. The contracts made in the Province of Quebec are in excess of those made up to the same date last year. Freights and prices are also much about the same. The Cape Breton collieries bid fair to become an important source of supply to the European markets in the near future. Some delay in the transhipment of the coal at the wharfs at Montreal was occasioned by a strike, but this has happily terminated and unloading goes on briskly as usual.

Mr. E. R. Faribault, and party of the Survey, have resumed their examination of the gold areas and are now at work in the district of Musquodoboit.

Mr. Hugh Fletcher, who has done so much sound and thorough geological work in the province, will leave for the Pictou Coal fields in the beginning of next month.

The Tenny Cape Manganese Co. (Limited) which was incorporated last session of the Legislature, as its name implies is a company formed for the purpose of purchasing, mining, shipping and otherwise engaging in the manganese business. It has a capital stock of $200,000 and is composed of several New York men of known standing and ability, together with several men from the province. They have purchased a large manganese property on the well-known belt of that mineral in Hants county and intend to operate immediately. The Tenny Cape and Chrivirari districts contain the most continuous and best beds of ore now known in that province, and the property purchased by the above company has already been worked and has proved valuable which, together with its excellent location for shipping, guarantees them, with the outlay of some capital, a handsome return for their investment. The ore is of high grade and the demand unlimited.

Dr. A. R. C. Selwyn, Director of the Geological Survey, is now in the province with the object, it is said, of having an investigation made by Dr. Bailey into the geology and minerals of Colchester County.

The Nova Scotia Steel and Forge Company, of New Glasgow, has been merged into the Nova Scotia Steel and Iron Company, with a capital of $2,000,000, divided into 10,000 ordinary shares and 10,000 preference shares, and a debenture capital of $600,000. The company last-named has been formed to extend the present business, also to take over the iron areas, railway franchises and other franchises of the New Glasgow Iron, Coal and Railway Company, and to erect blast furnaces, mine iron ore, and carry on all work necessary for the operation of the furnaces and the manufacture of iron and steel in all its branches. The provisional directors of the Nova Scotia Steel and Iron Company are : Thomas Bayne, Halifax ; John F. Stairs, Halifax ; Frank Ross, Quebec ; William Jacks, ex-M.P., Glasgow ; James D. McGregor, James M. Carmichael, H. S. Poole, George F. McKay, Graham Fraser, Harvey Graham.

The Springhill colliery has been troubled with heavy water from spring rains, but their battery of six pumps has kept the workings clear. The Joggins colliery has started its season's shipments.

The Acadia colliery is running a double shift, pending the erection of a more powerful winding engine.

Salmon River District.

The Dufferin Mining Co. held a meeting on the 10th inst., and organized under the charter given by the Provincial Government, session before last. The mine is understood to be looking better than it has done for some years.

Oldham District.

The property of the Oldham Gold Co. was sold by a Master of the Supreme Court at public auction on the 10th inst. at Oldham. The property, consisting of some ninety-six mining areas, with stamp-mill, engines and a good mining plant, was knocked down to Mr. T. P. Putnam, of Lower Onslow, N.S., for the sum of $22,850. This property has practically been idle for over two years.

The Standard Gold Co. at Oldham are erecting a new shaft-house on the Consolidation shaft, which will be equipped with pumping engine for the plunger pump, and also a 20-h.p. hoisting engine for the skip. It is expected to have the new gear running by August 1st, when the old east shaft will be abandoned and all rock and water will be taken to the consolidation shaft. This company is reported to want good miners badly.

Waverley District.

The miners of the Lake View Co. were notified on the 2nd inst. that the mines were to be shut down for an indefinite period, pending the erection of the stamp-mill it is supposed. Manager Hayward is keeping the water out, but no men are employed under ground. A large force are employed in the mill.

The Palgrave property has passed into the hands of "The Nova Scotia Syndicate, Limited." Mr. Gowland has been superseded by Mr. MacDuff, who has taken the management of the Syndicate's property, and has begun vigorously a reformation much needed in the company's former methods and system.

Gold River.

The mines of the Neptune Co. have been closed for an indefinite period, and only a watchman is in charge of the property. Mr. C. E. Willis, the former manager, has his whole time occupied with the management of the Central Rawdon property.

Malaga District.

The Parker-Douglass Co. are still increasing their extensive surface plant, and are at work now upon the machinery for the transmission of power from the "wild cat" run to the mines. This company also intend equipping their latest purchase (in Whiteburn) with a new mill and other machinery.

The other properties in this district are in the category of prospects, but have a very promising outlook if development work is properly carried on. The district is a good one, but has had a set back through too vigorous and misdirected "booming."

Quebec.

At the annual meeting of the Dominion Lime Company the following directors were elected :—Frank Jones, Portsmouth, N.H.; F. P. Buck, W. B. Ives, M.P.; T. J. Tuck, J. G. Robertson, Sherbrooke ; R. H. Pope, M.P., Cookshire ; Geo. Van Dyke, Lancaster, N.H.; C. H. Sinclair, Boston, and J. P. Cook, of Salem, Mass. The affairs of the company were found in a healthy condition, and with the increased railway connection the business outlook was most encouraging. The Upper Coos and Hereford railway, recently leased by the Boston and Maine railway, connects the works more directly with the large railway system of the latter road, and opens a wider market for the product of the kilns.

We are informed that the trade of the Bell's Asbestos Company, Limited, for the past quarter shows an increase of 1½ per cent. over the same period of last year, and that most of the large customers who had withdrawn their custom for a time are now returning. There is every expectation of a satisfactory interim dividend being paid both on the old and new shares next month. The raw material is being sold at as high as £45 per ton, as compared with £18 last year, and there is every prospect of getting still higher prices during the remainder of the year, the latest price received from New York being £53 per ton. Late advices from the mines are most encouraging, and point to a larger output this year than ever before.

Ontario.

Sudbury District.

Recent advices from this district show that work on the mines operated by the Canadian Copper Co., the Dominion Mineral Co., Messrs. Vivian & Sons and others is being carried on vigorously. In anticipation of the operation of new Ontario Mining Act, quite a number of prospectors have arrived, and an unprecedented rush of prospectors into the district is expected this coming season. Besides, a good many of the mining speculators, having found out that undeveloped properties cannot be sold at any price, are preparing to open their claims this year.

Port Arthur District.

Numerous new discoveries have been made of late in both the outside country and among the working mines. The new veins which have been traced and are being developed at the Badger and Beaver mine properties are extremely encouraging, some of them showing silver freely near the surface. Renewed activity is also taking place at the Porcupine mine, which was recently pumped out, and to which the roads are being improved with a view to active development by the Badger Silver Mining Co., by whom it has been acquired. The stamp mill at the Beaver mine is now busy day and night, and a long steady and valuable output will doubtless follow.

Development at the mines of the Badger Silver Mining Company is being vigorously prosecuted upon the new vein, 350 feet to the northward of the old vein, Badger No. 1. From all indications the new find is the main vein from which the old vein, out of which about $250,000 worth of silver was taken in 1889, was a stringer. The new vein measures five feet in width, is heavily mineralized, and carries an average of 1,757 ounces of silver to the ton ; as far as prospected, it is steadily increasing in richness and promises to exceed in value anything hitherto opened in this district. The same vein has also been discovered by cross cutting on the west side of the mountain, 2,500 feet from the discovery shaft. It has the same width there and carries equally rich ore with that at the point of first discovery. A steam hoisting plant has been put to work at No. 1 end or discovery shaft. Sinking and drifting is being vigorously carried on on both sides of the mountain. The force of miners has been largely increased, and the output of the Badger for the coming season may be expected to exceed anything in the history of silver mining on the north shore of Lake Superior.

The Silver Mountain mine is reported as showing extra vigor since the advent of the new manager. A new promising vein on this property will likely be tested and in a thorough manner shortly.

The Crown Point mine has changed hands, or rather a one-half interest has been purchased by some Duluth people, who already have considerable invested in Thunder Bay lands.

Other finds north-east of the Beaver are being eagerly taken up by capitalists who are anxious to try their luck in this well established section of country.

The Dominion Government are again recognizing the value of this section in a mineralogical point of view. No less than four members of the staff are now working out the geology and topography of the country west of Port Arthur.

The Silver Islet Co. has employed Captain Frethering to look over their numerous and extensive mineral locations around the north shore of Lake Superior. One of the directors of the company accompanies him in a tug chartered for the purpose.

The Rabbit Mountain mine shows signs of life of late. General Wild is building a residence a short distance north of the original shaft.

Further discoveries of both magnetic iron and maganese have been made; the exact location, however, will not be revealed until after the necessary surveys have been made.

Rat Portage District.

The reduction works at Rat Portage will be completed by the end of August.

Just as the important mineral reasources on Lake-of-the-Woods are beginning to show signs of vigorous development, it is greatly to be deplored that one of the principal promoters should be involved in litigation which may have a deterrent effect on other and similar undertakings in the district. It appears that in 1875 the Keewatin Lumber Company were granted by the Dominion Government a Lease of the whole of the islands of the Lake-of-the-Woods, with exclusive possession of same for a period of twentyone years, with the option of renewal for a further and similar period. Sultana Island, formerly an Indian reserve and now being operated as a gold location by an English syndicate, under an agreement with the Ontario Mining Company, is claimed by the Keetwatin Lumber Company as one of the islands covered by the provisions of this Lease, and in exercise of their assumed right of possession they have ordered off the miners now at work and made application for an Injunction to restrain further operations. The Ontario Mining Company on the other hand contend that their title from the Department of Indian Affairs is perfectly valid and secure; they also claim that the location is not an island but a peninsula. Apart from the question at issue between these two parties the instance serves very well to illustrate the short-sighted and pernicious system of granting to any company or individual large tracts of valuable territory without reserve of the minerals to the Crown. Under a fair and just code of mining laws, such as those in force in most European countries, lavish extravagance of this kind would be impossible and neither the farmer nor the lumberman would have any moral or legal right or control over any minerals found on property conveyed to him for the purpose of his calling.

British Columbia.

A strike exists at the Wellington collieries at Victoria, owing chiefly to the demand of the workmen that the time of going in and out of the mine shall be considered as part of the working hours.

Arrangements have been made whereby the REVIEW will henceforth be furnished regularly with reliable information concerning the progress of mining operations in the promising district of Kootenai.

The exports of coal from the port of Nanaimo from 1st January to 22nd ult. have been:—January, 39,727 tons; February, 32,879 tons; March, 42,615 tons; April, 51,323 tons, and to 22nd May 33,669 tons.

Dr. Campbell, manager of the new reduction works at Revelstoke, states that the smelter which combines the excellencies of several of the best smelters in Colorado, is now ready for operation. The furnaces have been tested and found to be in excellent working order. The company is now prepared to buy at the current value and pay cash for all the ore which may be sent to it.

At the annual meeting of the Western of Canada Oil, Lands and Works Campany, Limited, accounts were presented showing a deficit on the year ended March last of £231, increasing the debit balance to £1,131. The directors in their report ascribe this deficiency to the abandonment of nine old wells during the year. Thirteen new wells have been drilled, and the production of oil has been increased to over 1,800 barrels per month from the 100 wells that are now being pumped.

ST. LAWRENCE CANALS.

RAPIDE PLAT DIVISION.

NOTICE TO CONTRACTORS.

SEALED TENDERS addressed to the undersigned and endorsed, "Tender for the St. Lawrence Canals," will be received at this office, until the arrival of the eastern and western mails on Wednesday, the 23rd day of July next, for the construction of a lift lock, weirs, etc., at Morrisburg, and the deepening and enlargement of the Rapide Plat Canal. The work will be divided into three sections, each about a mile in length.

A map of the locality, together with plans and specifications of the respective works, can be seen on and after Wednesday, the 9th day of July next, at this office, and at the Resident Engineer's office, Morrisburg, where printed forms of tender can be obtained.

In the case of firms there must be attached to the tender, the actual signatures of the full name, the nature of the occupation and residence of each member of the same, and, further, an accepted ceeque on a chartered back in Canada for the sum of $6,000, must accompany the tender for Section No. 1, and an accepted cheque on a chartered bank in Canada, for the sum of $2,000 for each of the other secttons.

The respective accepted cheques must be endorsed over to the Minister of Railways and Canals, and will be forfeited if the party tendering declines entering into contract for the works at the rates and on the terms stated in the offer submitted. The cheques thus sent in will be returned to the respective parties whose tenders are not accepted.

By order,
A. P. BRADLEY,
Secretary.

Department of Railways and Canals,
Ottawa, 13th June, 1890.

Money Orders.

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

On Money Orders payable within Canad t' e commission is as follows:

If not exceeding $4			2c.
Over $4, not exceeding		$10	5c.
" 10,	"	" 20	0c.
" 20,	"	" 40	20c.
" 40,	"	" 60	30c.
" 60,	"	" 80	40c.
" 80,	"	" 100	50c.

On Money Orders payable abroad the commission is:

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

For further information see OFFICIAL POSTAL GUIDE.

Post Office Department, Ottawa,
1st November 1889.

SEALED TENDERS, addressed to the undersigned, and endorsed "Tender for Caisson," will be received at this office until Friday, the 18th day of July next, inclusively, for supplying, erecting and completing in place, a Wrought Iron Caisson for the Dry Dock now in course of construction at Kingston, Ont., in accordance with the plans on exhibition at this office, and at the Engineer's office, 30 Union street, Kingston, and with the conditions and stipulations contained in a Form of Tender, copies of which can be obtained on application to the undersigned and W. O. Strong, Esq., Resident Engineer, 30 Union street, Kingston, Ont.

Tenders will not be considered unless made on the form supplied, and signed with the actual signatures of tenderers.

An accepted bank cheque, payable to the order of the Minister of Public Works, equal to five per cent. of amount of tender, must accompany each tender. This cheque will be forfeited if the party decline the contract, or fail to complete the work contracted for, and will be returned in case of non-acceptance of tender.

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

By order,
A. GOBEIL,
Secretary.

Department of Public Works,
Ottawa, 13th June, 1890.

North-West Mounted Police

RECRUITS.

APPLICANTS must be between the ages of Twenty-two and Forty, active, able-bodied men of thoroughly sound constitution, and must produce certificates of exemplary character and sobriety.

They must understand the care and management of horses, aud be able to ride well.

The minimum height is 5 feet 8 inches, the minimum chest measurement 35 inches, and th maximum weight 175 pounds.

The term of engagement is five years.

The rates of pay are as follows:—

Staff-Sergeants	$1.00 to $1.50 per day
Other Non-Com. Officers	85c. to 1.00 "

	Service pay.	Good conduct pay.	Total.
1st year's service,	50c.	——	50c. per day
2nd "	50	5c.	55 "
3rd	50	10	60 "
4th	50	15	65 "
5th "	50	20	70 "

Extra pay s allowed to a limited number of blacksmiths, carpenters and other artizans.

Members of the force are supplied with free ra tions, a free kit on joining and periodical issues during the term of service.

Applicants may be engaged at the Immigration office, Winnipeg, Manitoba; or at the Head quarters of the Force, Regina, N.W.T

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