

CANADIAN MINING REVIEW

Established 1882

Vol. XX—No. II.

OTTAWA, FEBRUARY 28th, 1901.

Vol. XX—No. II.

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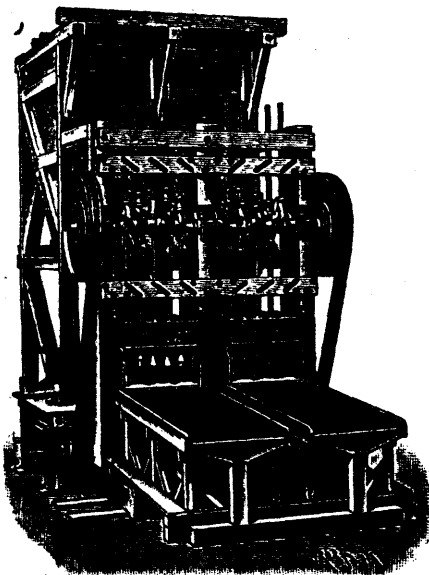
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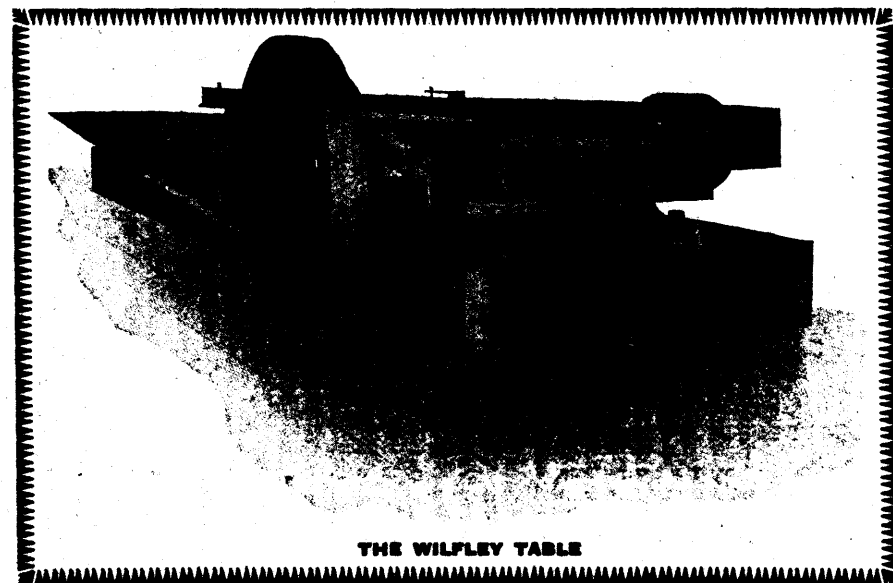
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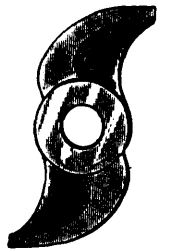


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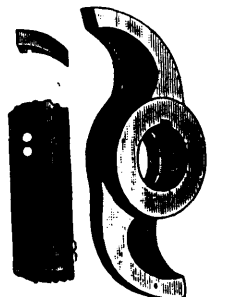
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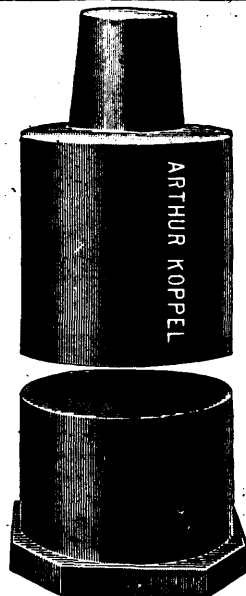
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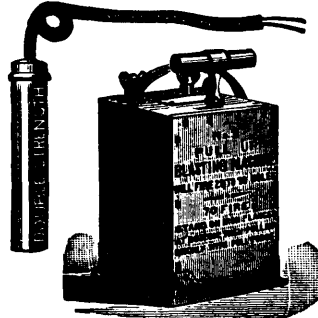
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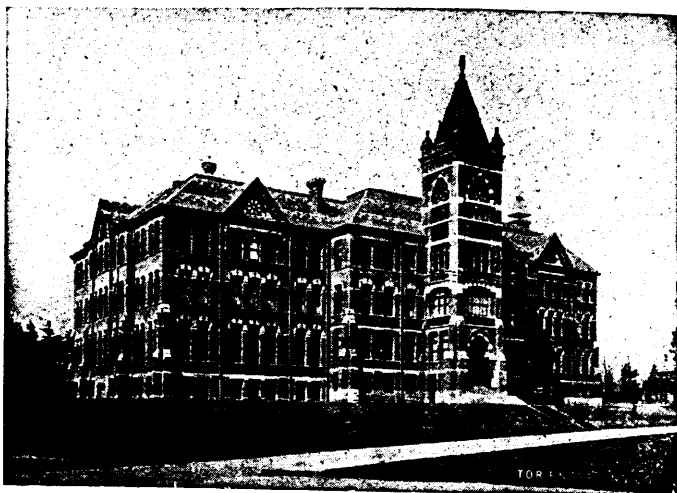
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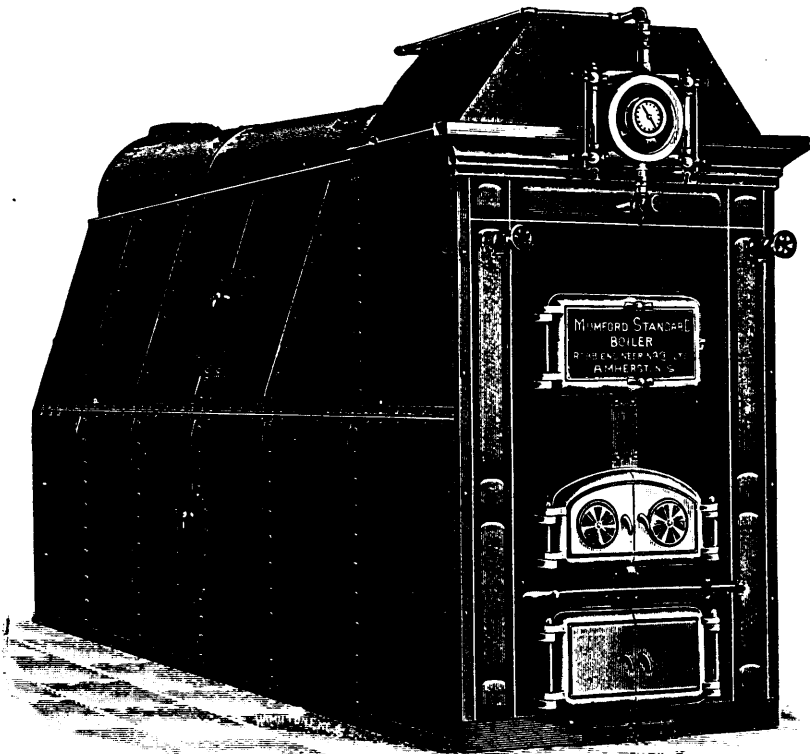
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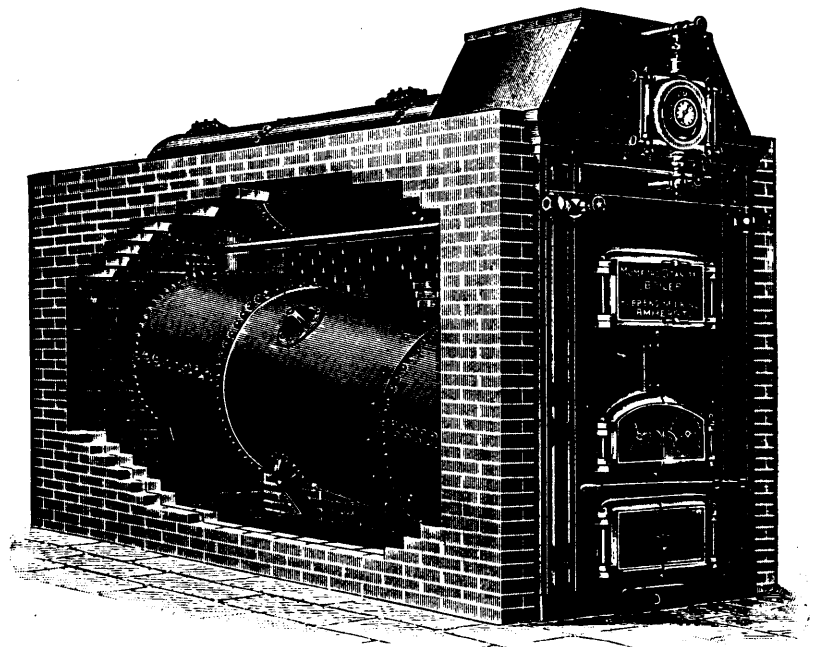
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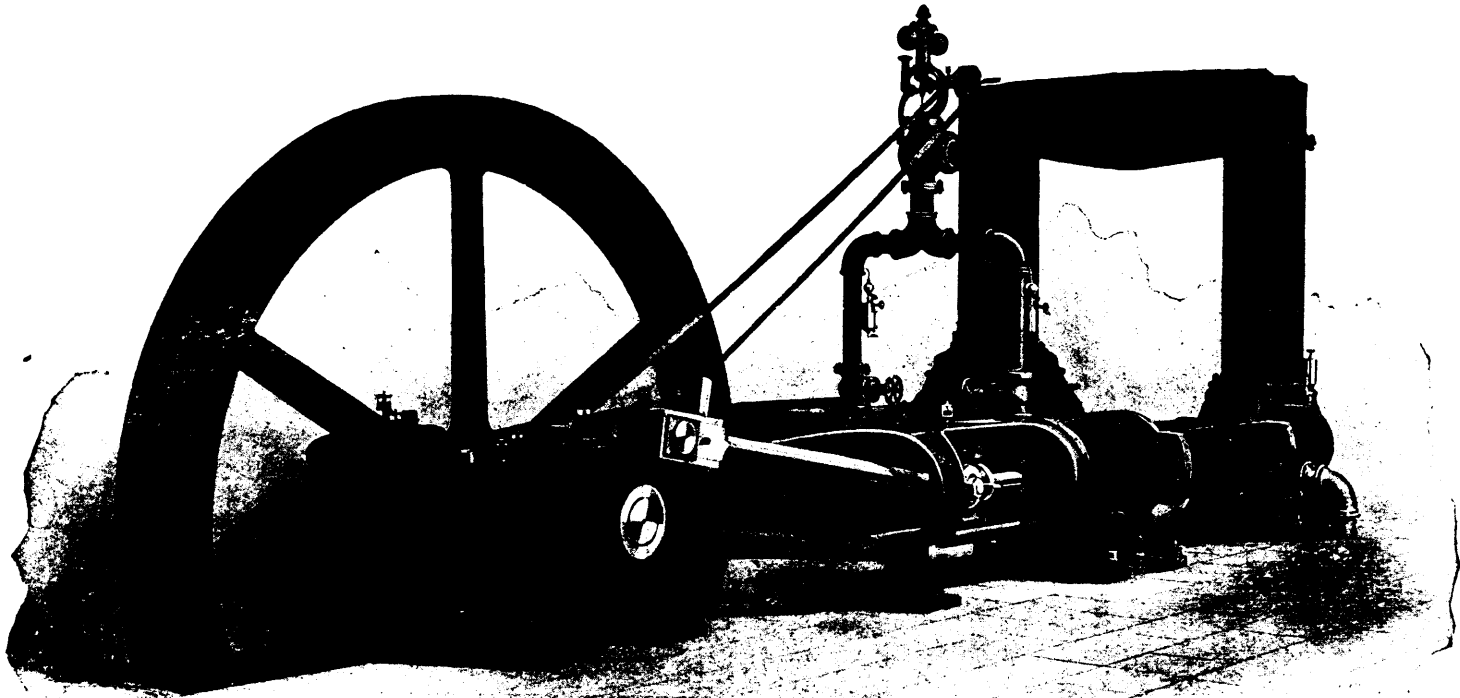


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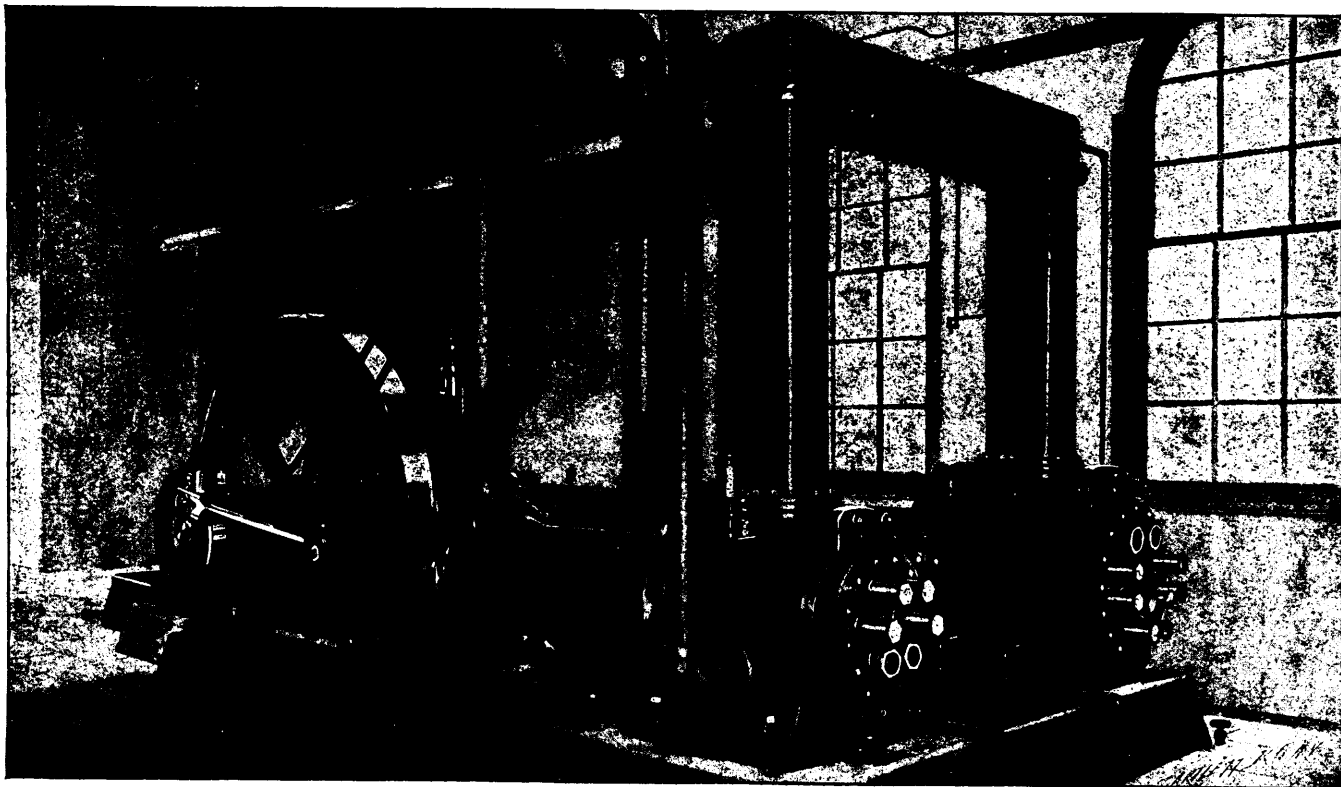
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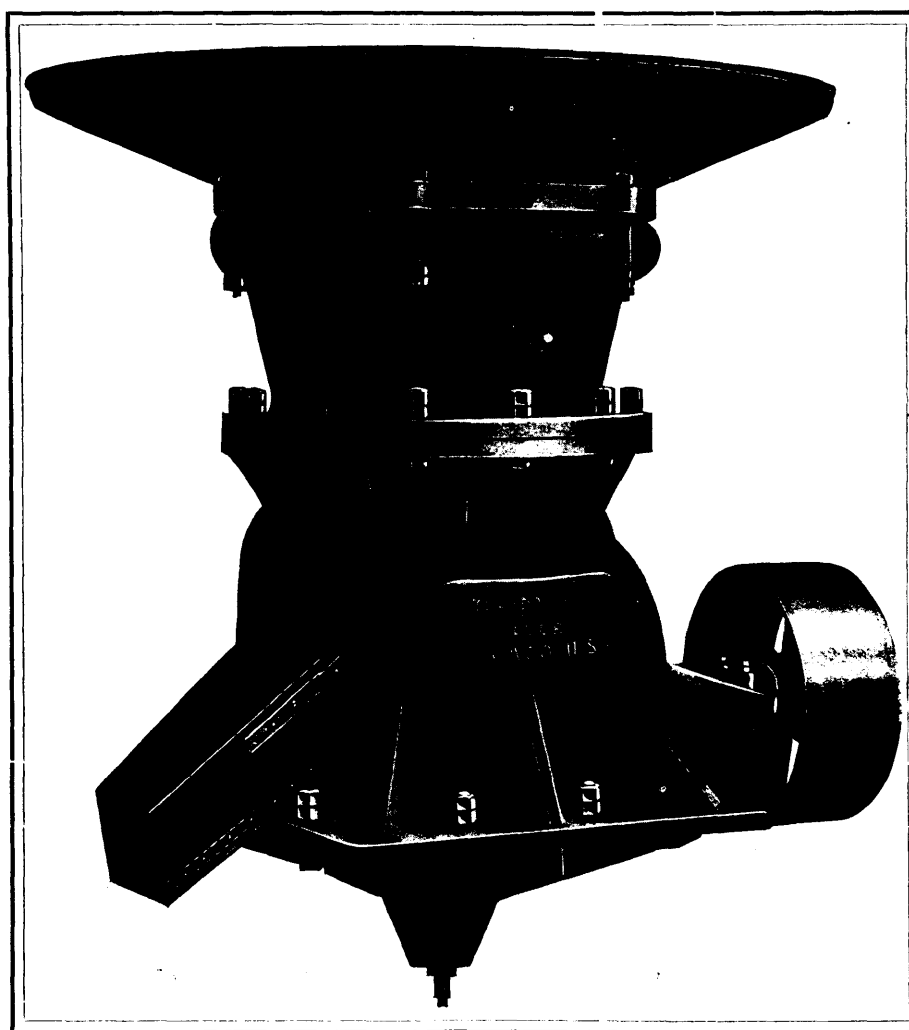
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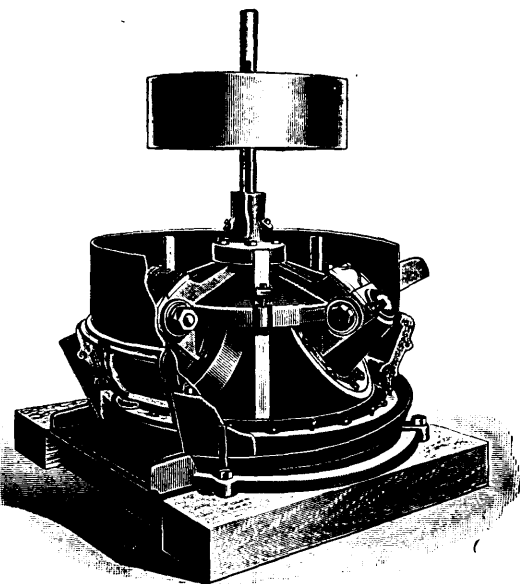
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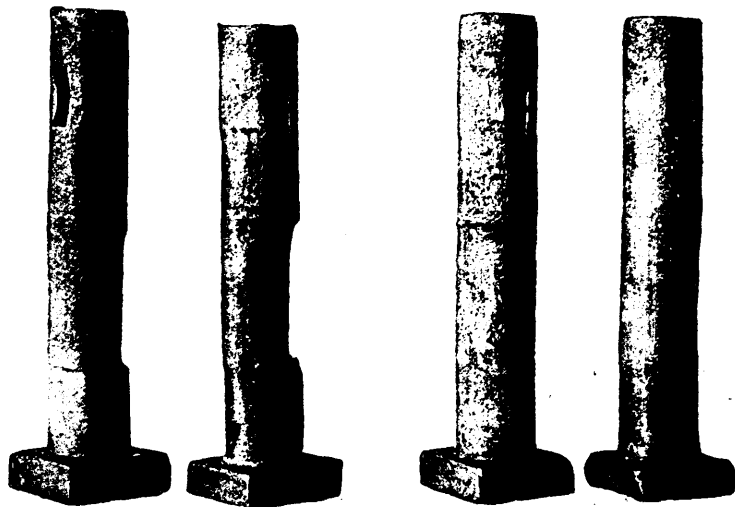


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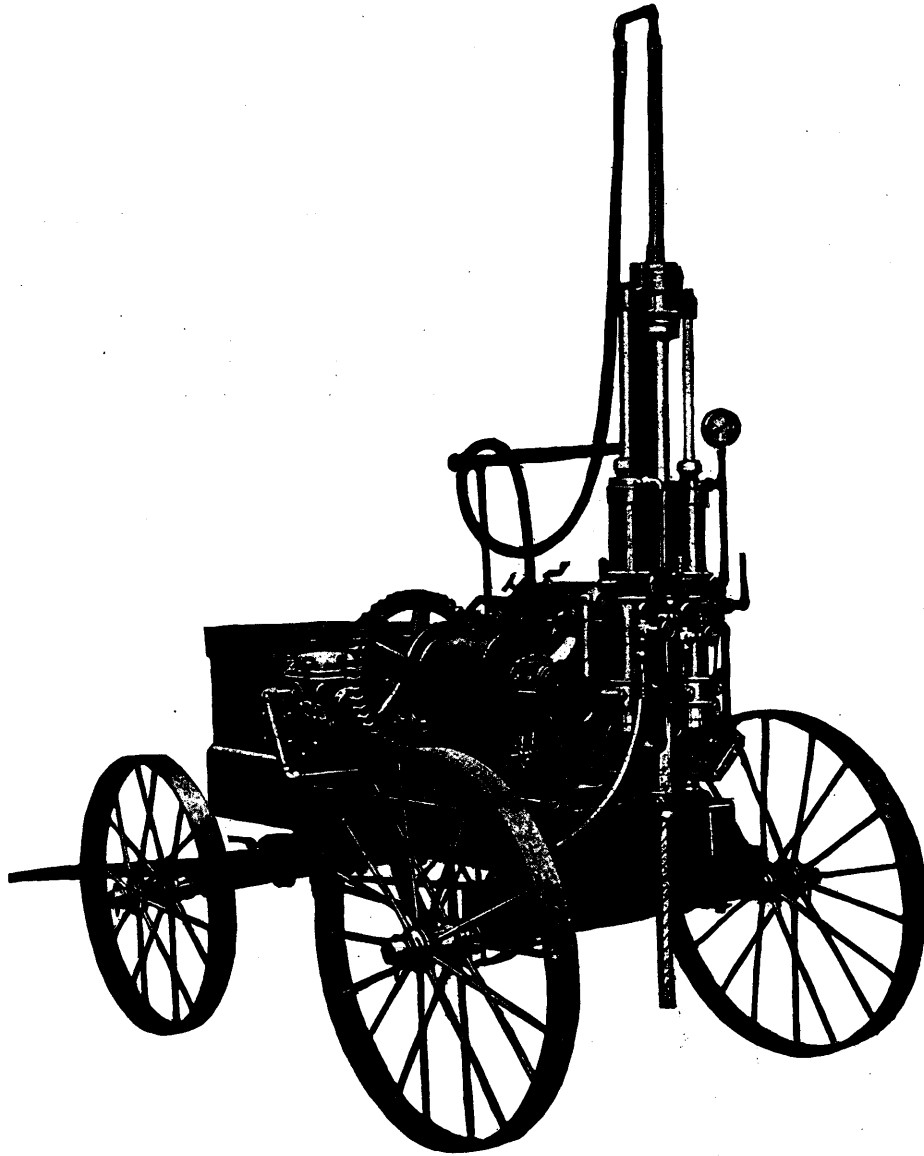
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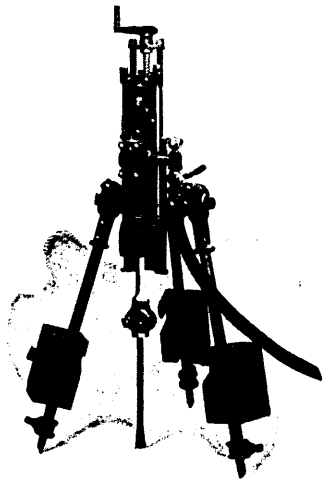
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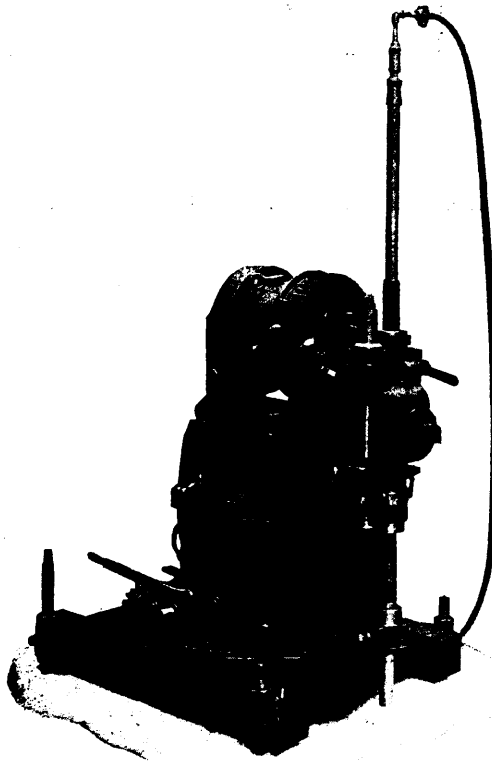
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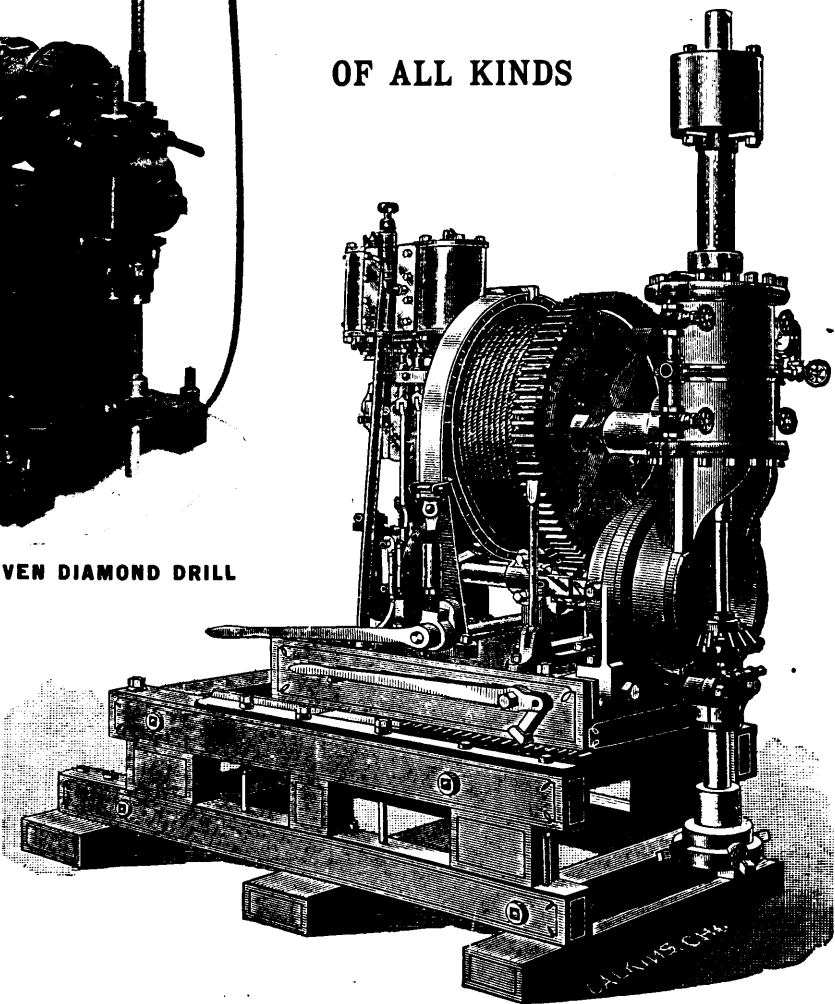
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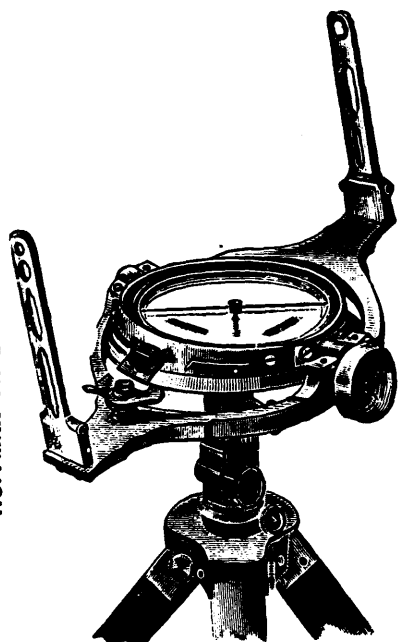
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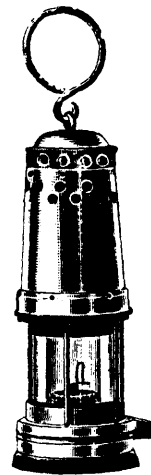


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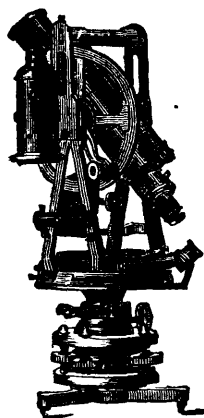
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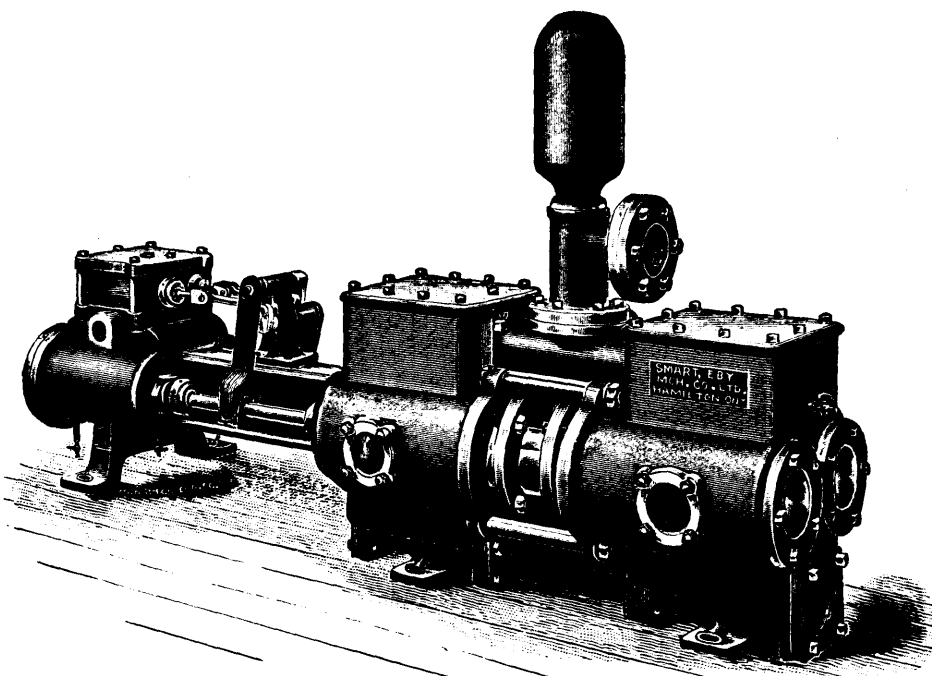
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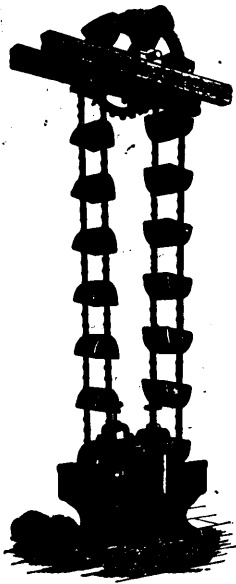
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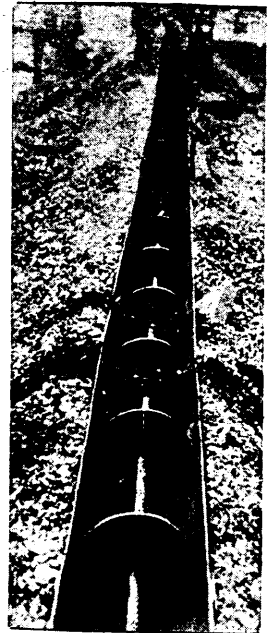


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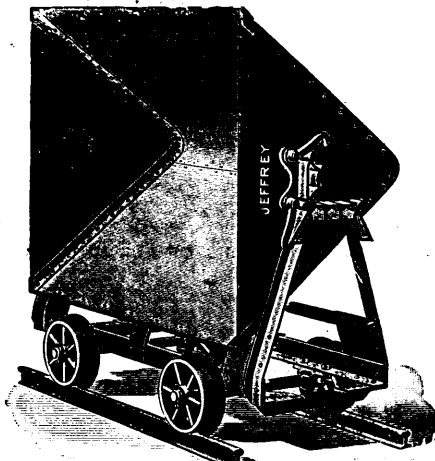
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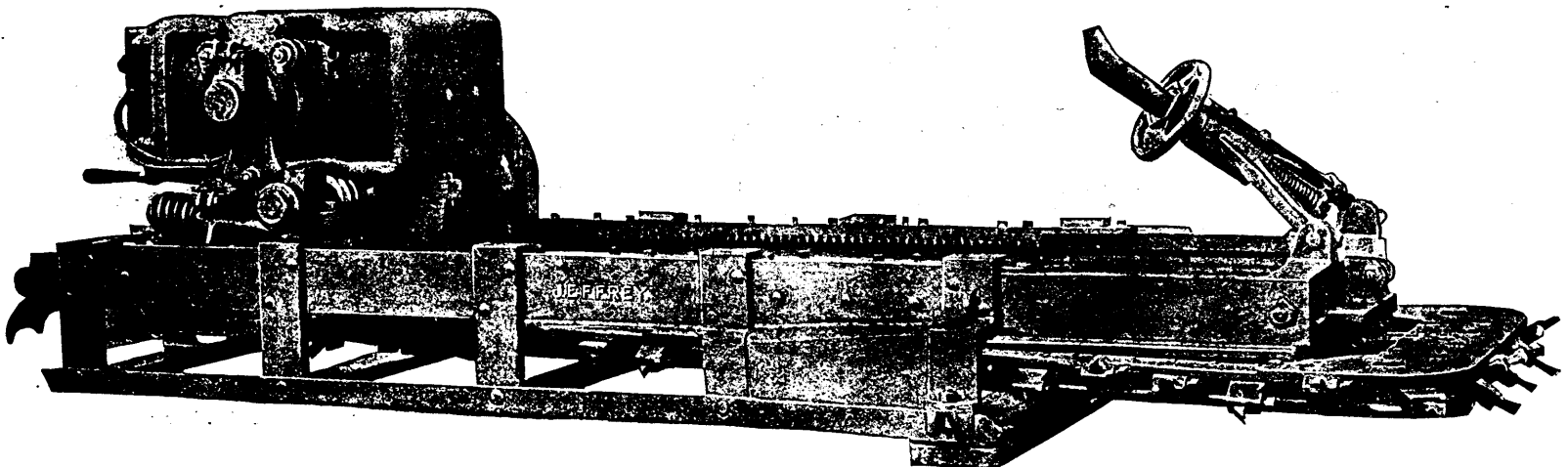


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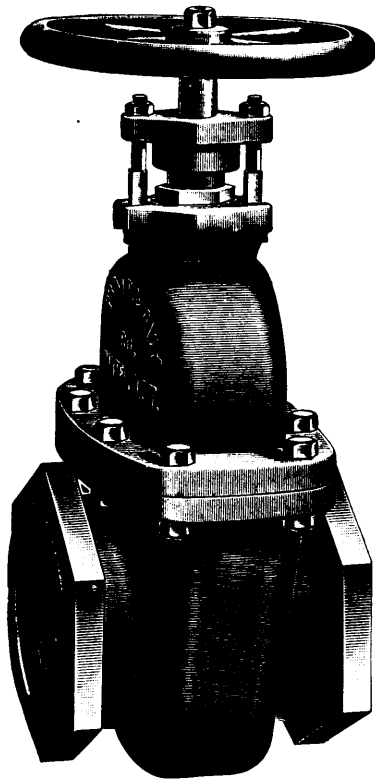
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Ontario's Mining Lands.

THE Crown domain of the Province of Ontario contains an area of over 100,000,000 acres, a large part of which is comprised in geological formations known to carry valuable minerals and extending northward from the great lakes and westward from the Ottawa river to the Manitoba boundary.

Iron in large bodies of magnetite and hematite ; copper in sulphide and native form ; gold, mostly in free milling quartz ; silver, native and sulphides ; zinblend, galena, pyrites, mica, graphite, talc, marl, brick clay, building stones of all kinds and other useful minerals have been found in many places, and are being worked at the present time.

In the famous Sudbury region Ontario possesses one of the two sources of the world's supply of nickel, and the known deposits of this metal are very large. Recent discoveries of corundum in Eastern Ontario are believed to be the most extensive in existence.

The output of iron, copper and nickel in 1900 was much beyond that of any previous year, and large developments in these industries are now going on.

In the older parts of the Province salt, petroleum and natural gas are important products.

The mining laws of Ontario are liberal, and the prices of mineral lands low. Title by freehold or lease, on working conditions for seven years. There are no royalties.

The climate is unsurpassed, wood and water are plentiful, and in the summer season the prospector can go almost anywhere in a canoe. The Canadian Pacific Railway runs through the entire mineral belt.

For reports of the Bureau of Mines, maps, mining laws, etc., apply

to

HONORABLE E. J. DAVIS,

Commissioner of Crown Lands,

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ORNAMENTAL AND STRUCTURAL MATERIALS IN ABUNDANT VARIETY.

The Mining Law gives absolute security to Title, and has been
specially framed for the encouragement of Mining.

Mining concessions are divided into three classes:—

1. In unsurveyed territory (a) the first class contains 400 acres, (b) the second, 200 acres, and (c) the third, 100 acres.

2. In surveyed townships the three classes respectively comprise one, two and four lots.

All lands supposed to contain mines or ores belonging to the Crown may be acquired from the Commissioner of Colonization and Mines (a) as a mining concession by purchase, or (b) be occupied and worked under a mining license.

No sale of mining concessions containing more than 400 acres in superficies can be made by the Commissioner to the same person. The Governor-in-Council may, however, grant a larger extent of territory up to 1,000 acres under special circumstances.

The rates charged and to be paid in full at the time of the purchase are \$5 and \$10 per acre for mining lands containing the superior metals*; the first named price being for lands situated more than 12 miles and the last named for lands situated less than 12 miles from the railway.

If containing the inferior metal, \$2 and \$4 according to distance from railway.

Unless stipulated to the contrary in the letters patent in concessions for the mining of superior metals, the purchaser has the right to mine for all metals found therein; in concessions for the mining of the inferior metals, those only may be mined for.

*The superior metals include the ores of gold, silver, lead, copper, nickel, graphite, asbestos, mica, and phosphate of lime. The words inferior metals include all other minerals and ores.

Mining lands are sold on the express condition that the purchaser shall commence *bona fide* to mine within two years from the date of purchase, and shall not spend less than \$500 if mining for the superior metals; and not less than \$200 if for inferior metals. In default, cancellation of sale of mining lands.

(b) Licenses may be obtained from the Commissioner on the following terms:—Application for an exploration and prospecting license, if the mine is on private land, \$2 for every 100 acres or fraction of 100; if the mine is on Crown lands (1) in unsurveyed territory, \$5 for every 100 acres, and (2) in unsurveyed territory, \$5 for each square mile, the license to be valid for three months and renewable. The holder of such license may afterwards purchase the mine, paying the prices mentioned.

Licenses for mining are of two kinds: Private lands licenses where the mining rights belong to the Crown, and public lands licenses. These licenses are granted on payment of a fee of \$5 and an annual rental of \$1 per acre. Each license is granted for 200 acres or less, but not for more; is valid for one year, and is renewable on the same terms as those on which it was originally granted. The Governor-in-Council may at any time require the payment of the royalty in lieu of fees for a mining license and the annual rental—such royalties, unless otherwise determined by letters patent or other title from the Crown, being fixed at a rate not to exceed three per cent. of the value at the mine of the mineral extracted after deducting the cost of mining it.

The fullest information will be cheerfully given on application to

THE HON. THE COMMISSIONER OF COLONIZATION AND MINES,
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Leases for Mines of Gold, Silver, Coal, Iron, Copper, Lead, Tin

—AND—

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TITLES GIVEN DIRECT FROM THE CROWN, ROYALTIES AND RENTALS MODERATE.

GOLD AND SILVER.

Under the provisions of Chap. 1, Acts of 1892, of Mines and Minerals, Licenses are issued for prospecting Gold and Silver for a term of twelve 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. The cost is 50 cents per area. Leases of any number of areas are granted for a term of 40 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 an ounce, and on smelted Gold valued at \$18 an ounce.

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

MINES OTHER THAN GOLD AND SILVER.

Licenses to search for eighteen months are issued, at a cost of thirty dollars for minerals other than Gold and Silver, out of which areas 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 for a nominal fee, 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, 10 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

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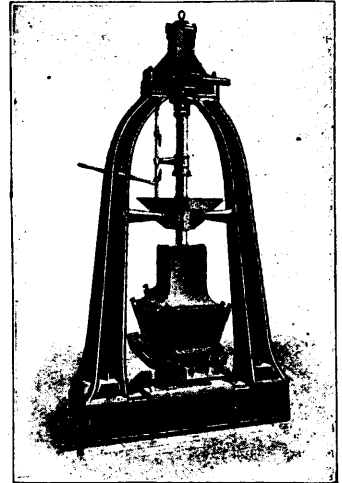
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Lot 2,	Con. 4,	"	"	315
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Lot 4,	Con. 4,	"	"	315
Lot 5,	Con. 4,	"	"	319
Lot 6,	Con. 4,	"	"	318
Lot 12,	Con. 3,	Graham	"	274
Lot 12,	Con. 4,	"	"	290

Total 2,699

belonging to The Vermillion Mining Company of Ontario, will be sold at public auction, en bloc, at the Auction Room of C. J. Townsend, Toronto, Ontario, on the 14th day of May, 1901, at the hour of 12.00 o'clock noon, to the highest bidder. Terms of sale 10 per cent. cash, 15 per cent. in thirty days, 25 per cent. in four months, 25 per cent. in nine months, and 25 per cent. in eighteen months, the unpaid pur-

chase money to be secured by mortgages bearing interest at five per cent. per annum. The Mortgage to be settled in case of dispute by the Junior Registrar of the High Court of Justice, subject to Appeal to a Judge of the High Court.

Possession not to be given until the first 25% of the purchase money shall have been paid.

The purchaser may pay the whole of the purchase money in cash if he desires.

Premises may at any time be inspected on behalf of the intending purchasers, and samples of ore for the purpose of assays taken away up to the limit of 500 pounds upon the production of the written permission of Messrs. McCarthy, Osler, Hoskin & Creelman, or of Messrs. Beatty, Blackstock, Nesbitt, Chadwick & Riddell, both of Toronto, Ontario.

References may be had for particulars of samples and analyses of ore to the Director of Mines, Toronto.

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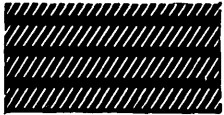
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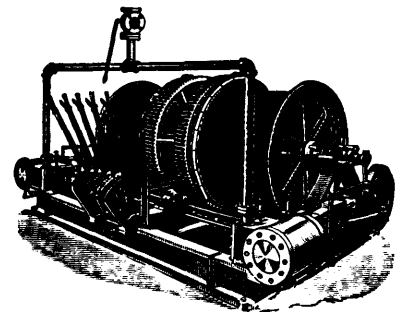
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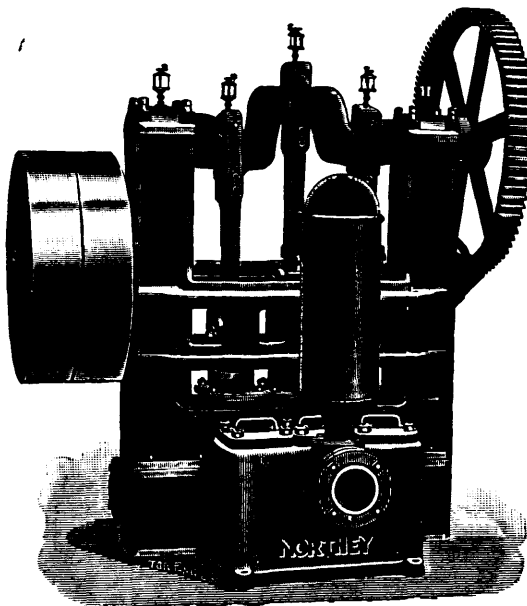
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Established 1882

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B. T. A. BELL, Editor and Proprietor.
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Mining Progress in Ontario.

In Ontario the mineral industry during the year 1900 has on the whole made good progress, in some branches remarkably good, and it is probable that the statistics for the twelve months when published will show a gratifying increase in the aggregate output.

In copper, nickel and iron the advance has been marked, while gold will probably show a somewhat smaller yield than last year.

Production of structural materials, such as brick, stone and lime, always a barometer of prosperity, has been active, and to this list of materials must be added cement, mostly Portland, the home market for which promises ere long to be fully supplied by Ontario manufacturers.

Petroleum continues to be produced at the rate which has characterized the past number of years, and it is not likely, unless the attempts now being made to reach the supposed reservoirs in the Trenton limestone prove successful, that this rate will prove capable of much acceleration.

Natural gas, that ideal fuel, flows in large volumes from the wells of Welland and Essex, but in the latter field a diminishing yield is reported, and an outcry is being made against further export to Detroit. The supply to Toledo has already been cut off.

The salt beds of Bruce, Huron and Lambton contribute a portion of their enormous stores to satisfy the requirements of the Province, and the salt makers are able to get a rather better price per barrel than formerly, but continue to complain of competition with the English article and the impossibility of trading with the United States.

Of the minor minerals, mica has been in brisk demand and larger supply than in 1899; the auriferous mispickel ores of Deloro are yielding considerable quantities of arsenic as a bye-product, zinc ore is being produced near Rosspport on the C. P. R. and exported to Belgium; graphite is being mined and shipped in Renfrew County and the extensive bodies of corundum which have within the last two or three years been shown to exist in Eastern Ontario are beginning to be worked and to yield quantities of the crushed and graded article for abrasive use.

The remarkable rise in the price of pig iron which took place in 1899 led as a natural result to an increase in production and a search for new deposits of ore. The magnetite mines of Eastern Ontario have been pumped out and overhauled, and a number of them have been producing and shipping ore, some of which went to the blast furnaces at Hamilton and some to smelters south of the line. The production of iron ore in Ontario in 1899 was 16,911 tons, which is not more than one-quarter or one-fifth of the output of 1900. This large increase is due to the opening up of the Helen hematite mine in Michipicoton by Mr. Clergue, the development of which in so short a time is a tribute

to the energy with which the "Jason of Algoma" carries on his operations. The body of ore in the Helen mine is a very large one, doubtless containing many millions of tons, and the ore is of good, though non-bessemer quality, running pretty uniformly about 55 or 57 per cent. of metallic iron. The bulk of the output for 1900 was carried by boat to the new blast furnace built by the Canada Iron Furnace Company at Midland, and blown in in December last. A sample cargo was sent to Ashtabula, and Mr. Clergue is credited with the intention of entering into competition with the mines of the Mesaba and Vermilion ranges in supplying the furnaces of Cleveland and Pittsburg, in spite of the duty of 40 cents per ton. The Helen mine was discovered in 1897 and but little work done on it until after it passed into Mr. Clergue's hands in 1898. Since that time a railway twelve miles long has been built, ore docks constructed, steamers brought from England to carry the ore and next season will probably see half a million tons taken from the mine. The Midland furnace makes the third in operation in the Province, the other two being at Hamilton and Deseronto. The last named makes charcoal iron exclusively, and at Hamilton the first open-hearth steel ever made in Ontario was produced during the present year. Two crucibles are in steady operation with a capacity of about 15 tons per day each. At both Hamilton and Deseronto the ores made use of have been chiefly from the American side of Lake Superior, but since an abundant supply of equally good ore has been laid bare at Michipicoton, it is quite probable the wants of the furnaces will be supplied from our own Province. New blast furnaces are being projected at Collingwood and Kingston, the former by the Cramp—Ontario company, the stock of which is at present being offered to the public. Drilling in the Mattawin iron range has been going on nearly all the year but it is stated that the ore proves mingled with considerable jasper. On the Atik-O-kan range, further away, the McKellar Bros. of Fort William have sold their magnetite locations to an American company, who are now stripping and opening up the properties and propose to work them extensively during the present year. Extensive deposits of magnetite are reported from the Lake Temagami country.

In copper, the old Bruce mines, on the north shore of Lake Huron, are being put in commission again. An English company with an American manager (a good combination in mining) is providing the capital, and large works are in course of construction. At Rock Lake, too, a short distance away, a very promising prospect is passing into the mining stage, and a similar condition prevails at Massey where the Orford Refining Company (or the Ontario Smelting Company) is opening up a newly discovered copper vein which promises both depth and richness. This Company is also putting up a concentrating plant at

Copper Cliff, to re-treat the Canadian Copper Company's mattes and raise their metallic contents to about 80 per cent., as well as to reduce to matte the ores from its own Massey mine. The McGown and Wilcox mines near Parry Sound are being opened up.

The copper-nickel ores of the Sudbury region are being developed in an eminently satisfactory manner. The pioneer company (The Canada Copper Company) is producing more extensively than ever and its operations show what success can be achieved by skill and energy backed by capital. Dr. Ludwig Mond, the English scientist, is developing a property at Victoria mines and will smelt the ore, bringing the matte up to 80 per cent. metallic contents before shipping it to England, to be refined by the process of his own invention. Mr. Clergue is putting the Gertrude nickel mine in Creighton township in shape. It is from this property that he proposes to draw his supplies of nickel ore for manufacturing ferro-nickel and nickel steel at Sault Ste. Marie. The pig iron for his steel rail plant he will bring from Midland for the present, but it is on his extensive programme to erect a blast furnace or furnaces at the Sault for the reduction of his own iron ore, and looking into the not distant future he discerns a market in the shipyards of England and Scotland for the plates and sheets he will make at Sault Ste. Marie. The Frasch process of refining nickel which was brought into prominent notice some months ago is still being experimented with by the nickel-copper company at Hamilton, but so far operations on a commercial scale have not been begun.

The gold mining industry of Ontario has not as yet come up to the sanguine expectations which were entertained three or four years ago. Stock manipulations have in some cases taken the place of honest mining, gross incompetency in others has led to muddling away the money of shareholders with little or nothing to show for it, and in still others funds have been laid out with a lavish hand where the prospect of success was slight from the start. The close of the year sees only three mines in western Ontario producing bullion, viz., the Mikado, Sultana, and Sakoose. The last named is a new property near Dymont station on the C.P.R., owned by the Ottawa Gold Milling and Mining Company, who carry the ore 136 miles by freight and mill it at their reduction works at Keewatin. The Mine Centre group of mines are all idle, including the Golden Star, Olive and Foley. A new company is being formed to take over the first named of these three, and the outlook for a resumption of operations is hopeful. At Sturgeon lake about seventy miles north of Ignace station on the C.P.R., some very promising finds of gold both in wide and narrow veins were made last summer, and at least one 10—stamp mill is now going in over the ice. It is to be hoped the results will show this action to have been warranted, though in other parts of the gold field experience has shown it to be the part of wisdom to spend money in proving the existence of gold in paying quantities before rushing up surface works. In eastern Ontario the mispickel mines of Deloro are yielding both gold and arsenic, and it would appear that the knotty problem of treating these refractory ores has found a satisfactory solution. In Belmont township free-milling quartz is being crushed with favorable results by the Cordova Exploration Company.

The West End Syndicate has been producing silver in considerable quantity from the mine of that name west of Port Arthur.

Pyrites is being mined near Millbridge, Hastings county, and a large deposit near Port Arthur is being uncovered.

The outlook for 1901 is good, and there is reason for believing that the mineral industry of the premier Province is entering on an era of progress such as it has not yet seen.

Canadian Mining Institute meetings, Montreal, 6th, 7th, 8th., March. All mining men welcome.

Lead Refining in Canada.

Recent developments south of the border have brought the lead miners and smelters of Canada face to face with a difficult question. The public is familiar with the attempts which have been made to establish lead smelting in the Dominion on a stable basis, and has seen failures at Golden, Revelstoke, and on Kootenay Lake, while successful smelters at Trail and Nelson are only beginning to get on a firm basis and there is no refining. In seeking for a reason for the failures, it may be said at once that they were not due to a lack of lead ore, nor altogether to costs of fuel or freight. As to ore, there are three or four mines which would be called big lead producers even in the Cœur d'Alenes.

There are two reasons for the backwardness in smelting and the absence of lead refining plants, one of which may be called natural and the other artificial. Under the first head, is the lack, hitherto, in Western Canada of so-called "dry" ores, such as are found south of the line in Colorado, Utah, Montana and Mexico. As there are doubtless many unfamiliar with technicalities of smelting, it may be said that an ore is called "dry" if it does not contain lead. The dry ores of the States are rich in gold and silver and cannot be smelted by themselves. In order to smelt them successfully, they have to be mixed with high grade lead ores as a flux. The lead collects the precious metals which are subsequently separated by refining from the lead bullion produced. In Canada these rich dry ores are lacking, or at least undiscovered at points within reach of the lead ores. In order to smelt lead in Canada, only low grade dry ores are available. These could be availed of to the extent of four tons of dry ore to one of the lead concentrates if the cost of lead smelting was so low, or the market so handy, that the lead smelters could afford to pay a better price for these low grade ores—such ores as are found in Rossland, for instance, and in other West Kootenay camps carrying gold, but too low in copper to be smelted for that metal alone. In the United States, the rich gold ore is the more important, and the lead ore considered a flux. In Canada at present the lead ore is the most valuable and the dry ore the flux. So necessary is lead to the Southern ores that often no smelting charge is made on lead concentrates. The profit comes from the dry ore.

A word only need be said about the market. As in many other cases, the artificial barrier at the frontier prevents Canadian lead from being marketed in the United States. The consumption in Canada probably does not exceed 3,000 tons annually, of the manufactured metal. But Europe and the East can take all that we can produce, and we should be able to hold both of these markets if competition from the United States could only handicap our business through their import duty. But the import tax has fostered and made possible the Lead Trust known as the American Smelting and Refining Company. Before the formation of this trust our lead miners could sell their product for shipment to the United States, even when shipping facilities were much poorer, and there was active competition among rival buyers. Now there is but one buyer, which makes its own terms, and these terms have been recently made more onerous if not prohibitory. To-day the concentrates of the St. Eugene mine, for instance, must seek a market in Germany, Belgium, and even Italy, paying freight charges across a continent and three thousand miles of ocean. Considerable of this lead comes back, by the way, in the form of white lead, litharge, red oxide, orange, etc., as the lack of refineries in Canada and the small duty of five per cent. on white lead, etc., prevent the establishment of these manufactures in Canada. Were it not for the very high grade of the Canadian ores and the silver they carry, these artificial conditions would prohibit lead mining.

When it comes to refining of lead bullion produced here, under



COURTENAY DEKALB,
Mining Engineer,
Inspector of Mines for Ontario.

present conditions, and considered regardless of patriotic or national interests, the lead smelters of British Columbia could afford to pay freight on their bullion to Chicago, for instance, and refine it there, because of two factors usually overlooked in discussing this problem. If the lead were refined in British Columbia, the bullion before refining, would carry about five ounces of gold and 250 ounces of silver per ton. Express charges on the silver to the New York market, at the rate of \$8.00 per \$1,000 of silver and of \$3.50 on each \$1,000 of gold, would make the cost of delivering these precious metals about \$1.55 more per ton of lead bullion than would be the cost of freighting them to New York in the form of base bullion at say \$16.00 per ton. But another and more important condition still further works in favor of the refinery in the United States. When the United States refiner imports lead bullion, to separate the precious metal in bond, he is required to export only 90 per cent. of the lead. This leaves him practically 10 per cent., which he can sell in the States at Chicago prices. A simple calculation will show what he gains—or any United States refining works would gain—under this Government concession.

On a certain day last week, London lead sold at £16 5s. Taking exchange at \$4.85 and remembering that the English quotations are per ton of 2240 pounds, this price is equivalent to \$70.00 per short ton, or 3.5 cents per pound. On the same day, the price of lead in Chicago was 4.25 cents per pound. If we take freight and insurance from Chicago to London at say \$8.00, this subtracted from the \$70.00 makes \$62.00 per ton, which the imported lead is worth in Chicago. Could this lead be sold for consumption in Chicago, at 4.25 cents, it would be worth \$85.00 per ton. But as 90 per cent. of it must be exported, we have the following calculation :

90% at \$62.00 per ton is equivalent to.....	\$55.80
10% at Chicago price of \$85.00 equals	8.50
	<u>\$64.30</u>
But if all the lead had to be exported and sold at.....	62.00
	<u>62.00</u>
The difference being gain to refiner in the United States.....	\$2.30
Add express charges saved on gold and silver..	1.55
	<u>\$3.85</u>

Thus the advantage at present in favor of a United States refinery is \$3.85 per ton, not considering nearness of market or cheapness of coal. To offset this and to allow the possibility of a little profit until refining as an industry is established in Canada, it is proposed that a bounty, limited in amount and in time and in quantity to which it is applicable, shall be asked of Parliament.

Once established, the Canadian refiners should be able to take care of themselves; without assistance in the beginning no one would dare go to the expense which the erection of a modern refinery would entail.

The associations of the United States Smelter Trust are close with great railway interests, which can foster their industry to any desired amount, and their absorption of all the refineries in the United States, but two or three, enables them to exact even a prohibitory toll from Canadians. Their recent amalgamation with Guggenheims has brought to them not only additional smelters and refineries in the United States, but has given them a control of the chief lead mines and many of the smelting works of Mexico, and of other producers even in South America. While it is probably true that there still exist in New York and San Francisco two independent refineries, it can easily be imagined that these refineries will be absorbed, whenever it becomes worth while to fulfill the conditions necessary to their acquirement. Not only has all competition ceased for Canadian lead ores, or lead bullion requiring

to be desilverized, but charges have been increased to a point making it necessary to export bullion to Europe or abandon the smelting of lead ores rich in silver, or as a last resort, sell out to the Trust.

Of course a bounty should not be given to any one refiner, but allowed 'pro rata' upon the total tonnage of refined pig lead produced from the smelting and refining of Canadian ores, wherever and by whomsoever it be done, and the Government should be assured that no monopoly will be created, either East or West.

We must not lose sight of the incidental benefit which would accrue to other mining, if lead refining becomes a settled industry in Canada. Let us repeat: A refinery will help that class of mines most needing assistance in Canada—the low grade gold mines containing too little copper to justify their treatment by themselves. There are millions of tons of such ore. Again we say:—for every additional ton of lead concentrates smelted four or five tons of these dry ores can be utilized. The miner of lead ores has a very limited market at present. With the tariff-dam on the south, the long haul to Europe, and the necessity of accepting the lower English price for his lead, the limit of profitable assay is easily calculated. If he smelts himself or sells to Canadian smelters, the price he receives is regulated by the profit to the smelter. If it does not pay to refine in Canada under present conditions, the circle is completed and the miner suffers as well as the smelter. If on the other hand a bounty enables the refiner to obtain a foothold in Canada, the miner is in direct line to benefit from the market of refined lead.

It should not take long, with conditions of water transportation so favorable, to take the Japanese and Chinese markets as well as to successfully enter the European field.

The competition with the States is not likely to grow less. New York is likely to become a greater smelting and refining port, for additional South American and even Australian ores, for soon by means of subsidies or other changed conditions in American shipping, there will be regular and cheap connection with other lead producing countries. Even at present ocean freight rates, ores are now coming from the west coast of Mexico to be smelted at New York, just as nickel ores are being imported from New Caledonia to the same port. Again, protected by the high duty on the refined metal, and having in mind the greater profits, if they were not obliged to re-export foreign lead, it will surely not be long before the United States Congress will be asked to remove the duty from ores, while retaining the tariff on the metal, but this cannot benefit the Canadian miner as long as the South American and Mexican mines are owned by the smelting trust or its affiliated interests.

Finally, if the Government fails to act at once in this matter, no refinery can be built for a year at least. Our rivals across the line are refusing to contract for a short term even at their present high charges. They will get further entrenched, and by the economy of their combination, by their power to control freights in the States and their ability to refine wherever the costs of fuel and labor are least, can take away from us our legitimate markets of England and the Continent or close down all our lead mines not most favorably situated, and incidentally some of the low grade copper and gold properties of British Columbia and other provinces.

Even when charges warranted the shipment of ores to the United States, Canada "did all the rough work," and assumed the risks of the mine, while the United States reaped more than half the profit—the smelter's and refiner's half—and could determine safely what its profits should be.

Those who are most familiar with copper mining and smelting are predicting the early fulfilment of the expectation that this metal will reach the European consumer from Canada in the form of refined ingots, wire bars, or even in wire and sheets. We are headed in that

direction and moving at a rapid rate. No longer are copper ores shipped in quantity to American smelters. With the exception of to one smelter near the border, the product is now going east to market in the form of matte containing 50 per cent. of copper. The larger works are preparing to bessemerize this matte in Canada before this year is out. The product then will be marketed as pig copper, 98 per cent. fine. The next and last stage will be a copper refinery, for which capital is all ready, and some of our magnificent water powers will be supplying the electric energy to separate from this pig copper the pure metal, and the gold and silver. This copper industry will require no protection and can take care of itself at prices now established. But unless Canada is to see its lead mining limited to those mines exceptionally well situated, and lead smelting handicapped and is willing to depend upon United States brands for its refined lead, the industry must be fostered by a bounty. Again we say: A bounty limited in amount, limited in duration and limited as to tonnage.

Freight and Treatment Charges on B. C. Lead Ores.

In its issue of 26th January there appeared in the editorial columns of the *Western Mining World* a reference to certain statements by Mr. E. B. Braden, concerning the comparative freight rates to Omaha from the Cœur d'Alaine country and British Columbia. Being anxious to have some explanation of this article we took occasion, when he was in Ottawa this month, to interview the General Manager of the Trail Smelter. Mr. Aidridge in substance said:

In December, 1899, an offer was made the Canadian Pacific Railway by United States smelters and the Great Northern Railway involving certain freight and treatment charges to the lead miners of British Columbia and a certain freight charge to themselves. The total rate which the lead miners received as a result of this offer resulted in giving to the Canadian lead miners, as it turned out, from \$5 to \$10 more per ton for their ore than they received during the year 1899. In one instance this arrangement secured for the Canadian Pacific Ry. practically the entire through rate, the United States road only receiving a very small amount for a long haul while the Canadian road received a very large percentage for a comparatively short haul. This agreement also involved a tariff rate of \$17.00 per ton to Omaha, which at the time was entirely satisfactory to the United States smelters. Before the end of the year the conditions in the United States had changed materially from what they had been at the beginning of the year. In other words, the supply of lead ore greatly increased while the production of dry ores was materially less. The American Smelter Trust then sent a representative to ask that the agreement which they had proposed and made with the Railway be modified to the extent of their receiving a rebate on the freight rate to Omaha. But the railway took the stand that as this rebate was simply for the benefit of the Smelter Trust and would in no way benefit the lead miners, they must insist upon the agreement being carried out as made. They invited the Smelter Trust to send a representative to meet with their representative to discuss the matter of freight rates for the coming year. The railway used every effort to have a place and date fixed for this meeting previous to January 1st, 1901, and being unable to get the American Smelting and Refining Company to set a place and date, they suggested a meeting themselves, and both the American Smelting and Refining Company and the Guggenheim's Smelters intimated that they would send representatives to this meeting. The railway company therefore had a representative present to discuss these matters, but neither the Smelter Trust nor the Guggenheims were represented. Immediately after this piece of "horse play" upon their part, they sent their agent and representative, Mr. E. B. Braden, to the

Slocan country to circulate the report that they were in the market for British Columbia lead ores, but that they had been unable up to the present time to secure satisfactory rates for the year 1901. A meeting of the Slocan mine owners was held, at which Mr. Braden appeared, and he immediately brought up questions of freight rates, which, he stated, were insupportable, and insisted that unless the railway company reduced this rate they would not purchase ores in British Columbia. He furthermore referred to the freight rate to Great Falls, which as a through rate was a fair one, but was one in which the Canadian road obtained for the short haul practically the whole rate. The lead miners of the Slocan pointedly referred to the fact that the Canadian Pacific and the Great Northern had both reduced their freight rates to all points \$1.00 per ton, and asked Mr. Braden as to whether he was in a position to give them the same treatment charge as last year, which would have given them \$1.00 per ton more for their ore than they had received the previous year. Mr. Braden stated that he was not in a position to do this. They then asked him as to whether he was in a position to quote any rates whatsoever, to which he replied he was not.

Within a week or ten days of the time that Mr. Braden was circulating these reports and being interviewed by different papers in British Columbia, a prominent mine owner of the East Kootenay country wired direct to the Vice-President of the American Smelting and Refining Company, asking him for a treatment charge upon his ore, leaving him to arrange the freight rates. The reply received was to the effect that the American Smelting and Refining Company was not now in the market for lead ores, but that they might possibly be able to handle some ore at their Omaha works. A few days later this correspondence was carried on further, with the result that the East Kootenay mine owner failed absolutely to obtain anything definite whatsoever from the American Smelting and Refining Company, and one of their officers admitted informally that they had been tricked by the Trust and that it was now evident to them that they did not intend to make any rates on British Columbia ores.

In other words, the play of the American Smelting and Refining Company was first to raise the refining charge to Canadian smelters to \$4.00 per ton, believing by so doing that they would remove the competition of Canadian smelters; secondly, that they would temporarily withdraw entirely from the British Columbia lead market, thus leaving the Canadian lead producers with practically no market for their products. Considering the fact that the United States smelters had been handling something over 50 per cent. of the lead ores of the country, it certainly left the Canadian smelters in somewhat of an embarrassing position; but I am glad to say that the railway company has, through its Smelting Works and the Hall Mines Smelter, placed within the last month a very large lead output in the east and west Kootenay countries, including the St. Eugene, North Star, Sullivan, Payne and others, and the miners will receive practically as good rates as they received during the year 1900, when the American Smelting and Refining Company took over 50 per cent. of these ores. The American Smelting and Refining Company have therefore found to their chagrin that not only can the British Columbia lead miners live without them, but they have actually been able to obtain practically as good rates as when they were in the market. It is interesting to note that in a recent misunderstanding between various interests in the Trust, the Trust's policy in dealing with the British Columbia situation has been severely criticized by those who are likely in the future to dictate its policy.

There is no doubt but that the relations between the Canadian lead ore producers and the Canadian smelters should be very close, as their interests are to a certain extent the same, and it is only fair to

say, so far as the smelters are concerned, that they have not made more than a fair interest upon their investment in the handling of the lead ores of the country.

If the bounty of \$5.00 per ton on pig lead is granted by the Government this session, it will have the effect or not only firmly establishing the lead smelting and refining interests, but it will also secure for the lead miners better rates upon their ores and stimulate largely the lead mining industry, as well as creating a healthy demand for a large tonnage of low grade dry ores which are necessary to mix with the lead ores in the smelting processes.

Referring to Mr. Braden's remarks upon the subject of comparative freight rates to Omaha from the Cœur d'Alene country and British Columbia, I have in hand a Northern Pacific Railway Tariff, No. 4509, which reads as follows:—

"Mullan, Burke, Wallace, (Cœur d'Alene points), to Omaha, Nebraska, \$12, \$14 and \$16 per ton respectively," depending upon whether the ore or concentrates are less than \$50 per ton, between \$50 and \$65 per ton, or over \$65 per ton, figuring 100% of the metals at the gross New York prices of refined metals.

On the above basis of calculation, practically all the Slocan ores would take the \$16 rate, while some of the East Kootenay would take the middle valuation. It is possible that a later tariff may have been issued than the above quoted, but I doubt whether any has been issued reducing the above tariff rates, and it is safe to say that there never has been a \$10 rate issued from the Cœur d'Alene country to Omaha on ore assaying as high in lead and silver as the British Columbia. It might be well for Mr. Braden and the "Western Mining World" to give their authority for their statement that a \$10 rate has been made. At any rate the Canadian Pacific rate compares favorably with the Northern Pacific tariff referred to.

Very Bad Form.

Last summer it will be remembered that the American Institute of Mining Engineers visited Canada on the invitation and as the guests of the Canadian Mining Institute and the Mining Society of Nova Scotia. The executive of these bodies went to much trouble in arranging and carrying out the details of an elaborate programme of excursions extending from the province of Quebec, through Nova Scotia and as far as the Island of Newfoundland.

The whole programme from start to finish was arranged and carried out under the entire direction and control of the Canadian societies and the heavy expenses incurred, somewhere in the neighbourhood of \$10,000, were provided by the members of the Canadian organisations supplemented by grants from the Dominion and Provincial Governments and special concessions from Canadian railways. In the light of these facts it is, to put it mildly, somewhat surprising to find the following untruthful paragraph in the recently published transactions of the American Institute:—

"This, like the similar result of the transcontinental trip of 1899, was due to the vigilant and skillful management of Mr. Theodore Dwight, Assistant Treasurer of the Institute, who in both cases undertook, outside of his regular work, the arduous task of managing the Institute excursion. This mention is made not only as a well deserved acknowledgement of Mr. Dwight's services, but also as an indication to members, that in future excursions under the same efficient management, they may feel assured of perfect arrangements for their comfort, and of the safety with which they may rely upon preliminary estimates of expense, as at least sufficient to cover the actual cost."

We understand that the attention of Dr. Raymond, Secretary of the Institute, has been called to the offensive character of this impertinent puff by Mr. Theodore Dwight on behalf of Mr. Theodore Dwight.

Canadian Bounties Paid in 1900.

From the annual blue book of the Auditor-General for the fiscal year ended 30th June last we obtain the following figures of the bounties on iron and steel and silver paid by the Dominion Government during that period as follows:—

BOUNTY ON PIG IRON.

Canada Iron Furnace Co. (\$18,234.92)—	
Radnor Forges, Three Rivers—	
Production during 12 months ended June 30, 1900—	
6,052.78 tons from Canada ore at \$3	\$18,158 34
38.29 tons from foreign ore at \$2	76 58
Deseronto Iron Co. (\$27,026)—	
Production during 12 months ended April 30, 1900—	
462 tons from Canada ore at \$3	1,386 00
12,820 tons from foreign ore at \$2	25,640 00
Hamilton Blast Co., Ltd. (\$107,009.69)—	
Production during 12 months ended May 31, 1900—	
11,929.19 tons from Canada ore at \$3	35 787 57
35,611.06 " foreign ore at \$2	71,222 12
John McDougall & Co. (\$5,485.07)—	
Grantham Iron Works—	
Production during 10 months ended April 30, 1900—	
1,828.37 tons from Canada ore at \$3	5,485 07
Nova Scotia Steel Co. (\$73,162.22)—	
Production during 12 months ended May 31, 1900—	
11,886.225 tons from Canada ore at \$3	35,658 67
18,751.77 " foreign ore at \$1	37,503 55
Mineral Products Co., Pictou (\$7,378.24)—	
Production during 5 months ended Nov. 30, 1900—	
2,459.415 tons from Canada ore at \$3	7,378 24
	\$239,296 14

BOUNTY ON PUDDLED IRON BARS.

Ontario Rolling Mills Co.—	
Production during June, 1899, from pig iron made in Canada, 40,165 tons at \$3	1,200 50
Hamilton Steel and Iron Co., Ltd.—	
Production during 11 months ended May 31, 1900, from pig iron made in Canada, 2,973.54 tons at \$3	8,920 60
	\$10,121 10

BOUNTY ON STEEL INGOTS.

Nova Scotia Steel Co.—	
Production during 12 months ended May 31, 1900, from pig iron not less than 50 per cent. of which was made in Canada, 21,453.43 tons at \$3	\$64,360 29

BOUNTY ON SILVER.

Hill Mines Co. (\$17,482.07)—	
Mined in 1888-9, 31,190 tons (proportion of \$30,000, less \$71.91, cost of inspection)	\$10,442 09
Portion of unexpended bounty of 1895-6, distributed under O. C.	6,69 95
Short paid on output of years 1895 to 1898, inclusive, as shown by inspection	340 03
British Columbia Smelting and Refining Co.—	
Portion of unexpended bounty of 1895-6, distributed under O. C. \$5,484.81, less overpaid on output of years 1895 to 1898, \$193.40, and cost of inspection, \$49.19	6,246 22
Canadian Smelting Works—	
Mined in 1898-9, 57,805 tons (proportion of \$30,000, less cost of inspection, \$29.35)	19,456 65
W. G. Parmelee, deputy minister, travelling expenses in connection with inspection of miners' books	150 45
	\$43,335 39

Central Canada Chamber of Mines.

Last month we referred to the remarkable character of the literature being distributed by an aggregation of Winnipeg and Rat Portage merchants and trades people under title of "The Central Canada Chamber of Mines." Since then the *modus operandi* of this corporation has been considered by the Council of the Canadian Mining Institute who authorize us to publish the following resolutions:—

"The Council of the Canadian Mining Institute having considered the circular letters and publications of an organization called the Central Canada Chamber of Mines, and believing that the indiscriminate publication and distribution of this literature, containing false and misleading statements, is prejudicial and hurtful to the mineral industries of Canada;

RESOLVES to put on record this expression of its views on the work and procedure of the Chamber, and at the same time to express its unqualified disapproval of any financial aid or assistance being given to it by the Dominion or Provincial governments, and further

RESOLVES that the Secretary be authorized to communicate this resolution to the President and Secretary of the Central Canada Chamber of Mines, to the Honorable the Minister of the Interior, to the Honorable the Commissioner of Crown Lands for Ontario, and to the editors of the leading Canadian and foreign Mining and Financial press.

In this connection and supplementary which we have already written with regard to this so called "Chamber of Mines" we reproduce the following extracts from letters received since last REVIEW from prominent mining men in the Lake of the Woods:—

"I took issue with the Winnipeg Chamber of Mines and withdrew my name from it at the start. The literature published by Mr. Malcolm is the quintessence of puerility and would be funny if it did not reflect on all interested in the district over which the Chamber has arrogated to itself the position of grandmother."

Another mining engineer writes:—

"Will you allow me to express my congratulations to you for the great service you have done the Mining Industry in West Ontario by the publication of your article on "Geology as She is Wrote."

There is no excuse whatever for the Secretary of the Chamber of Mines, for he has disregarded the repeated warnings of the press and persisted in pouring forth his wild and exaggerated effusions.

The Chamber of Mines is now run by a clique formed from the working executive, merely to further their own ends, regardless of the effect on the country."

Canadian Mining Institute.

The Annual General Meetings of the members of this representative organization of Canadian mining engineers and mine managers will be held in the Windsor Hotel, Montreal on Wednesday, Thursday, and Friday, 6th, 7th and 8th of March next. Business sessions will be held on Wednesday and Friday mornings in the Library of the Institute, Room IV. of the hotel, and sessions for the reading and discussion of papers in the Club Room on Wednesday and Thursday afternoon and evening at three and eight p. m. and on Friday afternoon. The members will dine together in the Windsor on Friday evening. By special arrangement made with all Canadian railways members and mining men will be carried to Montreal and returned for a single fare on obtaining Convention Certificate from their ticket agent and on having same signed by the Secretary. The following elaborate syllabus of papers will be presented:—

1. **Coarse Concentration in the Slocan District, B.C.**
By Mr. S. S. FOWLER, S.B., Nelson, B.C.
2. **The New Mining Plant at the Le Roi Mines.**
By Mr. BERNARD MACDONALD, M.E., Rossland, B.C.
3. **A Simple and Convenient Instrument for Mine Surveys.**
By Mr. FRANK RUBBINS, M.E., Kimberley, B.C.
4. **The Duty of Stamp Mills in Crushing and Amalgamation.**
By Prof. COURTENAY DEKALB, Kingston, Ont.
5. **Notes on Gold Dredging, in Canada and New Zealand.**
By Mr. F. SACHELL CLARKE, Vancouver, B.C.
6. **Notes on Coal Shaft Sinking.**
By Mr. JOHN JOHNSTONE, M.E., Port Hood, C.B.
7. **On the Performance of Coal Cutting Machines.**
By Mr. T. J. BROWN, M.E., Glace Bay, C.B.
8. **On Coal Shipping Piers.**
By Mr. HIRAM DONKIN, C.E., Glace Bay, C.B.
- 9 and 10. **On the Treatment of Auiferous Misspickel Ores.**
(a) By Mr. P. KIRKEGAARD, Deloro Ont.
(b) By Mr. SYDNEY B. WRIGHT, Deloro, Ont.
11. **On Natural Gas in Ontario.**
By Mr. EUGENE COSTE, M.E., Toronto, Ont.

12. **On Company Law.**
By Mr. J. M. CLARK, Q.C., LL.B., Toronto, Ont.
 13. **A Review of the Iron Industry in 1900.**
By GEO. E. DRUMMOND, Montreal.
 14. **Notes on Milling Practice at the Athabasca Mine.**
By Mr. E. NELSON FELL, Assoc. R.S.M., Nelson, B.C.
 15. **On the Iron Ore Deposits of Bilbao, Northern Spain.**
(Illustrated by Lantern Slides)
By Dr. Frank D. Adams, Montreal, Que.
 16. **Pioneer Work in the Crow's Nest Coal Areas.**
(Illustrated by Lantern Slides)
By Mr. WM. BLAKEMORE, M.E., Montreal, Que.
 17. **On the Iron Ore Fields of Ontario.**
By Prof. W. G. MILLAR, Kingston, Ont.
 18. **Notes on Nova Scotia Mining Legislation.**
By ALEXANDER MCNEILL, Barrister, Halifax, N.S.
 19. **On Coal, Coke and Gas as Domestic Fuels.**
By F. H. MASON, F.C.S., Halifax, N.S.
 20. **Rope Driven versus Direct Driven Colliery Ventilating Fans.**
By Mr. FRANCIS T. PEACOCK, Montreal, Que.
 21. **Comparative Methods of Assaying Nickeliferous Pyrrhotites.**
By Mr. J. WALTER WELLS, B.Sc., Belleville, Ont.
 22. **On Certain Fault Conditions in the Copper Mines of Butte, Montana.**
By Mr. WM. BRADEN, M.E., Bruce Mines, Ont.
 23. **The Chemistry of the Limestones of Eastern Ontario.**
By Dr. W. L. GOODWIN, Kingston, Ont.
 24. **On the Magnetic Iron Sands on the North Shore of the St. Lawrence.**
By Mr. J. OBALSKI, Inspector of Mines, Quebec.
 25. **On the Composition of Some Canadian Limestones:—**
(a) For Calcium Carbide,
(b) " Chemical Pulp,
(c) " Portland Cement.
By Dr. J. T. DONALD, M.A., Montreal, Que.
 26. **Up the Pitch versus Across the Pitch (Continued).**
By Mr. O. E. S. WHITESIDE, M.E., Anthracite, N.W.T.
 27. **On Leaching Copper Ores by Sulphurous Acid.**
By Mr. E. P. JENNINGS, M.E., Salt Lake City, Utah.
 28. **Subject not announced.**
By Mr. CHARLES FERGIE, M.E., Westville, N.S.
 29. **Subject not announced.**
By Mr. CHARLES BRENT, Rat Portage, Ont.
 30. **Subject not announced.**
By Mr. W. F. FERRIER, M.E., Rossland, B.C.
 31. **Notes on Laboratory Work at McGill.**
By Dr. J. BONSAILL PORTER, Montreal, Que.
 32. **The New Coking Plant at Sydney, C.B., with some Notes on the Coking Properties of Cape Breton Coals.**
By Mr. A. J. MOXHAM, Sydney, C.B.
 33. **On the Occurrence of Nickel in Arizona, U.S.A.**
By Dr. A. R. LEDOUX, New York, N.Y.
 34. **Subject not announced.**
By Mr. D. W. ROBB, Amherst, N.S.
 35. **Notes on the Coal Haulage Plant at Port Morien, C.B.**
By Mr. J. G. S. HUDSON, Port Morien, C.B.
 36. **Subject not announced.**
By Mr. R. G. MCCONNELL, Ottawa.
 37. **On the Sedimentary Formations of the Province of Ontario and Firing Operations carried on in them.**
By Dr. H. M. AMI, of the Geological Survey of Canada.
- STUDENTS COMPETITION
(Entries will be held open until opening Session of meeting.)
38. **The Coal Mines at Fernie, B.C.**
By Mr. C. V. CORLISS (McGill).
 39. **The Concentration of Silver Lead Ores at Gem, Idaho.**
By Mr. W. M. EDWARDS (McGill).
 40. **Notes on Crushing and Screening under varying conditions in the Crock Dressing Laboratories at McGill University.**
By Mr. W. G. FLINT (McGill).

MORE NICKEL INSANITY.

With the reassembling of Parliament and the opening of another session of the Ontario Legislature, the Hamilton coterie of charter mongers and speculators renew their mendacious importunities whereby they seek to destroy the great copper and nickel mining industries of Ontario. Their latest move may be seen from a glance at the following despatch:—

"TORONTO, Feb. 7.—The Hamilton Steel and Iron Company, the Nickel Steel Company, and the Canada Iron Furnace Company have addressed a memorial to the Ontario Government asking that a tax upon nickel ore and copper and nickel ore, provided for in the Mines Act, be imposed, and that the revenue thus collected be paid as a bonus upon pig iron and upon nickel-steel manufactured in Ontario. Such action would give an immense impetus to the manufacture of nickel, iron and nickel-steel in Ontario. It is also asked that Ontario be given a monopoly of the raw material, and that the Government convey no further lands containing nickel ores to individuals who will not refine nickel in Ontario."

The unblushing impudence of this proposition is realized when one reflects that these pap-fed enterprises, heavily protected by bonuses from the Dominion and Provincial Treasuries, and fattened by special exemptions as to taxation and municipal grants, do not, so far as we are aware, spend one single penny in mining in Ontario. The Hamilton Iron and Steel Company *imports* the great bulk of its iron from the United States, and the Canada Iron Furnace Company *buys* its ores from another company. Neither of them do any mining in Ontario. While we are confident that this proposal to exact a license tax on the copper and nickel mines of Ontario is wholly unconstitutional, and, if imposed, cannot be legally collected, it may not be out of place to recite briefly the views we have repeatedly expressed in these columns concerning this extremely foolish agitation.

That the copper and nickel mining industries of Ontario, which have assumed great proportions and now rank as the greatest metalliferous mining enterprises in Canada, have been built up without asking or receiving one single dollar from either the Dominion or Provincial Governments. Fifteen years ago when the members of the Canadian Copper Company pluckily invested their capital and commenced their pioneer work of development in the region, Sudbury was a barren and inhospitable wilderness. To-day, owing to mining, and entirely dependant upon it, it has grown to be a thriving and prosperous community having a population in excess of 6,000 people, well housed, having excellent churches and schools, a good electric lighting system, a well managed hospital, and a water works and drainage system equal to the demands of the people. 1500 persons, miners, mechanics, furnace men, laborers, teamsters, etc., find employment at the mines, and many more could be given work were they available. A further instance of the immense importance of this industry may be gathered from the heavy expenditures which are made by the mines in wages, for Canadian mining machinery, for supplies purchased from Ontario merchants, for Canadian coke, for freights on Canadian railways. One company alone has expended no less than \$2,774,000 for wages and nearly \$5,000,000 for machinery and supplies. Last year the wage bill of one of the companies amounted to \$521,000, and \$526,000 were distributed in machinery and supplies.

Legislation such as that proposed by the Mines Act would close up these mines.

That the impression created by those fostering this agitation that Ontario has a monopoly of the nickel, or a practical monopoly of the nickel supply of the world, or even of the American continent, is entirely false.

In support of this statement, we submit the following official figures of the quantities of nickel ore produced by New Caledonia and by Canada and the United States during the years 1889-1899:—

Year.	New Caledonia.		United States & Canada.	
	Metric Tons		Metric Tons	
1889	1,050		409	
1890	1,200		750	
1891	1,900		2,160	
1892	950		1,950	
1893	1,600		1,800	
1894	1,900		2,250	
1895	1,850		1,800	
1896	2,707		1,700	
1897	2,858		1,900	
1898	3,648		3,250	
1899	3,700		3,650	
	Total	23,363	Total	21,619

It will be observed that during these eleven years New Caledonia produced 23,363 tons of nickel, while Canada and the United States produced 21,619 tons. From 1889 to 1900 the price of nickel declined from 48½c. per pound to 27c. per pound in Europe.

The growth of the nickel mining industry of New Caledonia, and the grave importance its competition to Canadian nickel ores in the American market is assuming, may be judged from the fact that on the first of this month the steamer Menantic arrived at New York from Port Morie, New Caledonia, with a cargo of 3,602 tons of New Caledonian ore, and another steamer is expected from there with an equally large cargo about the 25th inst., both for the Orford Copper Company at Constable's Hook, New Jersey.

The proposed taxation, if collected, would force New York refiners to invest in New Caledonia nickel mines, while the Canadian producers of nickel, having no market in Canada, would be forced into bankruptcy.

That the tax contemplated by the Act is in excess of its entire value is clearly shown by the fact that according to the official report of the Bureau of Mines covering operations during the year 1898 there were 121,924 tons of nickel and copper ore smelted and 21,101 tons of matte produced. The value of this matte is quoted at \$782,300. Now the tax proposed is \$50 per ton of matte, which applied on 21,101 tons of matte would amount to \$1,055,150, *this being greater than the total value of the product by \$272,700*; and when it is considered that in addition to this there were paid in wages alone, according to the Mines Report, \$315,501 to say nothing of the expenditures in plant, supplies, and freights, it will be seen that the copper and nickel smelters of Ontario would be asked to pay in excess of \$588,201 out of their capital, or from whatever source they could obtain it, for the privilege of being permitted to carry on their business within the Province.

It is stated by these agitators that at present Canada is receiving less than 28 per cent. of the metal contents of the ore mined at Sudbury. This is wholly untrue. From authentic information in our possession, we can state that during 1900 there were produced in the Sudbury district alone 21,518 tons of copper nickel matte, and that in this production about \$1,050,000 were paid for Canadian labour and supplies, this being 72 per cent. of the selling price of these metals. Further, it is well known that important concentrating works are now being erected at Copper Cliff, whereby the matte will be increased from 85 to 90 per cent. of its market value. These important works are expected to be in operation by the 1st of May this year.

That only a small portion of the nickel mined in Canada is used in the production of nickel-steel. During the first six months of last year out of 3,102,064 lbs. refined only 626,487 lbs. were used in the manufacture of nickel-steel in the United States.

Notwithstanding much jingo talk and profuse contributions to the *Toronto Globe*, the experiments by the Hamilton people have utterly failed to show that they can refine nickel on a commercial scale either by the Hoepfner or Frasch processes.

The question as to refining in Ontario depends upon two matters: first, the present state of the art of metallurgy and the nature of the processes necessary to refine Ontario ore; second, the extent of the market which the producers would have for the refined nickel when produced in Ontario.

There are only three known successful processes: first, that of Mr. Wharton, of Camden, N.J. His process is very complicated and expensive, so much so that he was entirely unable to become any large purchaser of the matte from Canadian works as produced and offered to him without any tax thereon. Secondly, that of Dr. Ludwig Mond. In regard to this nothing more need be said than that Dr. Mond, who has acquired by the expenditure of a large amount of money very extensive properties in Ontario, is absolutely opposed to the imposition of any such tax, and states quite frankly that it would result in absolute ruin to his project, and would prevent his being able to operate his Canadian property at all and compel him to obtain his ores elsewhere, and this on account of the fact that the coal and the acid which he uses in his process are very much more cheaply obtained in England and in Wales than in Canada—a very important matter with him; and secondly, that a very large part of his product being in the form of copper sulphate, for which there is a very limited market in Canada, the freight on this product to England, it being very bulky, would reduce his profits practically to the vanishing point; so much so, that not foreseeing any legislation of such a character as this by the Province, Dr. Mond, before investing capital in the purchase of Ontario properties, was at very great pains to satisfy himself that no export duty would be imposed by the Dominion Government upon his copper-nickel matte, and has several times, in the most unqualified way, stated that “if he had thought there was the slightest danger of the imposition of an export duty, or of such legislation as that contained in the sections of the Mines Act referred to, he would not have invested a dollar in Canadian properties.” The tax proposed by the Ontario Government would be very much more restrictive and disastrous than any export duty at any time proposed or suggested on the part of the Dominion Government.

It must be further noted with regard to Dr. Mond's process, that so far as the copper is concerned the copper produced is not refined copper but copper sulphate. Therefore, he would not be able to obtain the benefit of section 10 of the Act, which would permit the Lieutenant-Governor-in-Council to remit the license fee. The matte at present produced has practically gone through all the processes which require the expenditure of a large amount of labor; in fact, over 85 per cent. of the total amount paid for labor under existing circumstances will be spent in Ontario. The refining to fine metal of all the ore, even if done within the Province, would give employment to less than 100 men.

The only other process in operation is that of the Orford Copper Company, which is in operation near New York. This process requires to its successful operation certain alkali chemicals which are obtained in the vicinity of its works as waste products from a certain chemical works there. Furthermore, this product requires repeated smelting (some six or eight times) with this alkali, which finally slags off all the copper and iron, leaving nickel combined with sulphur alone, from which the sulphur is then removed. In order that this process can be worked to commercial advantage it is necessary that the alkali referred to be obtained very cheaply, and large quantities of coal are required for the numerous smeltings. Both these products are very

much cheaper in New York than in Canada. The waste alkali referred to is not produced in Canada except as a refined production, and the price is absolutely prohibitive. The large quantities of coal obtained costs \$2 per ton in New York, and \$4.90 per ton at Sudbury; but even if the coal and alkali could be obtained as cheaply, there is, nevertheless, the further matter which alone renders it possible for the Orford Copper Co. to refine Canadian matte to advantage—that the Orford Co. at New York has a large refinery of pure copper ores from various sources, and it is enabled to distribute the copper slag which comes from the refining of the Sudbury matte among its other furnaces, and so very cheaply and economically save copper slag. The copper produced by the Orford Copper Company from Sudbury mattes is only about one-tenth of its entire output of copper.

COAL MINING AND TRADE.

In all the coal mining districts of Canada there is an amount of development work going forward far in excess of anything previously known during the winter months, and it will not be the fault of the operators if there is a scarcity of fuel next season. In British Columbia the coast mines are working full time with an increased staff, and will be prepared to ship a larger tonnage next season than ever before. At the Fernie Mines the Managing Director, Mr. Rogers, states that over 10,000 feet of development work have been done during the last year, and assures the public that within a very short time the demand will be fully met. It is to be hoped this is a true prediction, as hitherto there has been a difficulty throughout the Kootenays in obtaining as much coal from these mines as was required. At the present time the output is about 1100 tons per day from Coal Creek and 75 tons from Michel, but the latter mine is not turning out at all well as the coal contains a much higher percentage ash than that at Fernie, reaching as high as 15 per cent in the coke. Unless further development shows improved quality this opening may have to be abandoned, a course which has been adopted with all the openings hitherto made on this Creek some four or five in all. It is difficult to understand why the output has not by this time reached at least 3,000 tons a day. It is three years since operations were first commenced, and although naturally the difficulties of opening up during the first year, retarded production at its beginning, it is nearly two years since the output reached 700 tons a day, and a second and third year should have shown a gradually accelerated speed of development. In the interests of British Columbia smelters which are clamouring for coke, and West Kootenay consumers who are buying coal from Lethbridge it is to be hoped this state of things will soon be remedied.

The local press has several times taken up the question of the importation of alien labour at these mines, pointing out that it has not only had the effect of driving the Canadians from the town, but has been very disastrous for the trades people, and has worked against the interests of the community and the Province generally.

According to the latest report the Fernie mines now employ 40 per cent. of Poles, Slavs and Hungarians, and 10 per cent. of Dagos. Most of the former come from the lawless districts of Pennsylvania and are anything but desirable citizens. In point of education they are no better than the Chinamen, and as little able to comply with the requirements of the new Act, which makes it illegal to employ any miners who cannot read the Rules and Mines Regulation Act in English.

There is a further question of the safety of the workmen involved in the employment of this class of labour, and reports of accidents occasioned by their recklessness and ignorance are becoming common.

No doubt the labor question is a most difficult one, and in every coal mining district of Canada at present there is a great scarcity of suitable men, but in a case like the one under consideration, where the charter of the Coal Co. secures them a selling price which leaves such a large margin of profit they ought certainly to be able to offer such wages as would attract white labour. As was pointed out in the last issue of the REVIEW the Company's own experts estimated the cost of production at less than half the selling price fixed by the Government. This protection is one which no other mining company in Canada, or, so far as we know in the whole world, has ever received, and should certainly not have left it possible for any such abuse as the above to creep in.

In Eastern Canada all the coal mines are busily employed, so busily in fact that they have not yet been able to lie idle for the customary winter repairs to machinery and appliances. During the month of January the Dominion Coal Co. raised 170,000 tons of coal, a record breaker, and shipped 50,000 tons of this to the New England Gas and Coke Co. at Everett. All the other mines are busily employed in making up the deficiency which existed at the end of the ordinary season, and so scarce is coal in New Brunswick and Quebec that American bituminous coal is being freely sold at Montreal. It is laid down at \$4.65, including freight and duty, an exceedingly low price when we remember that it has to be brought from Pennsylvania. At the close of the shipping season the Dominion Coal Co. reduced their price, but the collieries upon the mainland are selling at the same figure as in November last. This has led to a little complaining and the suggestion has been made that the Government ought to fix a limit to the selling price. Possibly those who made this suggestion had in mind what had been done in British Columbia, but the conditions are totally different, and there is no doubt it would be as great a mistake to adopt such a course as it was in the first instance to interfere in the case of the Crow's Nest Pass Coal Co. No doubt in that case the course adopted was one which at the time commended itself to the judgment of the Government and they believed that they were protecting the best interests of the Province, but in the short period which has elapsed since this Legislation, it has been made abundantly evident that competition would have resulted in giving the coal at a very much lower figure. A critic of the proposal has not inaptly remarked that if the Government fix the price of coal they should fix the rate of wages and the amount of profit, which is equivalent to saying that they should consent to eliminate the business element from the coal trade. The fluctuations in the price of Canadian coal have in the past been very slight and but for the abnormal demand of 1900, would probably have ranged not more than 50 cts. higher than the standard. With the number of mines now being opened in the Maritime Provinces it is certain that this matter will find its level in a very short time. It is interesting to observe the rapidity with which operations are being carried on by the Inverness and Richmond Collieries Ltd. in Cape Breton. The deeps are in 800 feet and the quality of the coal is improving; the per centage of ash and sulphur being less than near the outcrop. It is understood that if explorations now being made show a continuance of the coal seams to the north the railway is likely to be extended from Broad Cove to Cheticamp and a summer port established there; of course the bulk of the coal will be shipped from Port Hastings. Development at Port Hood is proceeding apace and shipments will commence early next season. Meanwhile the only difficulty here as elsewhere is scarcity of labour.

Radical changes have already been made by the new management at the mines of the Acadia Coal Co. The Macgregor pit, which for some years has been worked at heavy cost has been abandoned,

and the miners turned into the slopes. This will reduce the cost per ton, but how the output of next season will be affected remains to be seen.

Boring operations are still proceeding by the aid of the Calyx drill, in the McVey coal areas, but it will be several months before the depth at which the Mullin's seam is expected to be found will be reached. A contemporary throws cold water on the project and suggests that the exploration is more a matter of academic interest than practical utility. If this surmise is correct the men who are supposed to be finding the money have developed a hitherto unsuspected streak of interest in "academic" subjects. So sound an authority as the late Richard Brown believed in the continuity of the Mullin's seam all through the back-lands and its probable identity with the Tracy. All the explorations of recent years tend to confirm this theory, and we believe it is not so much a matter of whether the Mullin's seam is there, as it is a question of quality and thickness. The only proof made in this seam of recent years was at Victoria in 1895, when 100 feet of heading was driven into it. The result was not altogether favourable, the coal being somewhat tender and carrying a high percentage of ash. As however the heading was driven in the outcrop and on the extreme limit of the seam towards Sydney Harbour, it could not be accepted as a fair criterion of the general character of the coal, and there is every reason to believe that at a depth of 250 feet to 300 feet in the neighbourhood of Cochrane Lake, a good, workable seam, quality equal to the Pbelan will be found. The important point as affecting its value depends upon whether the seam is split like the Tracy and divided by a band of shale, or whether it is one solid seam. If the seams are identical then the problem is how far from the MacLeod areas towards Sydney the split continues. There was no sign of it at Victoria, but south of that district nothing definite seems to be known. It is to be hoped the proof will be pushed to a conclusion, as it solves the problem of the existence of this seam not only under the back-lands but under all the Glace Bay areas of the Dominion Coal Co.

In conversation with Mr. Hiram Dunkin, the general manager, of the Dominion Coal Co., who was at Montreal during the month, we learned, that the large compressor plant supplied by Walker Bros, of Wigan, England, has been installed successfully at Dominion No. 4 colliery and is giving great satisfaction. This magnificent piece of machinery is greatly admired by the officials of the company and it is unquestionably one of the finest of the many large compressor plants which have been installed in Canada during the past year. Its size is: High pressure steam, 31 inch diam.; low pressure, 57 in.; high pressure air, 32 in.; low pressure 51, cylinder 5 ft. stroke, capacity 6,400 ft. of free air per minute at 80 lbs. pressure and 450 feet piston speed. The weight is about 150 gross tons. The fly wheel weighs 25 tons. These figures give an idea of the great size of this beautiful compressor.

The following are the returns of the output and foreign shipments of the Vancouver Island collieries for the past year, the total shipments for 1900 showing an increase of over 142,000 tons over those of the previous year.

Output of the New Vancouver Coal Co. for 1900:—

	Tons.
January.....	47,193
February.....	47,128
March.....	52,163
April.....	47,881
May.....	51,674
June.....	52,265
July.....	44,015
August.....	44,817
September.....	67,023
October.....	53,376
November.....	51,686
December.....	51,400
Total.....	530,031

FOREIGN SHIPMENTS.			
1900.	N. V. C. Co.	Dunsmuir.	
January	32,286	19,788	20,034
February	38,832	17,811	18,847
March	37,423	12,483	25,187
April	36,379	13,795	22,873
May	41,286	11,996	27,316
June	39,985	21,107	36,440
July	37,571	8,497	18,982
August	41,070	18,070	31,085
September	31,997	10,013	24,237
October	32,805	12,371	27,090
November	42,132	20,069	20,935
December	28,609	3,759	20,479
	440,375	169,759	293,755
		1899.	1900.
New V. C. Co.	463,109	440,375	
Wellington }	206,422	7,811	
Union } Dunsmuir Collieries	88,174	169,759	
Extension }	11,386	293,755	
Total	769,094	911,700	

W. B.

CORRESPONDENCE.

Railways and the Mineral Interest.—A Proposal for a Government Railway.

The Editor:—

A railway charter known to the people of the United States and Canada bears in some features a striking resemblance to the letters of marque issued in the days of good Queen Bess, differing however mainly in this that her privateers were never allowed privilege of piracy against the lives and fortunes of the English. We have changed all that. The railway promoter—or privateer let us say, for there is no distinction of character—with, for pilot, the cunning skill of a solicitor, gets from the legislatures franchises which authorize the taking from the public all that they will submit to for freights and tolls, and at the same time the privilege of exploiting municipalities for bonuses and the pockets of investors who are induced to buy bonds and preferred stocks. What are the results? Every industry suffers. The railway privateer passes on to Newport, Monte Carlo, or to “wintering in the Riviera.”

This portrait of the railway privateer is not overdrawn. Its counterpart figures not only in Canadian history but in English history. A recent writer on Railway Nationalization tells us that “the financial jobbery incident to the mid-century railway promotions, stands out as one of the blackest spots in modern English history. Notorious swindlers exploited the credulity of the public to amass great fortunes out of perfectly bogus schemes. Mr. Herbert Spencer has probably written no stronger attack upon any abuse, than his scathing indictment of this phase of railway history. And it is a common fact that the opposition of the House of Lords to the London and Birmingham Railway was bought off by the promoters, who bribed several prominent inmates of the gilded chamber. Thus an hostile vote was reversed within a few days. It is true that several of the most glaring of these promotion abuses have passed away, and with the growth of the railway construction, opportunities for their practice on a large scale have also been removed, but many still prevail.”

At length the railway privateer must give place to the General Manager, whose function is to get dividends from farmers, manufacturers, miners and the travelling public; to stoutly defend vested interests on the one hand against the laborer or mechanic who for running the machine asks a fair wage, on the other against the freighter who clamors that transportation rates shall be struck on some other principle than that they are “what the goods will bear.”

No industry suffers so much from the oppression of the railway systems of Canada as that of mining. The high rates at all points on

ores have never been favourable to the development of traffic, while the lack of terminal facilities for loading and unloading has added to the cost of transportation. Canadian railways have been proverbially slow, and have made their customers pay in proportion to the slow revolution of driving wheels. The usual rate of half-a-cent per ton per mile, with reductions for large quantities and great length of haul, has been utterly disregarded by railway managers, and instead one hears of one cent and a quarter to one cent and a half per ton per mile on iron ore between various points on Eastern Ontario railways. Without dump car for unloading or ore bins for loading facilities, these railways are not properly equipped for accommodating this traffic, and so, what with high freight rates and terminal charges, iron mining is a struggling industry. And yet there is no business which would pay the railways so well as this. Every dollar of freight from the mine ensures a large return business in goods for miners and mining supplies.

If Britons, reduced as Sir Alexander Milner reported by remediless grievances to the condition of helots and outlaws in an alien country were able to arouse the sympathies of Canadians to the highest pitch of popular indignation, surely it is surprising that the same sort of sympathy has not been shown in any influential degree against the scale of railway rates in this country. In a series of articles on “Government Ownership of Railways” in recent issues of *The Canadian Magazine*, Mr. R. L. Richardson, M. P., has shown that the need which exists for the radical reform of discriminating rates is so great as to call for Governmental interference. But, it may be asked, will any indictment however strong have any influence upon Parliament unless backed up by indignation meetings in every business centre and petitions from every hamlet in the Dominion? Certainly not.

Let us turn from the serfdom under the railway machine which prevails in Canada, and from the unwillingness of our legislatures to apply a remedy, to our sister Colony of New Zealand, where the Government owns 2090 miles of railway, 177 miles being owned by other corporations. The revenue earned for the year ending 1st August, 1899, was 3.29 per cent. on capital cost. One item of revenue alone lets in a “flood of light” on the management of a railway in a country where “the public welfare is the supreme law” in comparison with railway management here where private interests are paramount and the public welfare subordinate thereto. The secret history of express traffic in Canada since Mr. Brydges divided with his friends the enormous profits of a contract between the company known as the Canada Express Company, in which he was a secret partner, and the Grand Trunk Railway of which he was General Manager, down to this time when the Dominion Express Company enjoys the special patronage of the Canadian Pacific Railway Company for the private benefit of the fortunate ones who own its stock, would be best interpreted by an English law lord gifted like the late Lord Chief Justice Russell with the power of expressing moral distinctions in clear and concise English. The Canadian public whose traffic has been tolled beyond the ordinary railway charge, the amount necessary to give the owners of Express Stock enormous dividends, stand befooled in the eyes of New Zealanders, whose Government derives a largely increasing revenue from the carriage of parcels, concerning which the Minister of Railways remarks:—

“The new parcels scale of charges came into force on the 1st April, 1897, since which date nothing has been more encouraging than the remarkable increase in the parcels business, the increase in numbers for the past year being 58,379, and for the past two years, as compared with the two previous years, 175,029 in number and £14,470 in revenue. This indicates that a large and lucrative business may be cultivated in this direction, and at the same time the producer and consumer may be brought into more direct communication, to the benefit of each other.” And he announces that along with a reduction of 20

per cent. in rates on agricultural produce in general, and 40 per cent. on cheese and butter, "it is also intended to introduce a new and reduced scale of rates for small lots of goods of 28 lbs. weight and upwards, with a view to encouraging by means of low freights the forwarding of small lots of goods."

Not only is the traffic of New Zealand carried mainly on "light" railways, 556 miles having 40 lbs. track and 64 miles 30 lbs. track, but the conditions of traffic are as opposed as they can well be conceived to those economics of railway traffic which distinguish this country and by comparison give our railway systems incomparably greater advantages for revenue. The Hon. Mr. Cadman, in his report as Minister of Railways, thus concisely points out the conditions which render New Zealand railways "costly to maintain and difficult to administer in an economical manner":—

"In the first place, the long-distance-transit business in New Zealand is carried on by ocean vessels and the Union Steamship Company, the railways really acting as feeders for the vessels which load and discharge at the numerous ports all along our extensive seaboard. Unlike most other systems, there is no one centre in New Zealand upon which all the railways converge, and from which they can be easily and economically controlled. The New Zealand railways consist of numerous disconnected systems, costly to maintain and difficult to administer in an economical manner. Time will doubtless rectify this, and each island will eventually have its system of railways with unbroken connections throughout. No comparison can be made with the business and working results of our railways as compared with, for instance, the State railways of Victoria or New South Wales, each of which have one unbroken connected system, terminating in the one case at Melbourne and in the other at Sydney. Such systems command the business of distant places, thereby securing a lucrative revenue, a class of business, as I have before indicated, almost entirely carried on by sea in New Zealand."

The expansion of railway traffic plainly calls for expenditures for increased facilities respecting which the same Minister remarks:—"It cannot be expected that existing facilities can successfully cope with a business increasing in such a remarkable manner, and which expansion, in view of the energy of the people, the fortunate results following upon the cutting-up of large estates for closer settlement, the increased production of gold, and cheap money, is, as far as I can see, likely to continue for some time to come."

The success of light railways in New Zealand and in Norway and Sweden supports the claim that, for a large part of the region yet remaining in this country to be opened to settlement they are eminently suitable. Take for illustration a proposal to construct a narrow gauge line from Lake St. John under the northern slope of the height of land looking to St. James' Bay, thence to Prince Albert, N.W.T., and thence to the valley of the Mackenzie River and the most northern mission on its banks or to the Arctic Sea. What square leagues of forest, tracts of fertile land like that on Lake St. John, mineral zones, rich in gold, iron, petroleum, coal, and fisheries would afford homes to millions from Northern Europe whose energies would be a constant demand upon our manufacturers and merchants.

The Dominion Government might well undertake such a work, and at the same time enter upon a new path in prison reform by employing as railroad navvies some 1200 inmates of penitentiaries. The system of imprisonment for crime is radically wrong in the judgment of most penologists. The criminal is employed on works within prison into which no element of profit enters, or he is exploited for the benefit of some contractor and denied any wage for his labor. In both cases he is put outside of all industrial relations to the community, and dealt with on the very footing of a slave. On the other hand if given the opportunity to earn a home, and the while protected from strong drink,

the criminal who now returns to society only to be scorned and tempted to another fall, would become a useful citizen either as a farmer, a railway laborer, miner or fisherman. The work of penal colonies along the line of construction would probably advance the railway with sufficient rapidity. Before many years would pass Canada would have its own railway to the great icy sea, with probably a branch to the Yukon on the West and Chesterfield Inlet on the east, operated by a body of reformed men now condemned to the pernicious methods of the penitentiary system.

Who doubts that such a work, backed by a moral purpose, and carried out with efficiency and economy, would do more to prosperously colonize large numbers of the North European races in habitats suited to their thrift and industry, than any land jobbing schemes of the money-grubbers who now prey like harpies on the public domain and the labor of the poor?

J. B.

Kingston, Ont., 15th Feb., 1901.

A Simple and Convenient Instrument for Mine Surveys.

By FRANK ROBBINS, Mining Engineer, North Star Mines,
British Columbia.

[Paper to be read before the March meetings of the Canadian Mining Institute.]

The excellent paper of Dunbar Scott and the very thorough discussions of the same in the transactions of The American Institute of Mining Engineers for 1899 make it almost a work of supererogation to write anything upon the subject. However the title of that paper "The Evolution of Mine Surveying Instruments" seems to lead the subject up to "perfection" while the title of this paper indicates—at least I intend it to—a simplicity of construction tending rather to "Involution." It may be well to say however that no one more keenly appreciates accurate under-ground surveys and perfect mine plans than the writer; and none is more inclined to condemn loose and inexact work in this direction.

The experience of all of us no doubt—particularly in mine examinations—tends to show that many mines, especially those which are for sale or are in urgent need of examination, have no plans at all; and in cases where plans exist they are frequently found not posted up to date. It may be taken as an axiom that a perfect report can not be made without a plan, that is, of course, unless it be something that can be condemned at a glance and summed up with a terse "No good." This plan must be something to show where samples are taken; where pay shoots begin and where they end; the reference of one level to another and the hundred and one details which will occur to the engineer.

Let us assume an extreme case. A short option is held upon a mine or prospect, situated in a remote mining district of British Columbia, the mine is reached by a mountain trail from the nearest small settlement 25 miles away, it is 20 miles over a mountain road from the settlement to the nearest small town, from which it is 50 miles of staging to the railway. The clients in Montreal or Toronto have waited till the last minute before sending the engineer out—probably till the snows have set in—and they are now anxiously waiting for the report.

The mine is reached and it is found that the values are variable, lie in a rather flat vein, and consist of more or less irregular shoots or bodies, these have been opened up by several levels, all as crooked as a ram's horn, there are two or three faults, and the owners have no map of the workings. While the engineer is getting warm an Indian messenger comes in with a wire from Montreal or Toronto telling him that it is important that he hurry his report. A plan is essential, there is no time for an accurate survey with careful closing points. What is wanted is something more than a sketch and something less than the perfectly constructed plan of a colliery properly conducted. How often do

engineers stumble upon just such cases as this? In my practice I find that they are the rule. Perhaps not in British Columbia where the mine plans are kept up as carefully as the recollection of the catechism.

Some sort of a sketch plan may be prepared with the aid of a pocket compass. I have tried this with an old fashioned mahogany box compass held in my note book, the sides of the book being used as sights—the needle never settled—I have tried it with a prismatic compass; but my points were never certain. I have carried a heavy transit along on such trips, nursing it carefully, in case of emergency; almost invariably in such case to find the mine perfectly provided with plans.

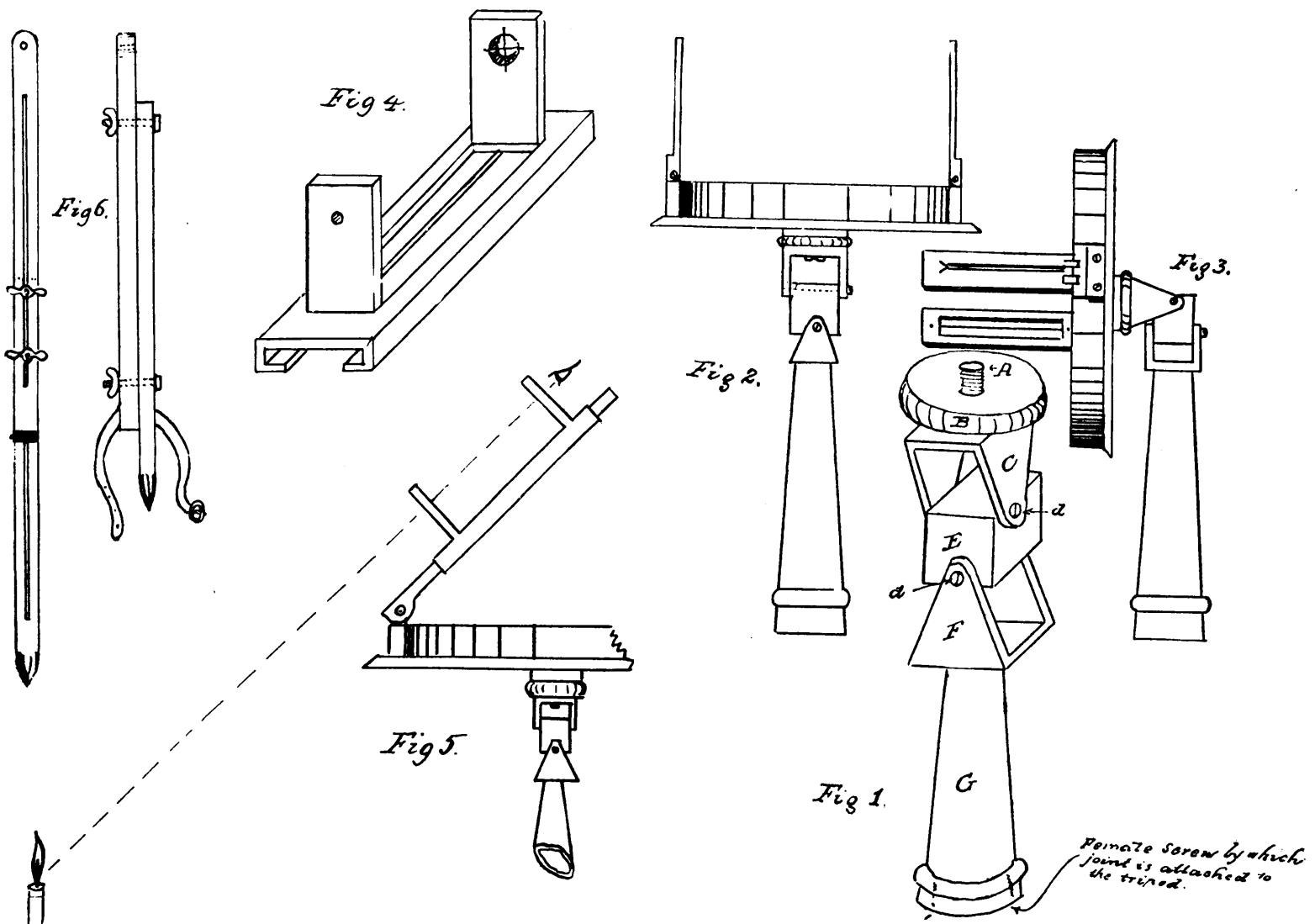
In the light of such experiences I hit upon the "simple and convenient instrument" which gives the title to this paper, with the aid of the accompanying cuts I will endeavour to describe it.

First I will assume that a compass which may be read to half a degree will come within the bounds of accuracy required. That, when local attraction is manifest, back and fore sights will be taken at every station and the included angle between them read, after the "old country" fashion of "blind dialing." Where attraction does not exist the instrument to be set up at alternate stations, only, and the middle station established by fore and back sights as in the ordinary compass practice. That the bottom plate of the dial have a semi-circle divided thereon, and graduated both ways from the E or W point from O to 90 degrees, with a pendulum indicator suspended from the centre pin traversing this semi-circle by which angles of elevation and depression may be taken when the dial is set in a vertical plane.

Many years ago I came into the possession of a pocket compass, made by Gurley of Troy, N.Y., this consisted of a flat square plate about 5 inches square upon which was set a compass dial with the

above pendulum attachment for vertical readings, this compass was provided with two folding sights. It was a good pocket compass. By laying the edge of the square plate upon a wall or upon a ladder I could read slope angles. By levelling it upon a few rocks and lying down upon my stomach in a wet drift I could get a bearing through the two sights with a fair degree of accuracy. By holding it in my hands and averaging the run of the needle through its oscillations I could also usually guess a bearing somewhere within 5 degrees. It struck me that this instrument was susceptible of improvement and that a light tripod to which the compass could be attached would prove a convenience. The tripod was easy enough, the attachment however had to be considered. The ordinary ball and socket joint was the first suggestion; but while this would admit of reading the needle to perfection it would not admit of the taking of readings in the vertical—a *sine qua non* in all mining instruments, I take it. I happened about this time to run across in an old book of mechanical movements the cut of an universal joint—*Goyjol's Joint*, it was called, if my memory serves me—which I thought would do. This consisted of a square block of metal with a bended plate on top and another underneath, these plates being attached to the block by screws running through the latter, one above the centre and one below it and at right angles to each other, thus admitting of the plate "C" passing through a semi-circular arc at right angles to the axis of the upper screw "d". The block "E" has also a range of movement in arc at right angles to that of "C" and around its pivot, the lower screw "d". I made such a joint of wood and sheet brass and saw that that it would answer the purpose. I sent this pattern to John Roach—the old instrument maker of San Francisco—who made for me the joint shown in Fig. 1.

A disc is centered and braced to the bottom of the compass; into



this disc a female screw is tapped. "A" shows a male screw corresponding to this and by which the compass and milled headed disc "B" are attached to each other. "B" is attached but not fixed to the bent plate "C" by means of another screw passing through a hole in "C", and threaded into "B". Thus "B" with the compass attached may be turned in any direction upon the surface of "C". See Fig. 2.

The bent plate "C" is attached to the block "E" by screw "d" passing through "E" but not fixed to it. The tension of the screw is sufficient to hold "C" in any position of its range of movement. The bent plate "F" is attached to the block "E" in the same way and "E" has a range of movement at right angles to that of "C". The bent plate "F" is fixed to the hollow spindle "G" which is screwed to the solid spindle of a simple tripod. It will be evident from Figs. 2 and 3 that not only can the instrument be leveled for horizontal observation; but it can also be turned into a truly vertical plane for dip readings with its pendulum clinometer.

In the position shown in Fig. 3 it is evident that an off-set (equal to the distance from the point of sight—usually taken at the end of the sights near the compass box—to the center of the top of the block "E") is made between the positions of the instrument in horizontal and vertical sights. The compass center being coincident with the center of block "E" when the instrument is set for horizontal reading. Correction may be made for this off-set, practically the same as for transits with parallel telescopes; but the error is so small that, with the limitations of the instrument, it may be disregarded.

With the above described joint and a light tripod it will be seen that I now had an instrument which was stable and by which I could take angles of elevation and depression and also horizontal ones within the range of sight possible between the top and bottom of the two folding sights, in fact in this last respect having the same range of service as the land surveyor's plain compass. But as bearings have to be taken down steep inclines something further was necessary. This was hit upon in the expedient shown in Fig. 4 and consists of a pair of sights with a peep hole in one and a round opening with cross-hairs in the other; the construction of this admits of sliding it either way upon either of the folding sights of the compass—usually over the open or fore sight.

With this attachment in place it is possible by raising or lowering the folding sight to which it is attached to look down any depression or up any elevation.

Fig. 5 shows the application of this attachment to a sight down an incline.

In practice it is usual to take the bearing of the incline first and to establish the point, if under-ground, by a candle; the instrument is then turned over as in Fig. 3 and the angle of dip taken to the same candle, and this recorded, with, or without, the correction for the difference between the centers of the instrument in the two positions.

When the instrument is in use the slide sight is usually left attached to it, when not, it is detached and dropped into the pocket. In fact the whole instrument—with exception of the tripod, and even that with the legs off, can easily be accommodated in an ordinary coat pocket.

Knocking about in out of the way places and packing one's belongings on horse or mule back every ounce counts and every cubic inch becomes an encumbrance, hence a tripod between four and five feet in length does not add to the comfort of a trip. As the legs of the one for this little compass were light they could be easily replaced; so I took to leaving them behind, depending upon the country and a jack-knife to furnish a new set, but, sometimes, "hitting the high places" straight sticks were not easily obtainable and I came to the conclusion that some kind of light extension tripod was a thing to be desired. A mine carpenter and a mine blacksmith between them constructed the device shown in Fig. 6 and it has proved a useful tool ever since and

has never been obtrusive in the pack. It is not material whether the lower part of a tripod leg slides into the upper, as is usual, or lies along side as it does in this.

The construction is as follows: A strip of hard wood about an inch wide (depending upon the sockets of the tripod head) and an inch and a half deep, a trifle shorter than the ordinary tripod leg, is cut in two. Each half is then ripped through the major part of its length, say to within three inches of each end; the slit is enlarged to about $\frac{3}{16}$ of an inch, it is on the deep side and as accurately as possible in the middle of this. The two pieces are of equal rectangular section, that is they do not taper, except the lower one which at the end is trimmed to a point and tipped with iron. Two brass screws with square heads and thumb-screws are fitted to each pair of pieces. These screws couple each pair together through the long slot and by means of them the tripod legs can be extended to their full length for use or reduced to the length of a roll of blankets.

I have had the simple instrument above described in use now for a good many years and it is still in perfect condition. The attachment of the bent plates C and "F" to the block E by the screws d appear to be the only weak point; but these parts have not worked loose and the screws have always preserved the necessary tension to keep the surfaces in sufficiently close contact for the purpose required.

The only improvement which suggests itself is that a larger compass could be substituted for the small one I use and that it have levels which mine has not. Such an instrument as Gurley describes as a "pocket Vernier compass with $3\frac{1}{2}$ inch needle" would be admirable if the pendulum clinometer were added to it.

With such an instrument as this in such a case as I have cited the traverse could be run and the notes platted and the examination probably finished in less time than it would take to send word to the railway that a transit was needed; and for the purposes of the examination and report the plan would be quite as good as one made to minutes by a careful man with a high class mining transit.

Notes on the Magnetic Iron Sand of the North Shore of the St. Lawrence.

By J. OBALSKI, M.E., QUEBEC.

[Paper to be read before the March meetings of the Canadian Mining Institute]

Those deposits have always been known, and forty years ago they called largely the attention of business men as being a source of iron ore of the best quality and of the highest grade.

In 1867, a company called the "Moisic Iron Co." was organized in Montreal; the president was Mr. W. M. Molson, and amongst the directors there were the Hon. L. Letellier, Hon. R. Laflamme, and L. Labreche Viger, M.P. This company bought large tracks of land in the vicinity of Moisic, built on the spot eight bloomary furnaces, using the magnetic sand as ore, and charcoal as fuel. The product of these furnaces was sent to the United States, or used in Montreal at a rolling mill controlled by the company.

Nevertheless, the chief market was in the States, where the product of the furnaces was shipped, submitted to the duty of pig iron, say, 7 per cent. per ton.

In March, 1875, under the protest of the American iron workers, it was declared subject to the duty on bar iron, say $1\frac{1}{2}$ cents per lb., or 34.80 per cent. per ton, which compelled the company to shut down the work, and to go into liquidation, owing to the absence at that time of a sufficient Canadian market.

In August, 1868, when Dr. Sterry Hunt visited Moisic, out of the eight furnaces built, there were four in operation, giving a total of three tons of iron for 24 hours with 12 men, using 1400 bushels of charcoal, say 466 bushels per ton of iron.

The concentration of the ore was then made by Dr. H. Larue's process, consisting in magnets under which an endless table passes with the sand on it. The magnetic portion was attracted, but there was a fine clothing under the magnet, and by moving it down, the iron sand was put loose and dropped in an adapted receiver. It is said that one ton of pure ore was obtained, out of 2 or 3 of sand per day for each machine.

Several process have since then been suggested for agglomerating the magnetic sand, and in the elaborated report of Dr. T. Sterry Hunt, published in 1866-1869, vol. of the Geological Survey, and in which I have largely taken information for this paper, I remark the name of Mr. R. G. Leckie as the patentee of a process for using that sand properly reduced in connection with the manufacturing of steel by the Marin-Semmens process.

Mr. Labrecque Viger was also the inventor of a process to manufacture directly steel from that ore.

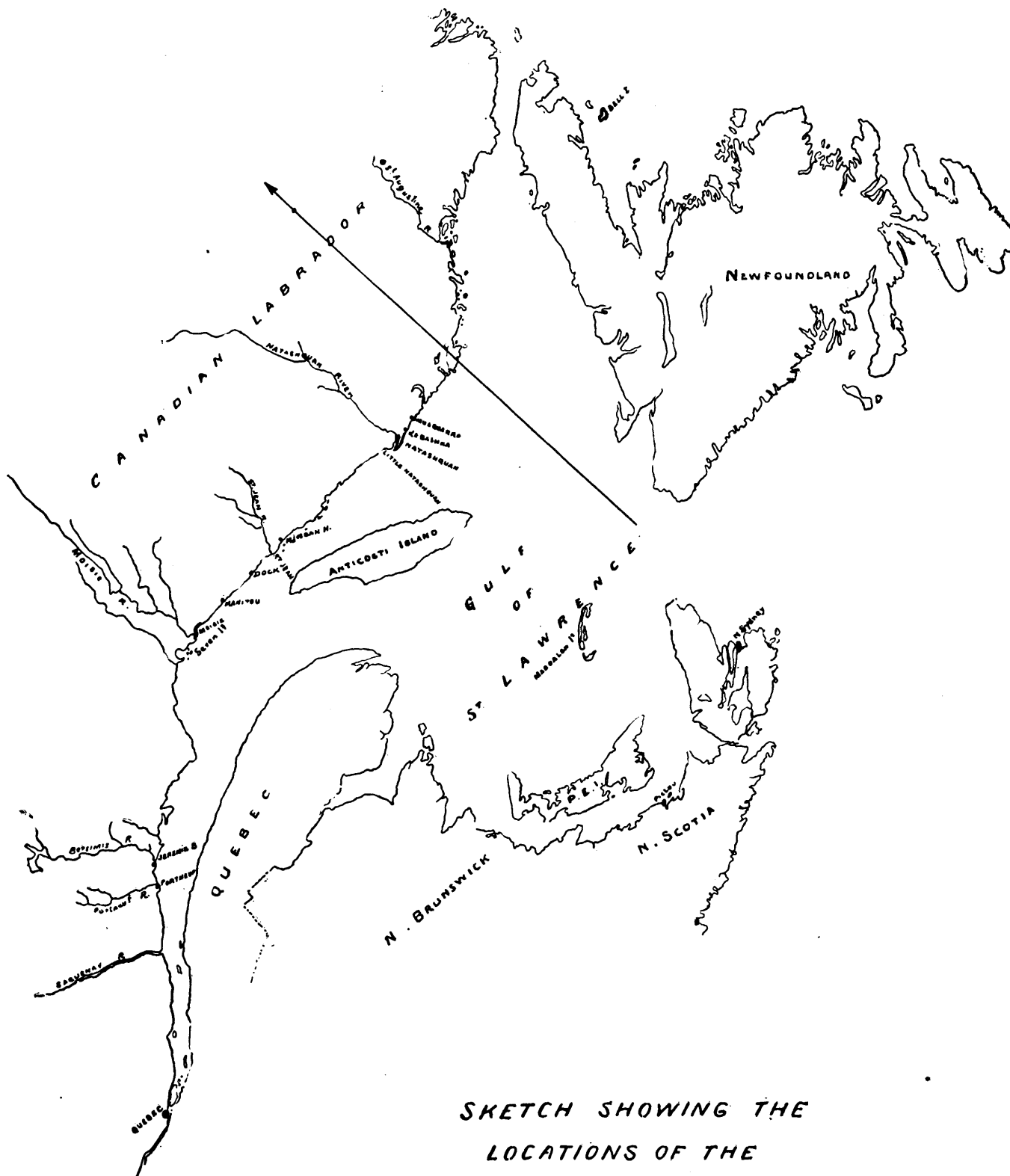
But since the abandonment of this industry, no other attempt has been made, and that immense quantity of iron ore is still there, waiting for the skill and energy of some enterprising concern to be utilized.

A company, called "the Natashquan Magnetic Iron Co." shipped from that place some quantity to England, for trial. I heard that the ore was successfully smelted then, but no practical result was obtained, probably on account of the difficulty of shipment.

Now, after that little historical sketch, I come to the study of the deposits themselves.

I copy again the following analysis from the report of Dr. Sterry Hunt (Geological Survey 1866-1869).

The black sand contains grains of quartz, garnets, and other hard



SKETCH SHOWING THE LOCATIONS OF THE BLACK SAND DEPOSITS

SCALE : 100 MILES TO AN INCH.

minerals, besides of magnetite and titanite iron. I never found a trace of gold, although it is claimed that there is some.

	MOISIC.			BETSIAMITS.		MINGAN.	
	1	2	3	4	5	6	7
Protoxide of Iron.....	70.10		56.38		24.66		46.31
Peroxide of Iron.....	"	92.68	"	92.44	"	86.92	"
		"	"	"	22.24	"	"
Titanic Acid.....	16.00	4.15	28.95	3.40	26.95	6.50	31.60
Oxide of Manganese..	"	0.40	1.10	undeterm.	1.10	0.52	1.35
Lime.....	"	0.90	0.95	traces	1.12	0.75	1.06
Magnesia.....	"	"	"	"	0.72	0.70	0.50
Insoluble.....	5.92	1.95	8.75	3.85	23.80	4.20	15.50
	92.02	100.08	96.13	99.67	100.59	99.59	96.32
Metallic Iron.....	55.23	66.73	43.85	66.56	34.94	65.58	36.00

Analysis No. 1 was that of the raw sand, 2, 4 and 6, of the magnetic portions, and 3, 5 and 7, of the non-magnetic.

It will be remarked that all the iron is indicated in the state of protoxide in the analysis of the raw ore or of the non-magnetic portion, on account of the difficulty of determining the degree of oxydation of the iron in the titanite mineral, which explains why the totals of the analysis are so much below 100.

The two next analysis were made in Belgium, in the laboratories of metallurgical companies:

Protoxide of Iron.....	28.04
Peroxide of Iron.....	71.07
Sulphur and Phosphorus.....	00.00
Equivalent to metallic iron.....	70.56
—	
Oxide (magnetic).....	91.719
Insoluble silicates.....	1.082
Alumina.....	3.340
Lime.....	2.750
Magnesia.....	0.389
Sulphur.....	0.099
Phosphorus.....	traces
	99.379
Metallic Iron.....	71.337
Phosphorus.....	traces
Sulphur.....	0.039

Analysis of Moistic pure sand, by Professor Stillman, of Stevens Institute, Hoboken, N.J.:

Oxide of Iron.....	96.67
Phosphorus.....	0.03
Sulphur.....	traces
Manganese.....	0.33
Titanium.....	0.00
Insoluble matter (silicate of Alumina).....	2.88
Undetermined.....	0.09
	100.00

Equivalent to 70.01 of metallic Iron.

ANALYSIS OF NATASHQUAN ORE.

	1	2
Metallic Iron.....	70.31	71.94
Silica.....	.68	.22
Sulphur.....	.014	.026
Phosphorus.....	.043	.030
Titanium.....	.370	.420
3		
Metallic Iron.....	69.780	69.68
Phosphorus.....	.015	.005
Sulphur.....	.011	.021
Titanium.....	.860	.000
Silica.....	.321	

Those analysis made recently have been communicated by Mr. R. T. Hopper from concentrated ore obtained with a special machine of which he has the control. They show that he practically got rid of

the titanium. Mr. Hopper has made important prospects and experiments on the black sand, specially on the ore of Natashquan.

By 1865, there were many applications for land on the Coast, and the Quebec Government had a few townships partly surveyed, and many lots sold for mining purposes.

Since that time, there was nothing done, but for a couple of years, some prospects have been made, and we have received many inquiries regarding the black sand. Eighteen months ago, I made a personal visit to the Coast, from Sheldrake to Natashquan, with the result that I was very favorably impressed by the magnitude of those deposits. It must be remarked that the sand does not occur all along the coast, but only in several places, the most important being Natashquan, Moistic and St. Jean.

I have not visited the Moistic deposit, but from several reports I have in hands, I understand that the quantity of black sand is large, and extends for quite a distance east of Moistic river. The nearest harbor is the Seven Islands bay, 16 miles from Moistic.

I give below my impression on the deposit I personally visited.

The beach sand has been produced by the disaggregation of ferruginous rocks of the Laurentian formation including anorthosites, against which the sea has broken during geological periods of indetermined length, and the matter so produced has been subjected to a natural concentration slightly different from that which occurs in an ordinary stream. The waves lift both the heavy and the light elements, but when they recede, they carry away chiefly the light elements, leaving the heavy ones on the beach; this operation repeated a great many times, causes deposits of greater or less thickness according to the strength of the waves. The wind also produces its effect by covering up the heavy deposits with layers of lighter sand. All these facts may be ascertained when a hole is dug in the beach, and the different layers of varying thicknesses and with varying percentages of metal are examined. Nevertheless, these deposits are chiefly observed about the low points, denuded of rocks, and their number is limited. It is very probable that the sea level has been lowered, and that, as the same phenomena occurred formerly, similar deposits may be found in the low-lying spots at a certain distance from the present sea-shore. This fact seems to have been ascertained by explorers and surveyors, and in the reports of the Department of Crown Lands and of Mines for 1899, a few facts are recorded regarding this point.

Dock Bay.—Immediately above the fishing station known as "Dock Bay," between Thunder and Jupitagan rivers, a little black sand is found in the bay, on a length of 500 feet and a width of 30 feet. On a point where the shore has been eaten away by the sea, there is a thickness of 10 inches surmounted by 5 inches of yellow ochre.

St. John River.—This deposit extends from the mouth of that river for a distance of 6 miles to the North East, but the greatest development is in sight at Pointe Noire, 4 miles from the river St. John. The black sand is visible on the surface in beds more or less rich, with a thickness varying from 2 or 3 inches to 10 inches. I measured the beach from low water mark to 100 and 300 feet where there is an intricate growth of small spruce trees making it difficult to see anything; but this soil may also contain ore. The river St. John can be entered only at high water and by small schooners.

From Pointe Noire to Mingan river, the shore is flat and the sand is also mixed with black sand. I did not find a great abundance of it, but as the action of the sea alters the look of those beaches, according as the black sand is more or less on the surface, it is possible that there may be enough to work at or at least that by prospecting a little inland, it may be found in greater quantities.

The nearest deep water harbor is Mingan, but the river St. John could be used for loading small schooners or barges which could be towed to Mingan (12 miles), for supplying large vessels.

Continuing along the coast, I found but little black sand, the shore being generally rocky. At Esquimaux Point, the beach is sandy, but I did not find it in workable quantities.

Great Natashquan River.—From the mouth of the river towards the East, for a distance estimated at 20 miles, there is in sight between the low water mark and the timbered ground, a stripe of sand formed by the flat beach from 100 to 400 feet wide, and of dunes ranging from 5 to 50 feet in height, and extending backwards 600 feet from low water mark. The black sand is distributed all through that area in alternate layers of varying thickness, going from 1 inch to 2 feet with a practical yield of black sand from 20 to 95 per cent.

I have measured sections of the dunes which for 15 and 20 feet in height would give from 40 to 60 per cent. of black sand as an average. It can be seen also on the East shore of the Natashquan river itself.

It is said that it continues as far as Kaghaska river and is found in this bay and the Musquarro.

The average proportion of black sand may be considered as 40 per cent., the quantity of pure magnetic iron being 25 per cent., containing from 68 to 70 per cent. of magnetic iron. I will remember that the theoretical yield of this ore is 71.78 per cent.

Now, if we take an average depth of 20 feet, a width of 600 feet only, we will have, for each mile, over 1½ million of tons of pure ore of 68 to 70 per cent. of iron, taking 300 lbs. as the weight of a cubic foot of such ore.

The tonnage is considerably larger, as we take only 600 feet of beach to the line of trees.

This beach, as well as the others I have seen, is exposed to the sea, and there is no harbor in the immediate vicinity, the nearest being that of Little Natashquan, 4 miles to the west of Great Natashquan. This harbor is well protected, and could easily be made accessible to vessels of heavy burthen. It is surrounded by granitic hills and protected towards the sea by islets of the same rock.

On the Great Natashquan, 12 miles from the sea, is the first fall, 30 or 40 feet high, which could supply the motive power for large mills, and it is followed by three other falls separated by intervals of from two to three miles.

According to the above, the beach deposits are generally in sight (or several miles on low shores exposed to the open sea and without harbors or shelter. Large vessels loading ore there would have to anchor at a rather considerable distance from the shore, and special flat-bottomed lighters of somewhat small dimensions would be required to convey the ore in sacks to the large vessels which would hardly be practicable. In the two principal instances where I made an inspection, I consider that it would be completely impracticable to ship the ore direct by sea from the spot whence it would be obtained. It would thus be necessary to seek for the nearest harbors, to have the sand concentrated and purified on the spot and the merchantable product conveyed by tramways to the point of shipment.

It will therefore be seen that the working of these deposits must be done on a large scale, and that it would require considerable capital for the manipulation of large quantities by mechanical process and for purifying and conveying the product to suitable harbors.

The working of the sand should be done by means of steam shovels feeding cylindrical driers, whence the ore would be taken to electro-magnetic separators, several systems whereof have been patented. When separated, the magnetic oxide would be loaded in small cars which, by means of tramways would convey the ore to the wharf where it would at once be loaded on the vessels or be kept in elevators. The motive power could be supplied by the water-power in these regions, and the fuel would consist of fire-wood cut in the neighborhood, or of Nova Scotia coal which could be landed there for \$3 a ton at the most.

The season of working would extend from May to October, say six months.

Sufficient ordinary labor could be obtained there cheap, and moreover, the manipulation of the sand should, as far as possible, be effected by mechanical means.

As for the use of that ore, I think that the Iron and Steel Works at Sydney, C.B., could use part of it as a mixture, the distance from the deposit to Sydney harbor being between 3 and 400 miles, and the coaling steamers returning from Quebec could take it as a backward freight to Nova Scotia. The distance from Natashquan to Quebec is about 500 miles, and from Moistic, 300.

The three principal deposits on the North Shore are in the vicinity and to the east of the Moistic, St. John and Great Natashquan rivers, but there are also less important ones at Portneuf, at Jeremie Bay (west of Betsiamis river), at Manitou River, at Dock Bay and in the bays of Kaghaska and Musquarro.

It is also reported that thin layers of black sand on the North West arm of St. Augustin river for a distance of 30 miles.

Notes on Gold Milling Practice at the Athabasca Mine, Nelson, B.C.

By E. NELSON FELL, A.R.S.M., Nelson, B.C.

[Paper to be read before the March meetings of The Canadian Mining Institute.]

The following notes may prove of interest, not on account of any especial features introduced into our process, but on account of the peculiar character of the ore treated. A casual inspection of the ore on the floor of the breaker room would create the impression that the ore is not suitable for milling at all. The general features are a hard blueish quartz, containing a large proportion of sulphides of zinc, lead and iron, showing free gold only when the ore is of fair grade, say from \$30.00 per ton upwards in gold values; and then usually closely associated with the lead and zinc sulphides. At times the entire ore body consists of solid sulphides, usually under these circumstances of either iron or zinc. We are not in the habit of making regular analyses of the ore, but in December we took a sample from the ore pulps of the mill runs of December 2nd to December 15th inclusive. The ore at this period was what we call medium to low grade, and its contents were as follows:—

Gold.....	1.35 ounces to the ton.
Silver.....	45 " "
Zinc.....	2.20 per cent.
Lead.....	1.60 "
Iron.....	10.70 "
Sulphur.....	6.00 "
Silica.....	68.80 "
Lime (Ca O).....	1.90 "
Alumina (Al ₂ O ₃).....	6.00 "

In general the ore may be described as high grade, as the average gold contents recovered in the mill, during last year, was over one and one-half ounces per ton and during the month of June reached very nearly three ounces per ton. A peculiar feature of the ore, and one which no doubt materially assists recovery in the mill is the free gold which is found imbedded in the zinc and lead sulphides, in samples where no sign of quartz is visible. I have before me a remarkable sample of fine grained galena, one inch high, ¾ inch broad and ½ inch thick, which is pierced by a wedge of gold, shaped like an Indian arrow head, ¾ inch long, ⅜ inch broad at the base and tapering to a point at the other end. The mill contains ten stamps, working in two batteries of five stamps each. The frame is of the front knee type. The battery posts are 12 x 25½ inches, the knee frames are 12 x 17 inches and the girts are 12 x 13½ inches. The whole is bolted together in the usual way and these dimensions seem to secure perfect

solidity. The cam shaft is of steel, $5\frac{3}{4}$ inches in diameter, fitted for Blanton cams. Ours are arranged in the order of drop 1, 3, 5, 2, 4, and while this plan does not seem suitable to our case, we are unable to experiment with any other style without a new cam shaft. I think it would be an improvement if, in sending out these shafts, the manufacturers should drill them for the wedges, so that the order of drop could be changed. We find that the pulp banks up around No. 1 stamp and this both impedes the action of this stamp and interferes with the amalgamation in this end of the mortar. With a view to overcoming this difficulty our practice is to give the end stamp about one-half inch more drop than the middle stamps. The cam shaft works in open boxes, a system which we have proved to be thoroughly satisfactory. The guides are individual guides of maple with the grain of the wood up and down. Each guide block is held together by two $\frac{3}{8}$ inch bolts running across the grain of the wood, with head and nut countersunk. Each pair of guides is held in place by two $\frac{7}{8}$ inch bolts running through the guide rail. A hard wood wedge is driven home between each end pair of guides and the battery posts, and secured by a bolt. These guides give excellent service, if care is taken to have the guide blocks thoroughly seasoned before fitting; the cost of renewal is very slight, and they have the inherent advantage of all sectional guides.

The cams and tappets are of steel; the latter are fitted with three keys; after 24 months wear we have not yet had occasion to turn one tappet, and the cams show no sign of wear; they work smoothly and consume practically no grease.

The stems are of steel and we have not yet, after twenty-six months use, had occasion to even turn one of these, which is eloquent testimony in favor of our style of guides. The bosses or heads are of cast iron, and the shoes and dies are of forged steel. We have tried various much recommended special compounds and have found none so satisfactory as the forged steel. They last longer, wear more evenly and can be safely used, if desired, down to a feather edge.

The stamp when new weighs 980 lbs. and the speed varies from 80 to 115 blows per minute according to the requirements of the time, with a drop of from five to eight inches.

Under these conditions the mill has made a good running record. We stop on the first day of each month to clean up the amalgam in the mortars, lace belts and so forth, which stoppages aggregated last year, eight days and seventeen hours, besides these delays we lost four days and twenty hours. Our motive power is entirely water; working under a head of 398 feet. We employ two impact wheels, one being a motor two feet in diameter, which operates the stamps, the rock breaker, the electric light plant and the cyanide plant, and the other being a twelve inch motor which operates the vanners only, and of which the speed is never changed.

The mortars were supplied by Messrs. Fraser & Chalmers and are described in their list as No. 50. The width of the mortar at the point of discharge is $14\frac{1}{2}$ inches. The height from the top of the die (when new) to the bottom of the screen discharge is $6\frac{1}{2}$ inches and the die is $6\frac{1}{2}$ inches deep; when the die is worn out, the height of the discharge is as much as 11 or $11\frac{1}{2}$ inches.

The screens are of the diagonal slot pattern, and our practice is to employ a 50-mesh screen when the dies are new, a 40-mesh screen after 30 days wear and a 30-mesh screen when the dies are wearing low. It is evident that a mortar arranged on these lines is not designed to attain high records of crushing, and the greatest tonnage which we have put through, was during the month of January, 1899, when we crushed 713 tons in 30 days, 7 hours, or $2\frac{1}{2}$ tons per stamp per day. The pulp after passing over the plates is sized in a cone sizer and passes in grades of size to four Frue vanners; the first or coarsest grade passing over a four foot corrugated belt and the other three grades passing over six foot plain belts. The tailings from the vanners have, up to the

present time, received no further treatment, but from this time forward will be treated in the cyanide plant.

Copper Plates.—These are arranged as follows:—

1 Back plate inside the mortar.....	10½ in. x 51½ in.
1 Chock block plate inside the mortar.	3¾ in. x 50 in.
1 Lip plate outside the mortar.....	8 in. x 54 in.
1 Apron plate outside do	56 in. x 120 in.

All are electroplated with $1\frac{1}{2}$ ounces silver to the foot. The apron plate has a fall of $1\frac{1}{2}$ inches to the foot and just sufficient water is kept flowing over it to keep the pulp from banking on the plate.

The practice is to dress the apron and the lip plates five times in each twenty-four hours, using as a cleansing solution a warm solution of dilute cyanide and sulphuric acid, the plates are brushed up with a hair scrubbing brush and smoothed off with whisk brooms, brushed across the plates. Fresh quick-silver is applied before the brushing process in quantity as may be necessary. In this way the plates are preserved beautifully soft and clean. The amalgam is removed every two days from the apron plates, a small piece of rubber being used as a scraper for this purpose. Every sixth day the screens are removed, the lip plates are cleaned of amalgam, and all of the trash and chips are cleaned out of the mortars; but the chock block plate, and the back plate inside the mortar, are only removed and cleaned at the general clean up on the first day of each month.

The amalgam is cleaned with fresh quick-silver and squeezed as dry as possible. In this condition the amalgam from the plates outside the mortars contains about 20 per cent. bullion and the amalgam from the plates inside the mortars from 30 to 45 per cent. bullion.

Assays.—At least four assays are made daily:—

1. Of the ore at the feeders.
2. Of the pulp as it leaves the last plate.
3. Of the tailings.
4. Of the concentrates.

The sample taken at the feeders cannot be considered a satisfactory sample, but averaged over a period of several days, the results are fairly good. For the year 1900:

The average of the feeder samples was	\$44.38
do do tailings do	\$8.71
The theoretical recovery was	\$35.67
The actual do do	\$33.66

Recovery.—The theory under which we have been working is that the gold should be given as early and as ample an opportunity as possible to amalgamate, and for this reason we have held to the use of as large plates inside the mortars as possible. For this reason, and in order to preserve the back plate intact, we do not alter the height of the chock block which carries the front inside plate, and in this way the level of discharge is always the same. In this way, there is very little tendency to scour the plates, excepting (to a limited extent) around stamp No. 1 where the pulp is banked up by the action of the stamps; and the change of screens, as aforesaid, offsets the increasing height of discharge which is produced by the wear of the dies. After the run of the month of June, we cleaned off the plates inside the mortars, 3,183 ounces of amalgam, which produced about 925 ounces of bullion or 64 per cent. of all the bullion recovered. During this month our percentage of recovery was 81 per cent. of the value of the ore. My opinion is, that our loss consists, almost entirely, in the sulphides; and that our loss in amalgamable gold is slight. From June until the end of the year, our percentage of recovery steadily fell to 77.6 per cent. in November, corresponding with the proportion of bullion and concentrates recovered.

Month.	Total amount recovered.	Percentage by value of Concentrates to Bullion.
June.....	81.0 p.c.	21.5 p.c.
July.....	80.7	24.0
August.....	79.6	29.2
September.....	79.4	27.8
October.....	78.4	29.7
November ...	77.6	38.7

In order to endeavor to ascertain what proportion of sulphides were being lost, we sampled and analysed our ore pulps during December, as afore described. During this period 230 tons of ore were milled producing 26.7 tons concentrates which when sampled assayed as follows:—

Gold	2.67 ounces per ton.
Silver.....	6.00 " "
Zinc.....	5.5 per cent.
Lead.....	4.8 "
Iron.....	34.3 "
Insoluble.....	17.6 "

If all the above figures are correct and 900 lbs. of ore should produce 100 lbs. concentrates, then

900 lbs. of ore should yield	900 x 2.2 p.c. = 19.8 zinc (lbs.)
900 " " "	900 x 1.6 p.c. = 14.4 lead "
900 " " "	900 x 10.7 p.c. = 96.3 iron "

Actual results are

In zinc we recover	5.5 lbs. or loss of	74 p.c.
In lead " "	4.8 " "	67 p.c.
In iron " "	34.3 " "	65 p.c.

The absolute accuracy of these figures is open to question, but I am satisfied that the general tenor of them agrees with our results in practice and they point to a serious need of additional concentration facilities. Our experiments, however, with the cyanide process for the retreatment of our tailings, seemed to offer such excellent chances of success, that we decided to instal a plant of this description and did not further consider the improvement of our concentration plant.

Fineness of Bullion varied during last year from 682.5 to 747.5 with an average for the year of 725.3. The fineness seemed to vary as the quantity increased, the bigger the brick, the higher the grade. It also seems to vary inversely with the proportion of concentrates recovered.

The number of tons crushed during the year was 5,054, which produced 520 tons concentrates or 10.2 per cent. by weight of the ore. The actual recovery in bullion was \$25.62 and in concentrates \$8.03 per ton; of the values recovered the bullion supplied 76 p.c. and the concentrates 24 p.c. The value of the tailings was \$3.71 per ton and the percentage of recovery was 79.4. The tailings have been impounded in a dam pending the completion of the cyanide plant.

Stain on the Plates.—An iridescent brass coloured stain constantly forms on the apron plates; I use the word stain because it is so thin, and in such a fine state of subdivision that when gathered up in water, its appearance is that of a dark coloured solution. Fresh quicksilver when applied to the plate covered with this stain instantly adheres, as readily as though the plate were bright, and it does not seem to interfere with amalgamation in any way. It is instantly removed with the first stroke of the brush, and when the brushing process is ended I have seen the stain reappear within fifteen seconds after the clean water has been turned on, before the attendant has time to release the first stamp. We have only made very slight investigation into the nature of this stain. Without more than suggesting that it has any connection with the above, I may here draw attention to the fact that while the iron sulphides are apparently entirely composed of common iron pyrites, FeS_2 = sulphur 53.3 and iron 46.7 per cent.; yet in the analyses of our ores and concentrates, we seldom find more than from $\frac{1}{2}$ to $\frac{3}{4}$ enough sulphur to satisfy the iron in the formula FeS_2 , not to speak of the sulphur necessary to satisfy the zinc and the lead.

A curious feature of amalgamation was noted when the mill first started. Amalgam was formed on the front plates in remarkable quantities which when retorted produced an insignificant amount of retorted sponge.

During the first ten days of November, 1898, 1,755 ounces of

amalgam (squeezed dry) produced 161.8 ounces of bullion or 9.1 per cent. This had been even more remarkable during October and the same feature continued during the following three months, after which it became normal.

Melting.—For melting the sponge we use a Braun gasoline furnace with one large burner. The size of the furnace is 10 inches in diameter and 12 inches high, measured inside.

We make bricks weighing from 400 to 500 ounces each. We use a flux as follows

Borax glass	100 grammes.
Bicarbonate soda.....	.50 "
Glass.....	600 "

and stir to excess with an iron rod. After skimming the slag, the brick is poured and is found in the mould with a heavy layer of matte on top. This is removed and the brick remelted under the same conditions. This process insures clean bricks in our case. The matte and slag are saved and, after the product of six months has accumulated, it is retreated in the pot with nitre and litharge, and the resultant lead is cupelled. The residues are again treated in a similar manner, which second process removes all the value except traces of silver.

Leaching Copper Ores by Sulphurous Acid.

By E. P. JENNIGNS, Salt Lake City, Utah.

[Paper to be read before the March meetings of The Canadian Mining Institute.]

The writer has had occasion in the course of his professional work to investigate a unique process of leaching copper ores by the use of sulphurous acid, which has been patented in the United States by James W. Neill, of Salt Lake City, Utah.

The process, while yet in the experimental stage, has a number of valuable features which will make it of interest to members having deposits of copper ore remote from transportation, fuel and fluxes.

The native oxides and carbonates of copper are readily soluble in sulphurous acid with the formation of cuprous sulphite (Cu_2SO_3). This salt is insoluble in water, but soluble in water containing sulphurous acid from which the copper can be precipitated by driving off the excess of sulphurous acid by heat. The precipitate is cuprous sulphite (Cu_2SO_3 , $Cu_2SO_3 + 2H_2O$) and contains 49.1% of copper. This salt is heavy, crystalline compound of a dark red color, which settles readily from the solution and can be washed by decantation, dried and reduced to metallic copper by fusing on the hearth of a reverberatory furnace.

The process is suitable both for sulphide and oxidized ores the former being first roasted to expel the sulphur and convert the copper compounds into oxides, as sulphurous acid does not attack sulphides.

The ideal ore is one carrying oxides or carbonates of copper in a silicious gangue; lime and magnesia are objectionable, as they dissolve in sulphurous acid and, while they do not materially interfere with the reactions, they consume a certain amount of sulphur and so increase the cost of the process.

In practice the ore is crushed to pass a 20-mesh screen, placed in covered tanks filled with water containing sulphurous acid and kept in a state of agitation by forcing a current of sulphurous acid from the gas generators through the solution; this brings each particle of ore in contact with the acid and also keeps the water saturated with sulphurous acid gas. All the copper will pass into solution in from one to four hours; depending on the physical condition of the ore.

The charge is now drawn into a settling tank, the sands allowed to settle for a few moments, when the solution, which carries more or less slimes, is decanted into a filter press that separates the solution from the slimes and forces it to the precipitating tank. The sands in the

tank and the slimes in the filter press are washed once with sulphurous acid, which is afterwards used in the treatment of the next charge.

The dissolving tanks are arranged in series, one above the other; the gas entering the lower one and passing through each one in turn, any excess being at last absorbed in a condensing tower.

The precipitating tank is supplied with a steam coil through which the exhaust steam from the crushing plant is passed, thus heating the solution and precipitating the copper as cupro-cuprous sulphite which settles rapidly to the bottom of the tank. The solution from this tank is run into another tank while still hot and freed from small amounts of copper that is in solution as sulphate by means of a little lime.

The precipitates are dried and smelted to fine copper.

The plant can be so arranged that nearly all the sulphurous acid except that combined with the copper can be saved and used again.

One pound of sulphur is required to convert four pounds of copper into sulphite, and another pound of sulphur will keep the cuprous sulphite in solution, but the greater part of this second pound of sulphur can be recovered. In practice about one pound of sulphur is required to treat three pounds of copper contained in the ore.

The sulphurous acid is produced either by burning pyrites or sulphur, the former can be obtained in most mining districts and the latter occurs in great beds in Utah. When the original ore is a sulphide, it will furnish, by roasting, ample sulphurous acid for its own treatment.

The advantages of the process over the sulphuric or hydrochloric acid method are: first, cost of the chemical is low; second, it is generated on the spot by the use of a very simple plant; third, a relatively small amount of the chemical is used; fourth, the copper is separated from the solution by heat alone; fifth, the copper produced is practically free from impurities.

Sulphurous acid produced by roasting pyrites is the cheapest chemical procurable in the western country and the plant is much simpler than that used in making sulphuric acid.

A unit of copper converted into cuprous sulphite requires but half the sulphur that would be required to convert it into cupric sulphate.

Cuprous sulphite is precipitated from the solution without the use of scrap iron, which is a great advantage in remote districts. In southern Utah for instance, scrap would cost from \$40.00 to \$50.00 per ton and from 2 1/2 to 3 1/2 pounds of iron ore required to precipitate one pound of copper from sulphuric acid solutions owing to the large amount of basic salts formed.

Sulphurous acid dissolves very small amounts of other metals that may be in the ore and the precipitated cupro-cuprous sulphite is practically pure and furnishes pure copper by a simple smelting operation.

In experiments made by the writer on ores of the Triassic Sandstone of Northern Arizona, 95% of the copper was extracted by leaching the ore for four hours, the ore was a mixture of blue and green carbonates with some oxide disseminated in sandstone; the grains of which were firmly cemented by a secondary deposition of silica making the rock harder to crush and much more difficult to leach than an open grained sandstone would have been, as the little particles of copper were coated with silica.

The experiments demonstrated the feasibility of the process with this kind of ore, and a plant will be erected in the near future for the treatment of the ores of the Coconino Plateau.

A company has been formed to re-open the Curran Mine at Mount Uniacke; there are a large number of leads so close together that they have to be worked together. In the old days of this mine, it was worked by an open cut 60 feet wide and over 100 feet deep, and it looked about as dangerous a place in which to work as can possibly be imagined. The old mill returns show about 2 1/2 dwt. per ton free gold; with proper and economic management this should be made successful.

COMPANY NOTES.

Canadian Smelting Works.—We are officially informed of the following output from the Trail smelting works in 1900:—

	Ozs. Gold	Ozs. Silver	Lbs. Copper	Lbs. Lead
Quarter ending 31st. March	15,811	257,298	655,699	1,943,738
" " 30th. June	12,022	270,024	328,966	1,875,409
" " 31st. Sept.	5,555	229,443	616,144	1,873,645
" " 31st. Dec.	15,515	244,709	2,007,881	1,931,288
	48,903	1,001,474	3,608,690	7,624,080

Payne Consolidated.—The Secretary advises under date of 14th inst:—

Statement for Quarter ended December 31st, 1900.

Tons of Ore Shipped, 2,957.	
Net Profit	\$120,668.07
Less Dividend paid Jan'y 15th,	78,000.00
Surplus,	\$42,668.07

Pending further development and instalation of machinery at the mine, shipments of ore will be reduced.

Cariboo McKinney Mining and Milling:—At the annual meeting of the shareholders held at Toronto on the 5th inst. directors report showed a net profit on the year's operations amounting to \$53,148 ozs. out of which there was paid to shareholders dividends amounting to the sum of \$50,000. Owing to difficulties encountered in the working of the mines which entailed unusual expense, as explained in the report of the managing director, the profit arising from the Company's operations was not as large as expected. Upon recommendation of the Managing Director the Directors have determined to suspend for a brief period the payment of dividends and to apply the earnings to the development of the ore chutes with a view to a more economical working of the mine, believing that the result will fully justify this policy.

The services of Mr. Jos P. Keane as Superintendent of the mine were lost to the Company during the early part of the year 1900. The Directors are pleased to state that during the present month they have again secured his services.

(Signed) ROBERT JAFFRAY, PRESIDENT.

THE CARIBOO MCKINNEY MINING & MILLING COMPANY, LIMITED.

Statement of Account 31st. December, 1900.

Capital Stock.....		\$1,250,000.00
Bullion.....		837,512.21
Rent.....		8,997.30
Profit and Loss.....		3,148.02
Mine and Water Rights.....	\$1,118,054.77	
Mill Plant.....	25,710.96	
Hoisting & Compressor Plant.....	30,224.22	
Buildings.....	2,627.18	
Office Furniture.....	242.55	
Mine & Mill Supply, Labor Salaries.....	416,301.35	
Expense.....	26,575.50	
Mineral Tax.....	4,890.33	
Dividends.....	457,337.52	
Cash in Bank.....	15,693.15	
	\$2,099,657.53	\$2,099,657.53

PROFIT & LOSS ACCOUNT FOR YEAR ENDING 31ST. DECEMBER, 1900.

Revenue.

Bullion.....	\$160,831.85
Rent.....	1,676.97
	\$162,508.82
Expenditure.	
Hoisting & Compressor Plant & Mining.....	\$80,098.32
Mill Plant and Milling.....	22,945.01
Mineral Tax.....	1,754.42
Expense.....	2,629.73
Salaries.....	1,933.32
	109,360.80
Dividends.....	50,000.00
Balance.....	3,143.02
	\$162,508.82

RECEIPTS & DISBURSEMENTS FOR THE YEAR ENDING 31ST. DECEMBER, 1900.

Receipts.

Cash in Bank 1st. January, 1900.....	\$18,340.57
Bullion.....	160,831.85
Rent.....	1,676.97
Mine and Water Rights.....	256.55
	\$181,105.94

Disbursements.

Hoisting & Compressor Plant & Mining.....	\$83,064.91
Mill Plant and Milling.....	24,527.01
Building.....	55.40
Expense.....	2,629.73
Office Furniture.....	6.00
Salaries and Directors' Fees.....	3,313.32
Mineral Tax.....	1,754.42
Dividends.....	50,000.00
Cash in Bank 31st. December, 1900.....	15,693.15
	\$181,105.94

Sultana Mine of Canada, Limited.—The report of the directors of the Sultana Mine of Canada, Limited, from August 14th, 1899, to September 30th, 1900, presented at the meeting held in London on February 6th, states that, owing to the faulting of the main ore body between the 6th and 7th levels the anticipations with regard to the date of distribution of profits mentioned in the prospectus have not yet been realised. The mine manager's report, covering the period from August 14th, 1899, to December 22nd, 1900, will show what has been done with a view of picking up this main ore body, and that the prospects of success are distinctly favourable. The policy of the directors has been from the beginning to thoroughly develop the mine. In all, since the formation of the company up to September 30th, 1900, £19,633, has been spent on the mine. Since March 15th, 1900, the mill of 30 stamps has been worked one shift only for the purpose of making trial runs, and to procure funds to assist in this development, with the results shown in the profit and loss account, £5,937. Vigorous development work has been in progress at the south air shaft from which most of the gold won has been obtained. The directors have furnished the shareholders with copies of the mine manager's weekly reports, from which it would appear that towards the latter end of December some important discoveries at the 2nd level south air shaft were made. The following cablegram was received from the mine manager on the 14th inst.:—"South workings. Sinking shaft on high grade ore body, westerly stopes looking exceedingly well. Judging from indications it is my opinion that mine will be self-sustaining at the beginning of May. This cablegram and the weekly reports above mentioned lead the directors to believe that very shortly the mine will be on a self supporting basis, and before long making profits. The directors think it right to bring the following facts to the notice of the shareholders. The company took over the mine in August, 1899, from Mr. John Fraser Caldwell, the vendor, subject to an advance from the Imperial Bank of Canada, for £10,000, in respect of which the bank hold a mortgage over the mine. At the same time Mr. Caldwell deposited with the company as security for this charge 50,000 vendor shares. The bank has never communicated with the company, but the directors understand that they are desirous of having this mortgage paid off, and the directors have opened negotiations with the bank on the subject. Profit and loss account shows a debit balance, for the period under review, of £987.

Le Roi.—Corrected shipments for 1900 were 149,246 dry tons of an average value of \$14.15 per ton. Cost of mining was \$3.25 per ton. The new five compartment shaft, now down to 900 feet level, has a daily capacity of 1,000 tons and as soon as the enlargement of the Northport Smelter has been completed the shaft will be supplied with its full quota of ore.

London Consolidated.—This Company's Silver Hill mine has been added to the shipping list. The first consignment was 100 tons sent Hall Mines Smelter and the management expects to ship an average of 25 tons per day. Vigorous development has been prosecuted with result that a large quantity of good ore is now on dump, with much more in sight in the mine. The list of shippers is steadily growing, but we cannot have too many additions to that list.

Queen Bess Proprietary.—This English Company, a subsidiary of the Duncan Mines Limited, owns the Queen Bess lying between the Payne on the North and the Idaho on the South. The vein carries high grade silver-lead ore netting \$60 per ton at the Smelter, but the excessive costs of mining and transportation make heavy inroads into this amount. When a tramway to connect the railroad and the new No. 5 Tunnel is completed costs will be very materially lessened. For the past twenty months the Company has been steadily developing at depth. Shipping has been continuous, but proceeds from ore sales have gone back into the mine. Last September a crosscut tunnel through the country rock was started with the object of tapping at considerable depth the leads exposed by the five upper tunnels. A three drill compressor was installed and has driven the tunnel 1835 ft; the tunnel is 7x9 ft. in the clear. The average rate of progress was 125 ft per month, but there was a record of 192 ft. in one month. A shaft from the No. 5 Tunnel has been sunk 245 ft. on the vein and a raise is now being driven to connect with the shaft. This raise will be 185 ft. high. The new tunnel will be the main working of the mine, all ore, supplies, &c. being handled through it. All the proven Slocan mines are now driving long tunnels to tap their veins at depth and an era of comparatively deep mining may be expected to follow. At present there are few mines in the District which have more than scratched the surface.

Sullivan.—This East Kootenay mine has entered into new contract with the C. P. R. and its Trail Smelter under which the mine will ship during the year on a graduated freight and treatment rate, this rate depending upon the quality and quantity of ore shipped. It is claimed this new contract will give the Company an average of \$2 per ton more than its former contract. During December shipments amounted to 1330 tons.

Sultana Nickel.—This property comprising 2640 acres in townships of Drury and Trill and owned by J. B. Miller and H. W. Eveden has been sold to Charles Neumann and Judge Kraus, of Chicago, the price it is said being \$250,000. This is the most important transaction in nickel lands that has occurred for some time. The new owners claim they have the most marvelous nickel deposit known to exist and they intend to work it on a very large scale. The property is 26 miles west of Sudbury, Ont.

Britannia Copper Syndicate, Limited.—Two meetings of the shareholders were held in Vancouver on February 4th. At the ordinary annual meeting over 80 per cent. of the issued capital stock was represented. After transaction of routine business the shareholders re-assembled in an extraordinary general meeting to amend by-laws, act upon a proposal to consoli-

date the 7-10 of the Britannia group of copper-gold claims with the 3-10 heretofore owned by Leopold J. Boscowitz, and the adoption of a general policy under which the management might either sell the property or devise ways and means for proceeding with development. The shareholders authorized the purchase of the Boscowitz 3-10, and the entire ownership of the Britannia group is now vested in the Britannia Copper Syndicate, Limited. The by-laws were amended and the directors authorized to proceed with the formation of a new syndicate having an authorized capitalization of \$3,000,000, to which, when considered by them advisable, the Britannia group shall be transferred for 2/3 of the capitalization of the new incorporation, the remainder to be devoted to opening and equipping the mines and the erection of suitable reduction works. Several proposals from Americans and Europeans for purchase of the Britannia group at prices ranging from £150,000 to \$1,100,000, quick cash, all of which were referred to the directors.

Crow's Nest Pass Coal Company.—The Company at a recent special meeting voted to increase the capitalization by issuing 60,000 additional shares, thus raising the capitalization from \$2,000,000 to \$3,500,000. Of the new stock 20,000 shares or \$500,000 worth will be issued at once, and the remainder held back for the meantime. It is understood that the new stock goes to the old shareholders at part in the proportion of one share to every four held. At a subsequent meeting of the shareholders the action of the directors was confirmed. Of the new issue of stock one-third will be issued at once and the rest when the needed stock issued has already been subscribed at a premium of \$15 a share. Mr. Elias Rogers, managing director of the Company, at the meeting, stated that if the present prospect of securing the southern market materialized \$800,000 would be spent this season in mining and building coke ovens. Mr. Rogers said that the company had 312 coke ovens burning, and was taking out of the mines from 1,200 to 1,400 tons of coal a day, about half of which is going to the ovens.

Mineral Products Company.—This Company controls deposits of pyrolusite in Albert and King counties. Besides the deposit in the Dawson settlement, the company owns Stockton Mine, near Sussex, as well as some undeveloped properties in other parts of the Province. Mr. Russell P. Hoyt, general manager of the company, has been seeking concessions from the St. John authorities for a smelting furnace, whose output will be 100 tons of ferromanganese per day.

B. C. Copper Co.—The contract for the converting plant for this company has been secured by the E. P. Allis Company, of Milwaukee. It is to be ready for delivery in three months. The machinery will cost in the neighborhood of \$40,000 at the factory. The plant consists of a blowing engine, one stand of converters, a 40-ton electric crane, a crushing plant and the necessary accessories. By the time it is ready to be installed a second furnace will doubtless be added to the smelter, bringing the daily capacity up to 600 tons. Roughly, this will produce 40 tons of matte, and that passing through the converter means 20 tons of blister copper, averaging 98 1/2 99 per cent.

Anglo Canadian Lead Syndicate.—At the first annual meeting of shareholders held in London recently the directors report for the year stated. The Company having after some delay, completed its arrangements with the Vendor, including the legal formalities in respect of the title and conveyance, proceeded to select a new Manager for the Mines, and, as the result of careful inquiries, they appointed Mr. E. J. Walsh, of Ottawa, who has been located at the Mines since the 9th of May last, and has been energetically at work on the necessary erection of new Plant and Machinery. At the same time he has, by repairing and utilizing the old Plant as far as possible, carried on the work of mining and concentrating, made shipments of Ore and Concentrates, part of which, consisted of ore raised since he took charge of the Mine. The sum of £1,161 18s. 10d. was recently received from the Smelters in London, as proceeds for part of the first cargo, which assayed as follows:—

Bullion Lead in Concentrates.....	63. 5 per cent.
Silver per ton of do.....	14.87 ozs.

The North Star Mining Milling Company, Limited.—Under date of 7th. January. Statement of Ore Shipments for quarter ending 30th. November 1900.

Tons of Ore Shipped.....	5353
Net Profit.....	\$92,787.42
Less Dividend for quarter paid 15th Dec.....	39,000.00

Surplus.....\$53,787.42
A dividend of 3 per cent. has been declared for the quarter ended 28th. November.

Corinth Mines Limited.—The following is excerpted from the director's report submitted to the shareholders on the 4th. ult:—

During the past season the prospecting operations referred to in the last report have been carried out on the Company's property. These brought about the discovery of an outcrop on which a little sinking was done, with the result that a pocket of payable ore was uncovered, from which 75 tons have been extracted. This ore is now in course of transit to the smelters for treatment and realisation and it is expected from the manager's estimate that, after allowing for the cost of extraction, a profit of £500 will be realized and that the gross return will to a great extent cover the year's expenses in connection with the mine. In addition the Mine Manager states that there remains yet unextracted a quantity of about 40 tons of ore of a similar character. In view of this discovery, and as Mr. J. D. Kendall, the Consulting Engineer (who, as the shareholders are aware, is well acquainted with the company's property) was in the neighbourhood, it was

arranged for him to again examine the mine in order that he might ascertain by further inspection, whether there was any likelihood of the ore continuing in depth. His report has been received, but it is unfavorable in this respect; and he does not recommend the expenditure of any further money on the property by the company. It is therefore intended, as soon as the payable ore has been taken out, to close down the mine.

Tyce Copper.—Mr. Pellew-Harvey the company's engineer, reports for month of December, under date January 16; up to December 31 over 600 feet of development has been accomplished on this property, and a fine wagon road has been built from the railway station to the mines and other important and permanent improvements carried out. A modern compressor plant with hoisting and pumping machinery is being installed. (Office note. A cable to hand states that machinery will be in operation on February 4). A working shaft 13 feet by 5 feet is being sunk to a depth of 500 feet after which connections will be made with the workings in the western portion of the mines and No. 2 shaft, which has already been sunk to a depth of 233 feet vertically. At the 200 feet level a crosscut north has intersected the ore chute, which at the surface yielded handsome returns. At this level large ore bodies have been met in the eastern workings of the property, one of which consists of copper schist of a payable nature, 15 feet wide, and parallel to this a higher grade lode has been met on a crosscut, showing 24 feet of good ore, the pay shoot being 4 feet wide, and yielding 8.88 per cent. copper, 0.72 ounces gold, and 3.5 ounces silver per ton. The average of the 24 feet from a series of assays yield 4.5 per cent. copper, 0.247 ounces gold, and 2.4 ounces silver per ton.—Note. With such a large body and facilities for local treatment, which is contemplated, it is expected large profits will result.

Granite.—The report from the Granite mill as to last month's run is as follows: Tons crushed, 706.7; bullion recovered, 438 ounces; concentrates, 34½ tons; gross values, \$8 500; percentage of extraction, 85.2. A special feature in connection with the Granite mill is the high percentage of values recovered as evidenced by the monthly statement issued. The figures are exceptionally high, and a constant high average is maintained. The recent shortage of water in the creeks supplying the mill is not as serious now.

CON. CARIBOO HYDRAULIC.

Manager Hobson Reviews a Successful Year's Operations.

The following is excerpted from the annual report of Mr. John B. Hobson, M.E., General Manager of the Consolidated Cariboo Hydraulic Mining Company, presented at the annual meeting of shareholders held at Toronto on 23rd instant:—

The canals opened earlier than usual under the influence of the warm Chinook winds that prevailed during the last two weeks of March, and washing commenced on the 4th of April, about two weeks earlier than usual.

The mine was operated 171 days and 13½ hours, with a quantity of water varying from 2,500 to 2,750 miner's inches.

The season's mining operations were divided into three runs, as follows:—

Washing was commenced in Pit. No. 1 on the 4th day of April, and was continued for a period of 66 days 1½ hours, ending on the first day of July. During the run 170,753 miner's inches of water was used to wash out 791,899 cubic yards of gravel and top clay, from which was recovered 7,867 ounces of gold, valued at \$134,728.45, an average yield of about 17 cents per cubic yard, and a daily product of \$2,039.48. The duty of the water attained was 4.63 cubic yards of gravel per miner's inch.

Washing operations were confined mainly to the ground thrown down by the bank blast exploded in August, 1899, and March, 1900. Both bank blasts included a large percentage of the clay and low grade gravel lying on the south-west rim, east of "Dancing Bill" Gulch. The inclusion of so large a percentage of low grade material explains the cause of the low average yield of 17 cents per cubic yard.

The second run commenced on July 2nd, continued for a period of 68 days and 12 hours, and ended on September 30th. During the progress of the run 188,375 miner's inches of water were used to wash out 751,000 cubic yards of gravel and top clay, from which was recovered 9,058 ounces of gold, valued at \$154,848.41, an average yield of 20.10 cents per cubic yard, and a daily product of \$2,260.56. The duty of the water attained during the run was 3.10 cubic yards of gravel per miner's inch.

After the whole of the gravel and clay disintegrated by the bank blasts was washed out, the run was continued to completion by undercutting and caving the main bank by force of the hydraulic streams.

The breaking up of the large masses of indurated clay by hand and the delay in the delivery of explosives required for the second bank blast, and to keep the pit clear of boulders, caused a serious loss of washing time and explains the cause of the falling off of the duty of the water below that attained during the first run.

The third, and closing run of the season, commenced on the 1st of October, continued for a period of 37 days, and ended on the 9th of November, when the low temperatures closed the canals and ended the season's washing operations. During the progress of the run 101,750 miner's inches of water were used to cave and wash out 301,039 cubic yards of top clay and gravel, from which was recovered 3 544.70 ounces of gold, valued at \$60,508.91, an average yield of 20.10 cents per cubic yard, and a daily product of \$1,635.37. The duty of the water attained was 2.70 cubic yards per miner's inch. The hard freezing of the gravel and lumps of indurated clay during several periods of low temperature retarded the progress of the pit work, and explains the cause of a further falling off of the duty of the water.

During the progress of the second and third runs about 5,940 cubic yards of gravel were washed from the lower bench through the bed rock cuts and sluice section No. 1. The product thereof was 320 ounces of coarse gold and nuggets valued at \$5,470.00, an average yield of about 92 cents per cubic yard. This product is included in that of the second and third runs. Washing operations were confined entirely to Pit No. 1, so there is no washing to report for Pit No. 2, which is practically in the same condition as it was at the close of the season of 1899.

SUMMARY OF THE SEASON'S MINING OPERATIONS.

Total Time occupied in washing in Pit No. 1..... 171 days, 13½ hours.
Total quantity of Water used..... 460,878 miner's inches.

Quantity of Gravel, washed:—

From Upper Bench, Main Bank..... 1,693,554 cub. yds.
" Intermediate Bench..... 144,444 " "
" Lower Bench..... 5,940 " "

Total quantity washed during the season..... 1,843,938 " "

Average duty of the water per miner's inch..... about 4 cubic yards.
Gold product for season..... 20,470.10 Troy ounces.
Value of the Gold..... \$350,085.77.
Average yield of gravel washed..... 18.10 cents per cubic yard.
Average product per washing day..... \$2,041.30.

The loss of washing time that occurred during the progress of the season's operations is distributed as follows:—

Repairing Hydraulic Plant and advancing giants..... 5 days.
Advancing and repairing sluices..... 5 " 11 hours.
Cleaning up..... 5 " 21 "
Delay in delivery of giants required for use on lower Bench..... 12 "
Delay in delivery of explosives caused by unusually heavy roads..... 18 " 8 "
Repairing break on Morehead Canal..... 14 "

Total Loss of washing time..... 47 days 6 hours.

The receipts and expenditures attending the operation of the Company's mines for the season will be found distributed in detail in the following statement:

MINE OPERATION EXPENSES FOR THE SEASON 1900.

EXPENDITURE.	
Lands and Leases—Rentals, etc.....	\$ 2,137 50
License Account—Free Miner's Certificates.....	110 00
MINING—	
Labor and Board.....	\$43,105 65
Explosives.....	31,622 10
Stores, etc.....	1,796 93
Bank Blasting, including Explosives.....	7,646 87
Sluice Extensions and Maintenance.....	84,171 55
Port. Hyd. Plant Maintenance.....	15,918 42
South Fork Ditch Maintenance.....	5,014 14
Morehead Ditch Maintenance.....	5,301 27
Mine Light Maintenance.....	5,061 05
Camp Maintenance, Fuel, etc.....	1,909 25
Buildings Maintenance.....	1,926 55
Roads and Trails Maintenance.....	1,175 95
Wagons and Harness Maintenance.....	279 13
Telephone Maintenance.....	363 46
Melting Plant Maintenance.....	94 00
Stable Expense Account.....	8 75
Bullion Expense Account—	
Government Royalty.....	\$5,567 45
Transportation and Melting Charges.....	4,915 33
Transportation of Miners, etc.....	10,484 80
Mine office expenses.....	4 665 41
Stationery and Printing.....	1,260 98
Postage and Telegraph.....	291 67
Incidental expenses.....	156 81
Fire Insurance Account.....	31 25
Management.....	485 50
Tools and Implements—depreciation for season.....	6,232 80
Horses and Mules Account—Loss for season.....	845 14
Wagons and Harness Account—Loss for season.....	245 00
Quicksilver Account—Loss for season.....	34 25
Quicksilver Account—Loss for season.....	1,485 65
Total Operating Expenses for season.....	\$151,181 72

RECEIPTS.

Profit on Stores sold to Employees.....	\$2,835 76
Profit on Blacksmith Shop.....	95 90
Profit on Lumber sold.....	98 64
Rent received from Morehead Camp Buildings.....	30 00
Total Profits for Season.....	\$ 3,060 30
Gold Product for Season.....	350,085 77
Total Receipts for Season.....	\$353,146 07

INVENTORY.

There is on hand at the Company's mines as per Inventory taken November 15th, 1900:—

Miscellaneous provision stores and mining supplies.....	\$16,575 43
Explosives.....	10,703 52
Quicksilver.....	1,351 00
Blacksmith Stores.....	1,662 51
Total Stores.....	\$30,292 46
Tools and Implements.....	10,223 77
Lumber, Saw Logs and Flat Timbers.....	4,144 33
Horses.....	730 00
Wagons, S eighs and Harness.....	1,753 75
Total as per Inventories.....	\$47,144 31

WATER SUPPLY.

The quantity of water available for use during the season of 1900 exceeded that of the season of 1899.

Precipitation for 1899.....	28- ⁶⁵ / ₁₀₀ inches
Precipitation for 1900.....	30- ¹⁰⁰ / ₁₀₀ "
Exceeding that of 1899 by.....	2- ² / ₁₀₀ "

A large percentage of the winter snow disappeared rapidly under the influence of the warm Chinook winds that prevailed during the latter part of March, and while the remaining snow went off under more favorable weather conditions in April and May, it was not sufficient to fill the reservoirs to the height attained during the previous season. The heavy rains that fell during the summer and fall months afforded considerable water, and made up, in great measure, for the limited quantity of water afforded by the winter snow.

Quantity of water available for use in 1899.....	463,056 miner's inches
Quantity of water used in 1899.....	353,056 " "
Quantity of water remaining in the reservoirs at close of season of 1899.....	110,000 " "
Quantity of water afforded by precipitation for season of 1900.....	370,878 " "
Total quantity of water available for use during season of 1900.....	480,878 " "
Quantity of water used during season of 1900.....	460,878 " "
Quantity of water remaining in Polley's Lake and Morehead Lake Reservoirs at close of season...	20,000 " "

The 20,000 miner's inches of water remaining in the storage reservoirs will be added to the supply afforded by the precipitation of the season of 1901.

WATER SUPPLY SYSTEM.

The winter frost and heavy rains brought down numerous small slides from the inner slopes of both main canals, and settlement occurred in two sections of flume built on the clay banks of the upper section of the Morehead canal, but nothing occurred during the season to cause a loss of more than 14 hours' washing time.

With these exceptions the water supply system remained in good running order throughout the season, and was maintained at reasonable cost.

CONDITIONS OF THE MINE.

The character of the deposits show a marked improvement as the workings are advanced up the channel. The heavy deposit of indurated clay overlying the gravel, on the southwest side of the channel, is decreasing rapidly. The pay gravel is increasing in depth in proportion to the decreasing in the thickness of the clay capping.

The channel appears to be widening, and the average yield of gravel washed during the season is a marked improvement on that of previous seasons.

The gravel on the lower bench continues of high grade, and will probably improve as the workings are carried around the big bend and advanced up the channel.

The gold saving appliances are in good running order and prove efficient for the economical removal of the gravel to the dumps and the recovery of a high per centage of the gold.

The Portable Hydraulic Plant is in good working order, but requires an additional 1000 feet of 24 inch steel pipe for necessary extensions next season. Pit No. 1, with this addition to hydraulic plant, may be considered in good condition for the ensuing season's operations.

A water supply equal to that of 1900 will assure a greatly increased gold product for the season of 1901.

The operating expenses will vary as usual with the quantity of gravel washed and the difficulties encountered during the progress of the seasons operations. Assuming that the clay capping will be successfully bank blasted and no accident occurs to interfere with the continuous operation of the mine, the operating expenses should not exceed about six cents per cubic yard of gravel washed.

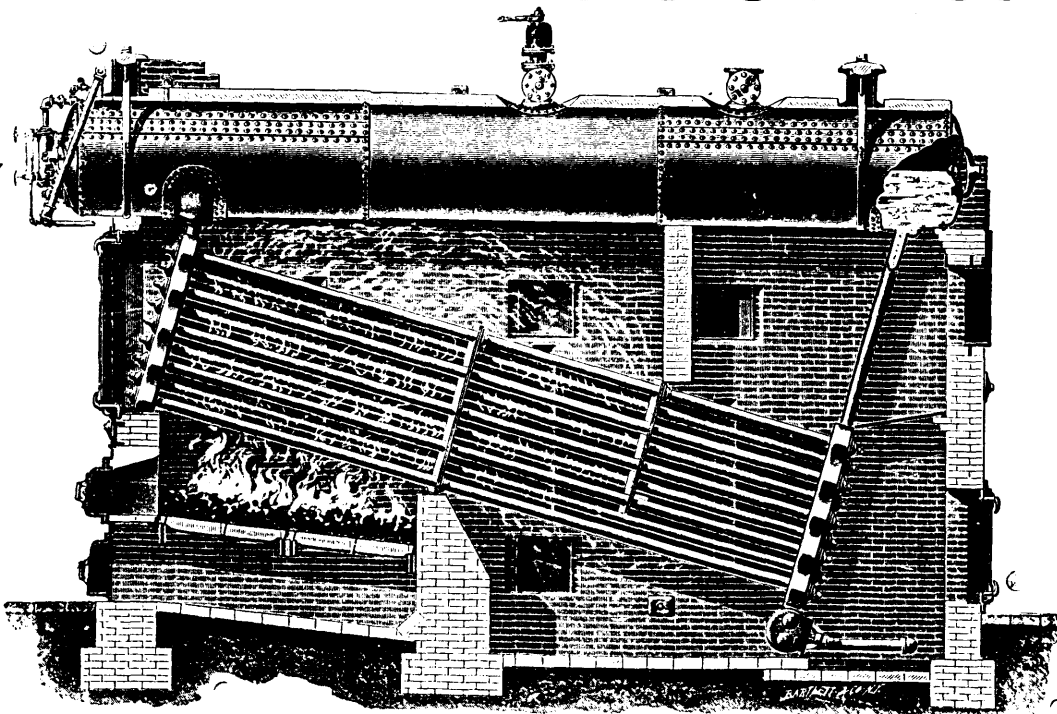
NOVA SCOTIA NOTES.

The official returns of the gold production for the year ended 30th September last, are the largest in the history of gold mining in Nova Scotia.

As showing how gold mining in this Province is paying the following figures of the Richardson Gold Mining Company are interesting:—

Capital of the company.....	\$100,000
Paid in dividends.....	26,500
Purchase of wharf and new machinery.....	15,000
Sinking fund.....	5,000
Total earnings in 1900.....	46,500

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This earning is the more phenomenal when we add that in 1896 the capital of the company was increased from \$50,000 to \$100,000, not by the subscription of more capital but by presenting the holder of each share with another share. Thirteen thousand four hundred dollars worth of shares, the property of the late George A. Pyke were recently sold by auction in Halifax for \$130 1/2 each, the purchaser being Mr. A. H. Whitman, President of the company.

Of the earnings of the Richardson Mines last year only about one thousand dollars came from the sale of concentrates. The mine made about 400 tons of concentrates of an average value of \$35.00 per ton, the sale of which had not been completed in time to go into last year's dividends.

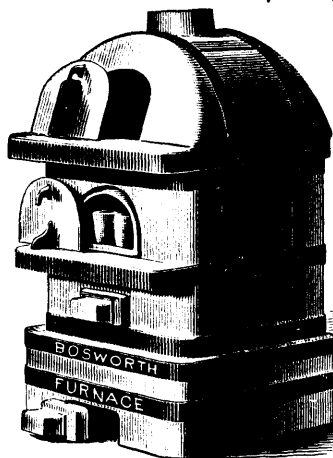
Mr. L. W. Getchell had only just started to re-open the Elk Mine at Caribou when the mill was destroyed by fire. Mr. Getchell proposes to install a cyanide plant at the mine.

We had a call from Mr. W. Prisk, manager of the Guffey Jennings Mine who informed us that the development work was progressing rapidly. Mr. Prisk brought 69 oz. of gold in with him, the result of crushings of rock obtained in the course of development work.

F. H. M.

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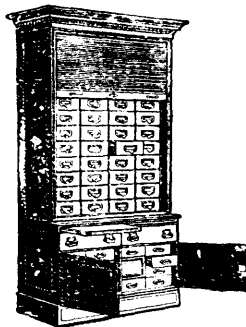
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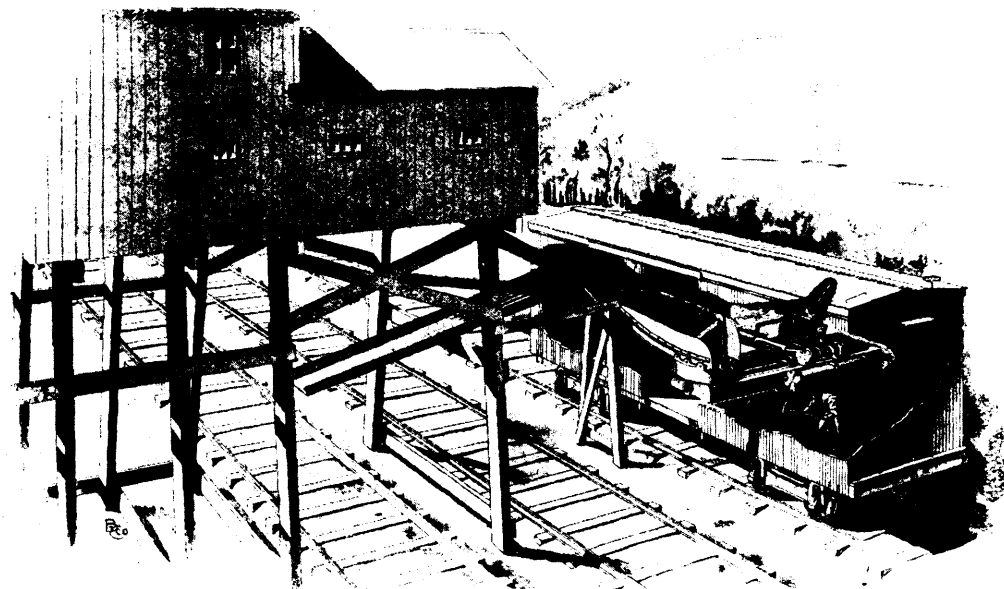
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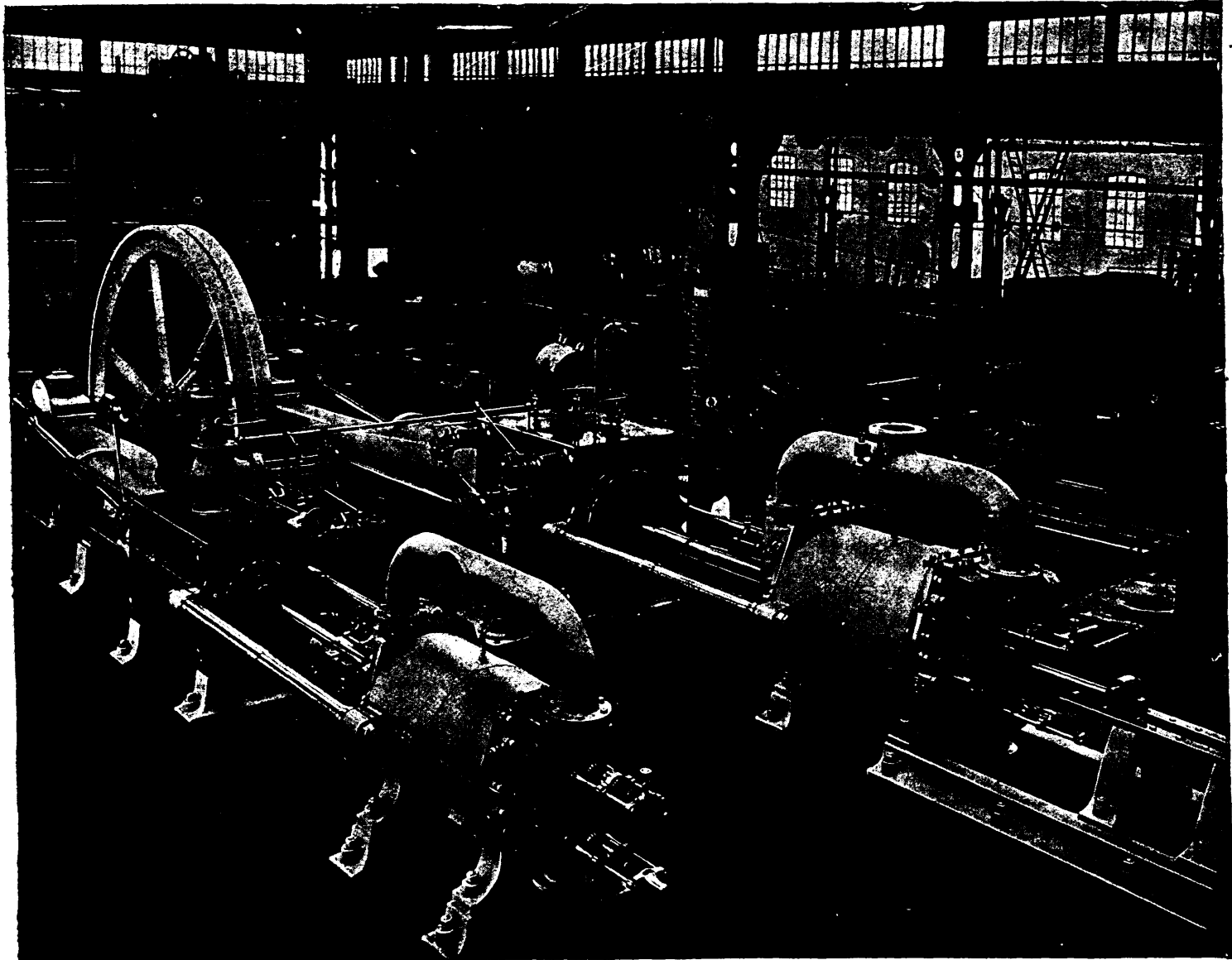
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We have received permission to state that tests made by the officials of the "RIO TINTO COMPANY" during the working of our COMPOUND, CONDENSING, TWO-STAGE, AIR COMPRESSORS at their MINES in SPAIN, showed that the Coal Consumption was 1.54 lbs. of Welsh Coal per Indicated Horse Power per hour. Also that the working of the Compressors was most satisfactory.

THE BLACKWALL TUNNEL

For the construction of the Tunnel, Six Air-Compressing Engines were erected. The largest Two Pairs of Compound Engines, were supplied by us. Messrs. S. PEARSON & SON, the Contractors for the construction of the Tunnel, have kindly written to us, as below, with reference to the quality and working of our Machinery :-

S. PEARSON & SON, CONTRACTORS.

MESSRS. WALKER BROTHERS, PAGEFIELD IRONWORKS, WIGAN.

DEAR SIRS,—We are pleased to confirm what we told you verbally the other day, viz: that we consider the Air Cylinders and Valves of your Compressors to be the best for such work as we have been carrying out on the above Contract.

One of your Engines ran for almost a year without stopping, and it gives us great pleasure to thus testify to the good qualities of the plant which we purchased from you.

We are, Dear Sirs, Yours faithfully. (Signed) S. PEARSON & SON, E. W. MORRIS.

BLACKWALL TUNNEL WORKS, EAST GREENWICH, S.E.

May 10th, 1897.

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ARON HIRSCH & SOHN, Halberstadt, Germany, or to their Agent,

L. VOGELSTEIN, 62 - 64 William St., New York.

QUEBEC MINING ASSOCIATION

The Annual General Meeting of the members of
the General Mining Association of the Province of
Quebec will be held in

WINDSOR HOTEL, Montreal,

On Thursday, 7th March, 1901, at
Twelve O'clock, Noon.

GEO. E. DRUMMOND,
President.

B. T. A. BELL,
Secretary.

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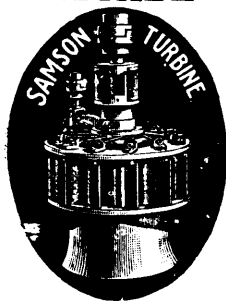
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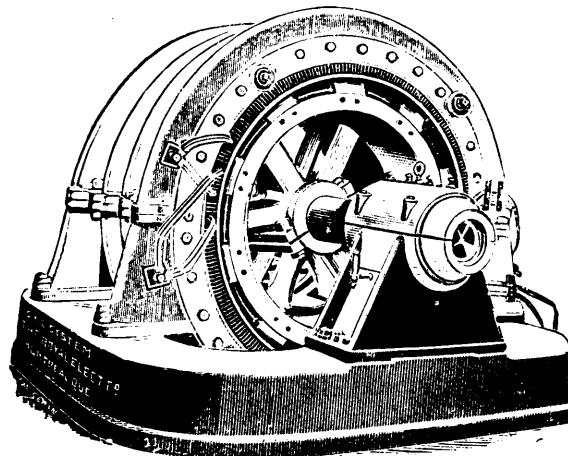
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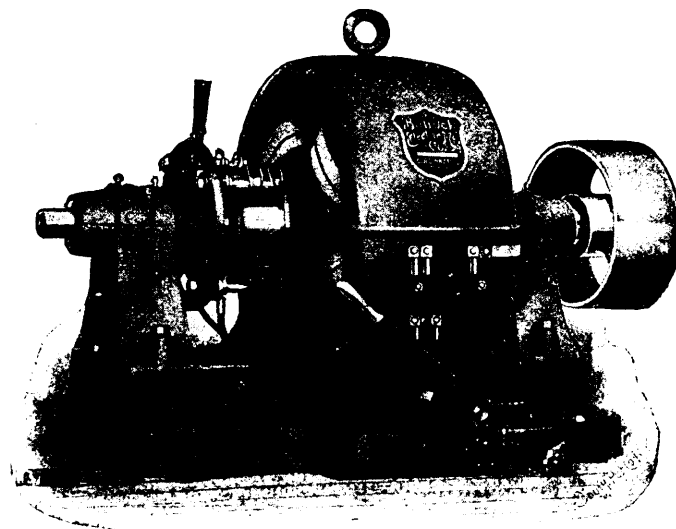


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3—Courses in Chemistry, Assaying, Mineralogy,

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For further information see the Calendar of Queen's University.

4—Post-Graduate Course for the Degree of

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For further information see the calendar of Queen's University.

Next Session begins October 3rd,

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**Matriculation Examination held at Queen's University, Sept. 20th.
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FOR CALENDAR OF THE SCHOOL AND FURTHER INFORMATION APPLY TO 

Dr. W. L. GOODWIN,

DIRECTOR

SCHOOL OF MINING, KINGSTON, ONTARIO.



ANNUAL GENERAL MEETINGS

—OF THE—

Canadian Mining Institute

WILL BE HELD IN THE

CLUB ROOM, WINDSOR HOTEL, MONTREAL,

—ON—

Wednesday, Thursday and Friday, 6th, 7th and 8th March, 1901.

ANNUAL DINNER, FRIDAY EVENING, 8th MARCH.

SPECIAL RAILWAY RATES.

By special agreement with the companies Members of the Institute and any Canadian Mine Manager or Mining Engineer attending these meetings will be carried to Montreal and return for a SINGLE FARE on the CANADIAN PACIFIC, GRAND TRUNK, INTERCOLONIAL, QUEBEC CENTRAL and CANADA ATLANTIC RAILWAYS. Members will ask for Convention Certificate when purchasing their tickets, pay single fare to Montreal, and on having Certificate signed by the Secretary will be returned FREE OF CHARGE.

SYLLABUS OF PAPERS.

The Syllabus of Papers for discussion at these meetings embraces a large variety of subjects of interest and value to Canadian mining men. Among those who have entered their names may be mentioned :—

Mr. HIRAM DONKIN, Glace Bay, C.B.
Prof. COURTENAY DEKALB, Kingston, Ont.
Mr. BERNARD MACDONALD, M.E., Rossland, B.C.
Mr. S. S. FOWLER, S.B., Nelson, B.C.
Mr. E. NELSON FELL, A.R.S.M., Nelson, B.C.
Dr. W. L. GOODWIN, Kingston, Ont.
Mr. P. KIRKGAARD, Deloro, Ont.
Mr. S. B. WRIGHT, Deloro, Ont.
Mr. CHARLES FERGIE, Westville, N.S.
Mr. J. M. CLARK, Q.C., L.L.B., Toronto.
Dr. A. R. LEDOUX, New York.
Dr. FRANK ADAMS, Montreal.
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Mr. A. J. MOXHAM, Sydney, C.B.

Mr. JOHN JOHNSTONE, Glace Bay, C.B.
Prof. W. G. MILLAR, Kingston, Ont.
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Mr. EUGENE COSTE, M.E., Toronto.
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Mr. F. H. MASSON, F.C.S., Halifax.
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and others.

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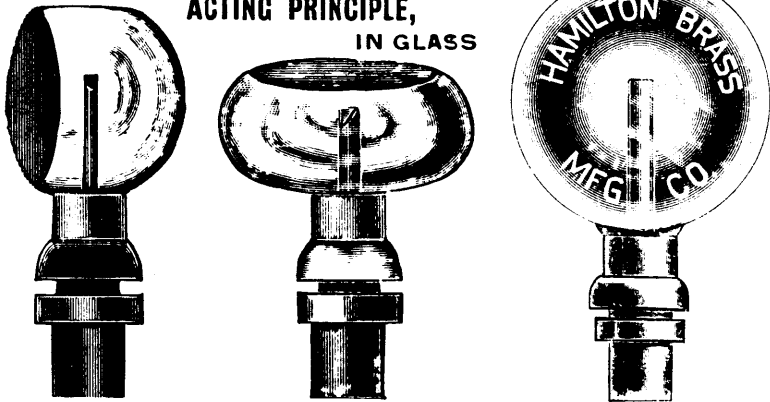
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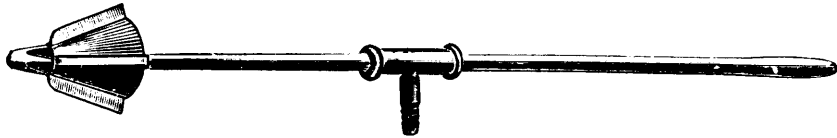
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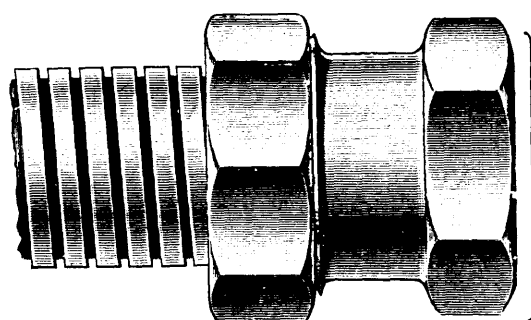
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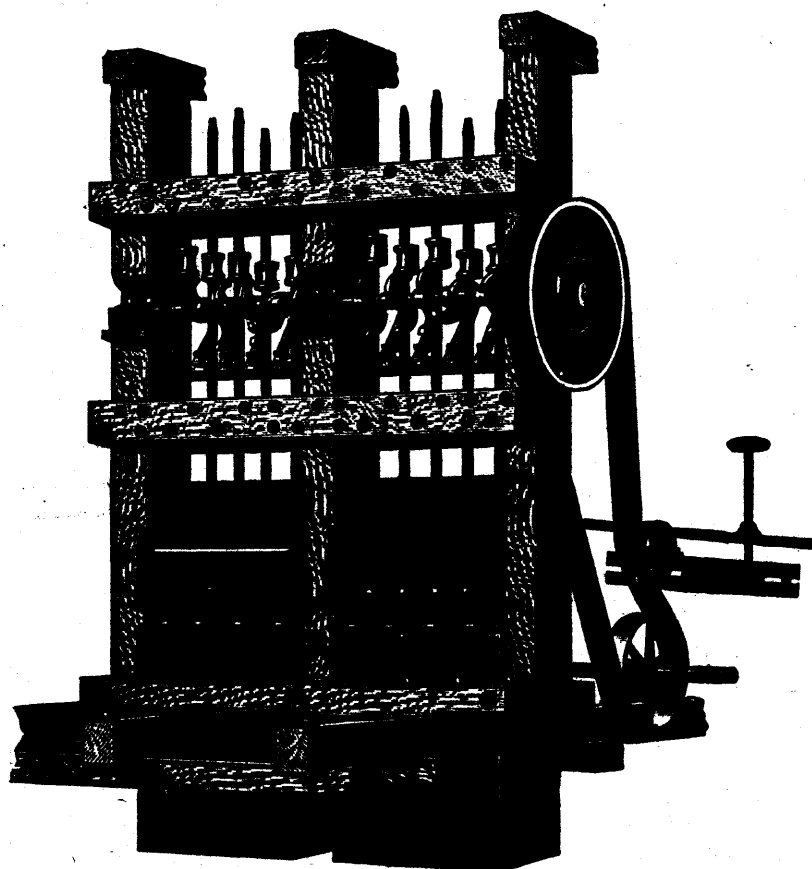
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