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TWENTY-FOURTH YEAR OF PUBLICATION

The CANADIAN MINING REVIEW

Established 1882

Vol. XXVII—No. 5. MONTREAL, NOVEMBER, 1906. $2.00 per year. 20 cents per copy.

DOMINION OF CANADA

SYNOPSIS OF CANADIAN NORTH-WEST MINING REGULATIONS.

COAL.—Coal lands may be purchased at $10 per acre for soft coal and $20 for anthracite. Not more than 320 acres can be acquired by one individual or company. Royalty at the rate of 10 cents per ton of 2,000 pounds shall be collected on the gross output.

A person 18 years of age or over having discovered mineral in place, may locate a claim 1,500 feet x 1,500 feet.

The fee for recording a claim is $5.

At least $100 must be expended on the claim each year, or paid to the mining recorder in lieu thereof. When $500 has been expended or paid, the locator may, upon having a survey, made, and upon complying with other requirements, purchase the land at $1 an acre.

The patent provides for the payment of a royalty of 2½ per cent. on the sales.

Placer mining claims generally are 100 feet square ; entry fee $5, renewable yearly.

A free miner may obtain two leases to dredge for gold of five miles each for a term of twenty years, renewable at the discretion of the Minister of the Interior.

The lessee shall have a dredge in operation within one season from the date of the lease for each five miles. Rental $10 per annum for each mile of river leased. Royalty at the rate of 2½ per cent. collected on the output after it exceeds $10,000.

W. W. CORY,

Deputy of the Minister of the Interior.

Directory of Mining Engineers, Chemists, Assayers, Etc.

24th YEAR OF PUBLICATION

CANADIAN MINING REVIEW

Established 1882

THE OLDEST AND ONLY OFFICIAL MINING JOURNAL PUBLISHED IN CANADA.

Published by The Review Publishing Co., Ltd. PUBLISHED MONTHLY. 171 St. James St., MONTREAL.

VOL. XXVII—No. 5. MONTREAL, NOVEMBER, 1906. $2.00 per year. 20 cents per copy.

THE CANADIAN MINING REVIEW.

Published by THE REVIEW PUBLISHING COMPANY, Limited, P.O. Box 2187, Montreal, Canada.

Subscription, payable in advance, $2.00 per year, including postage.

The REVIEW'S columns are always open for the discussion of questions cognate to the mining industry.

Advertising rates on application.

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CONTENTS.

During the past summer Mr. E. Lindeman, of the Mines Branch, has made magnetic surveys of the Glendover iron range, Ontario, and of an iron range near Bathurst, N.B.

We are informed that the Federal Government has promised a subsidy of $6,400 a mile for the first hundred miles of railway built north from Roberval toward Chibougamau, and that the Quebec Government has pledged itself to a land grant of 7,000 acres per mile for the same length of road.

The catalogue of the Geological Survey publication has heretofore, left to be desired, as the French say. No further reproach will, however, be possible, as a new catalogue has been issued that is a marvel of completeness and intelligent compilation. There are half a dozen different ways of getting what you need from it; if you don't know the number of the publication, you may possibly be aware of the author's name; if not, you may remember the year of the issue, or you may know the region to which it refers, and in any case you will run your quarry to earth by the aid of this invaluable little volume, which, by the way, has been compiled by Mr. W. P. Nicolas.

Another good thing has, seemingly, gone wrong.. The wonderful gold discoveries that were reported from the Peace River, do not apparently exist. Mr. J. A. Macdonnell has written to the Toronto Globe, saying that the samples he brought down with him had been given to the Department of Mines for assay and had been found worthless. Once more we have iron pyrites mistaken for gold, though the tests are so simple that one would have thought that some of the gentlemen connected with Mr. Macdonnell's survey, would have been able to detect the difference. We understand that Mr. Macdonnell claims to have got results of $5.70, $17 and $32 to the ton from some samples of ore that he procured upon the ground. We hope he was not mistaken, in which case there will certainly be another story to tell by this time next year.

The discovery of a large field of bituminous coal under the English Downs shows, that after more than eighteen centuries of prospecting, the end has not been reached in the British Isles. How long will it take to thoroughly prospect and develop the mineral wealth of the Dominion of Canada? The answer should surely run into astronomical figures. The truth is that we have as yet barely scratched the surfaces of a few of the more accessible districts. Mining schools and prospecting classes could be multiplied in Canada to our very great advantage. Meanwhile, the Ontario Government is doing something through its Summer Mining Classes, and we should like to see the other provinces follow the lead set by Ontario. The Geological Survey is doing grand work, but the tasks of the geologist and of the prospector are not identical; the former should point out to the latter where his work might begin, but you cannot expect a man who has to cover a district as large as an ordinary kingdom, in a summer, to do painstaking, detailed work, such as a prospector must do to be successful.

Judging by the reports brought down by the officers of the steamship Adventure, it seems probable that the Canadian and Grand Trunk Pacific Railways will carry most of the wheat from the prairie to the ocean for many a long day to come. The Hudson's Bay route does not seem an attractive one from the point of view of the ordinary shipmaster. Fort Churchill was reached on September 2nd, and it is said that a strong current runs through the river, and the vessel had to anchor a long way out from shore as the tides fall from 30 to 40 feet, leaving 1,500 feet of rock and sand bare at low water. The work of discharge was very slow ; 500 tons of cargo and 3,000 sacks of coal were put ashore. The weather was very stormy, so much so that at times the boats could not leave the ship. Two boats, which broke adrift from a lighter, were driven ashore and smashed. Two other boats attached to the stern of the steamer were sunk. The two gasolene launches were repeatedly injured by contact with the rocks. After this spell the weather suddenly changed, becoming cold with fierce snow storms, and, fearing to remain any longer, Captain Couch, of the Adventure, left on the 1st of October, with the balance of the coal, some 4,000 sacks. It was then freezing hard at night and six inches of snow lay on the ground. On the evening of October 3, the vessel passed through heavy Arctic ice, running strongly southward. The Adventure, however, scraped her way safely through. At Cape Chidley, on the 5th, the vessel encountered a strong gale of wind with thick snow, and this weather lasted all the way down the Labrador coast to Belle Isle, which was reached on Tuesday evening, October 9. The weather was mild but foggy for the remainder of the trip to St. Johns, Newfoundland.

The Mines Branch of the Department of the Interior under the direction of Dr. Eugene Haanel, Ph.D., has issued during the past few years a number of publications in addition to the annual reports. A great deal of very valuable work has been done in a quiet, unostentatious way, though, no doubt, most students of mining have kept themselves fairly well posted, and have managed to obtain copies of all the publications as they issued. In case, however, some of our readers have overlooked one or more of these reports, we would call their attention to the following list:—

"On the location and examination of magnetic ore deposits by magnetometric measurements."

Report on the Great Landslide at Frank, Alberta, 1903.

Report on the Mining Conditions in the Klondike, Y.T.

Preliminary report on the Limestones and the Lime Industry of Manitoba.

Preliminary report on the Industrial Value of the Clays and Shales of Manitoba.

Preliminary report on the raw materials, manufacture and uses of Hydraulic Cements in Manitoba.

Report on Mica, its occurrence, exploitation and uses.

Report on Asbestos, its occurrence, exploitation and uses.

Report of the Commission appointed to investigate the different electro-thermic processes for the smelting of iron ores and the making of steel in operation in Europe.

Preliminary report on the experiments conducted at Sault Ste. Marie, Ont., under Government auspices, in the smelting of Canadian iron ores by the electro-thermic process.

Report of the Commission appointed to investigate the Zinc Resources of British Columbia and the conditions affecting their exploitation.

Moreover, magnetic surveys have been made and maps constructed of the following magnetite deposits:

Baldwin Mine, Que.

Temagami Iron Range, Ont.

Calabogie Mine, Ont.

A revision of the iron ore deposits in Charlotte County, N.B.

Lot 7-A, Range V, Township of Leeds, Que.

Wilbur Mine, Township of Levant, County of Lanark.

The Belmont Iron Mine, Township of Cordova, Peterborough County.

We understand that a full report of the experiments in the smelting of Canadian mine ores by the electro-thermic process, at Sault Ste. Marie, will soon be available for distribution, as well as a monograph on graphite, and preliminary reports by Messrs. Hille, Cirkel and Dr. Woodman, on the iron ore deposits in Northwestern Ontario, along the Ottawa Valley and in the United States.

COBALT SHIPMENTS.

The official figures of the shipments of ore to the smelters from the mines in the Cobalt and Haileybury districts over the Temiskaming and Northern Ontario Railway for the month of October have been issued. The aggregate of the ore was 1,120 tons. The details and dates of the shipments follow, the amount of ore being in pounds:

From Cobalt—Oct. 2, La Rose mine, 43,000 pounds; Oct. 2, A. Longwell, 60,000; Oct. 2, American S. & R. Co., 40,000; Oct. 3, C. L. Dennison, 60,000; Oct. 3, Balbach Smelting Co., 60,000; Oct. 3, C. L. Dennison, 40,000; Oct. 5, Nipissing mine, 61,730; Oct. 5, Nipissing mine, 60,450; Oct. 5, Foster mine, 64,000; Oct. 5, F. L. Culver, 40,040; Oct. 6, R. A. Bailey, 60,000; Oct. 9, American Smelting Co., 60,000; Oct. 9, Nipissing mine, 60,275; Oct. 9, Nipissing mine, 60,020; Oct. 11, American S. & R. Co., 60,000; Oct. 13, Nipissing mine, 60,490; Oct. 13, Nipissing mine, 40,540; Oct. 15, Nipissing mine, 60,130; Oct. 16, University mine, 45,000; Oct. 16, Nipissing mine, 61,710; Oct. 16, Nipissing mine, 41,560; Oct. 16, La Rose mine, 53,600; Oct. 18, Nipissing mine, 49,820; Oct. 20, Nipissing mine, 60,090; Oct. 20, Nipissing mine, 60,080; Oct. 23, Nipissing mine, 61,230; Oct. 23, F. L. Culver, 41,560; Oct. 23, F. L. Culver, 56,780; Oct. 24, A. Longwell, 60,000; Oct. 24, A. Longwell, 60,000; Oct, 25, Nipissing mine, 61,490; Oct. 25, Nipissing mine, 59,500; Oct. 26, Foster mine, 63,000; Oct. 26, Nipissing mine, 60,860; Oct. 29, Nipissing mine, 60,650; Oct. 30, American S. & R. Co., 56,000; Oct. 31, Silver Queen, 47,590; Oct. 31, C. L. Dennison, 40,000; Oct. 31, Nipissing mine, 50,430.

From Haileybury—Oct. 24, W. G. Hunt, 40,000 pounds.

THE CONSOLIDATED MINING AND SMELTING CO. OF CANADA.

The first report of this company, covering the six months ending June the 30th, 1906, has just been issued, and is given elsewhere in this issue. It is, without peradventure, the most remarkable document of the kind ever made public by a Canadian mining concern. The sort of thing it develops is what we are accustomed to find in the reports of the Banks of Montreal, and of Toronto, the Canadian Pacific Railway, etc., but that a Canadian mining company should minimise its earning power and disguise its assets is a new experience.

The Consolidated Mines was formed about a year ago, to take over the Trail Smelter and the War Eagle, Centre Star mines, etc.

The first operation was the amalgamation of the War Eagle with the Centre Star. The par value of the War Eagle was reduced by this operation from $1,750,000 to $1,166,667. The St. Eugene, one of the big silver-lead properties of the world was also taken in, and the Consolidated figured out, as follows:—

Old value.	Companies.	New value.
$3,500,000	St. Eugene	$2,333,300
4,666,667 (estimated cost)	Centre Star	1,555,500
1,500,000	Trail Smelter	750,000
600,000	Rossland Power	60,000
$10,266,667		$4,698,800

When you leave 46c, and run off 55c on the dollar, of "stock water," you use the spigot somewhat freely, and, to say the least of the matter, it reverses the usual process of consolidation.

The new business began business as follows:—

Assets.

Mines and Plant	$3,900,000
Cash in Bank	325,315
Ore Shipments	153,628
Government Bounties due ..	17,450
Accounts receivable	100,274
Stores on hand.	202,220
	$4,698,887

As, however, it was announced in the initial report that the stock of metals, ores, etc., on hand when the Company took over its property to the value of $902,460, could be purchased on favorable terms, the business was in all probability actually inaugurated with gross assets of $5,286,087, and liabilities of $577,145 over and above the capital stock of $4,698,887. This was probably a bank loan in some form or shape. After six months of actual operation, the directors are able to report that the assets have increased to $5,532,327, an increase of $256,300.

The property account has been increased to $4,047,586, an increase of $147,586. This includes the Iron Mask, an abutting mining claim, purchased during the half year, and an expenditure of $130,997 on construction account.

The stock of smelter products, on hand, or shipped, ores, etc., has increased to $1,148,233, an increase of $86,147.

Fluid assets, stores, accounts receivable and bounties, etc., has increased to $333,299.55, an increase of $13.355.

The increase in these assets, amounts, therefore, to $247,088. The indebtedness to the Bank at the date of the statement applying to the portion of the business was $415,081.52, and there is an additional liability of $78,000, a guaranteed advance to the Snow-Shoe, to be repaid to the bank from the ore supplied by this mine.

In addition, one quarterly dividend of $117,470 was actually paid at that time. Two dividends of the same amount have since been paid.

The profit and loss account for the six months is, however, the most interesting statement of this kind possible. It is probably unique.

In all 157,640 tons of ore was smelted, yielding 64,590 oz. gold, 1,074,255 oz. silver, 15,133,683 lbs. lead, 2,391,161 lbs. copper, to a value of $2,994,927, and of this $1,622,450 came from the companies own mines.

The actual cost of mining, smelting and shipping this metal was $2,942,809.18. The sales of smelter products and of ores amounted to $3,309,665.20, a difference of $356,856.02, on the right side, but in addition the stock of metals and ores on hand had increased from $908,144.20 to $1,248,233.50, an increase of $346,089, so that the surplus over cost of production is $702,945. This is the surplus profit for the six months operation of a Canadian mining company, that is in the mining business as a business. The profit shown is only $325,854, and this result is obtained by charging off $245,176.48 for development work in the mines, and writing off $45,905 for depreciation.

The gross profit is magnificent and if the $245,000 spent on development does not represent the daily and hourly development necessary to the success of any mining property, but is, as there is reason to believe, the sort of "development that does not require to be repeated," the future of the concern would seem very bright.

The expenditure on the property admitted during the six months is:

On Construction Account	$130,979
On Development Work	245,176
	$376,155

In his report, the managing director informs the directors that during the six months there has been 15,461 feet of workings driven in the company's mine.

That an 1,100 horse hoist has been installed in Centre Star, and the workings of Centre Star, War Eagle and Iron Mask have been united so that in future, all the ore will be hauled up one shaft in 4½ ton skips.

That the electrolytic lead refinery has been increased in capacity from 50 tons to 75 tons per day, a new copper furnace added and other refining improvements made.

That the Iron Mask, a mining property having $242,451 of "probable ore" has been acquired.

The ore reserves of both the St. Eugene and the Centre Star have been increased.

This really means a great deal to get for $376,155 practically written off the profits for the first six months of even a "consolidated" business.

That every dollar that has been spent on the working of the mines, their development, and on the smelter, has been well spent, is, we believe, an undoubted fact.

It must not be forgotten that the Consolidated Mining & Smelting Company is as much a manufacturing plant as is the United States Steel Company, for instance, and the continued success of this enterprise, means the continuous prosperity of the mining industry in the Rossland district. Incidentally, the shareholders of the Consolidated Mines and the Canadian Gold Fields Syndicate (a concern with $600,000 capital, holding $426,600 in shares par value of Consolidated Mining stock), are to be congratulated. The net earnings, as shown, amount to to $14.04 per cent. per annum, on the capital stock. The pertinent and remarkable fact is, that when in the natural course of events a profit of 30 per cent. could have been shown, the ultra conservative course of cutting down the declared profit to 14.04 has been adopted, and this by the biggest, the best managed and most enterprising mining concern in the country. Is this an indication that the day of wild cat "mining" stock mines has passed, and that of the man that mines ore for profit has come?

CANADIAN ZINC PRODUCTION.

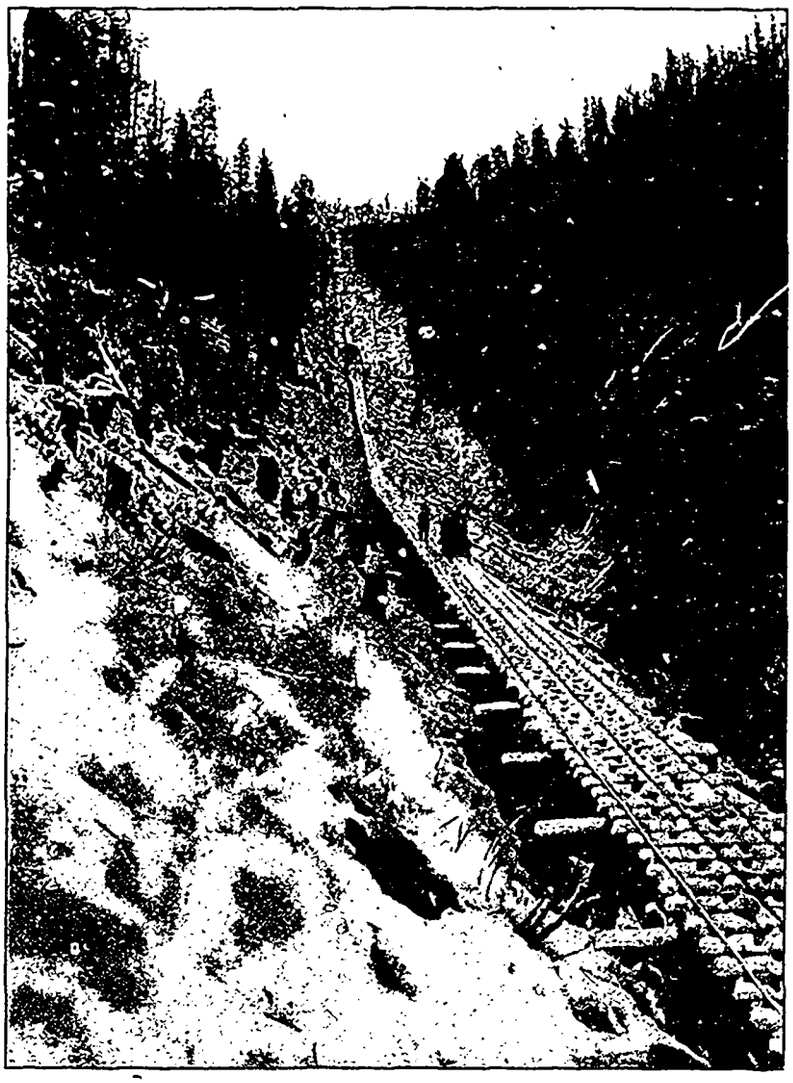
The report of the Commission appointed to investigate the zinc resources of British Columbia, and the conditions affecting their exploitation, is being distributed by Dr. Eugene Haanel, Ph.D., Superintendent of Mines.

Our readers will recollect that this Commission was instructed to undertake the investigation of the zinc resources of British Columbia, and their commercial possibilities during the summer of 1905. The gentlemen who composed it were: Mr. Walter Renton Ingalls, editor of the Engineering and Mining Journal, New York City; Mr. Phillip R. Argall, M.E., of Denver, and Mr. A. C. Garde, of Nelson, the former taking charge of the field work in connection with the developed mines of the province, the latter acting as Mr. Argall's assistant.

The report is a volume of 400 pages, and deals exhaustively with the production of British Columbia, the character of the ore, the markets, valuation, and cost of smelting, and, moreover, gives a history of the industry since its inception.

The districts treated of in detail, comprise:—Ainsworth, Slocan, East Kootenay, Nelson, Vancouver Island, and Texada, the coast of the mainland and the interior, from which it will be seen that all regions that have proved productive of zinc in British Columbia receive attention.

Mr. Ingalls says in his introduction that, British Columbia, the most westerly province of the Confederation forming the Dominion of Canada, comprises principally that section of British North America lying to the westward of the summit of the Rocky Mountains. The northern boundary of the province is the 60th parallel of latitude; its southern



Payne Tramway, Sandon, B.C.

boundary is the United States of America, or practically the 49th parallel; on the west it is bounded by the Pacific Ocean, and on the east by the Rocky Mountains; beyond that by the 120th meridian of west longitude. The total area of British Columbia is about 382,000 square miles. The country is traversed in a north-westerly direction by four more or less continuous chains of mountains, between which lie long and generally narrow valleys. These valleys form the channels of streams, which drain into the Columbia River; and in the southern part of the province several of them are occupied by long, rather narrow, navigable lakes, affording means of water-transportation, which have been extensively employed. This system of lakes has had an important bearing upon the development of the mineral resources of the province.

It was not until 1893 that the lode mines of British Columbia really began to be productive, the output from this source during the six years immediately prior to that date, amounting to an average value of only $60,000 a year, was derived from selected rich ores found near the existing lines of transportation.

In 1893, however, the value of the production of the lode mines of the province rose to $300,000, since which time there has been a steady increase, until in 1901 the output from this class of mining reached a value of $13,683,044. It fell off slighly in 1902, but the decrease was due principally to the lower market value prevailing, and in 1903 an upward tendency again became apparent.

The total shipments of zinc ore from the Slocan district, according to a statement by Mr. A. C. Gardé, from the Canadian Pacific Railway office at Nelson, B.C., are shown in the subjoined table. which include the ore passing over both the Canadian Pacific and Kaslo & Slocan roads:

Name of Mine.	1902.	1903.	1904.	1905.
Bosun	580	681	...	...
Wakefield	35	181	151	...
Payne	667	610	1,001	98
Whitewater	...	...	...	101
Ivanhoe	...	256	902	713
Hartney	...	...	21	...
Wellington	...	...	...	33
Bound Mair	...	...	60	...
Lucky Jim	...	...	48	2,462
Idaho-Alamo	...	...	30	60
Slocan Star	...	686	...	3,978
Canadian Smelt'g Wks.	...	...	...	260
American Boy	...	...	21	129
Last Chance	...	...	...	22
Blue Bell	...	...	...	37
Total	1,282	2,564	2,084	7,893

The statistics for 1905 cover only the first ten months of the year.

According to information furnished by Mr. Mackintosh, collector of the port, the shipments of ore passing through Kaslo, destined to the United States, from January 1 to October 31, 1905, were as follows:—

Name of Mine.	Tons.	Grade of Ore.					Remarks.
Lucky Jim	2785	53%	Zn.	9.5%	Pb.	3 oz. Ag.	Lump ore.
Whitewater.	101	47	"	3.0	"	33 "	" "
Wellington.	32	50	"	3.0	"	55 "	" "
Last Chance.	64	35	"	4.0	"	66 "	" "
Amer'n. Boy	140	42	"	7.0	"	9 "	" "
		47	"	2.0	"	15 "	" "
Slocan Star..	3566	32	"	3.0	"	32 "	Concentrate.
		35	"	2.5	"	45 "	"
Silver Bell ..	37	49	"	0.5	"	4 "	Lump ore.
Total.....	4125						

Mr. G. O. Buchanan, Dominion Inspector of Lead Bounties, Kaslo, B.C., communicated to me, under date Dec. 15, 1905, the following statistics of zinc ore production in 1905, compiled from reports received from the owners and managers of the respective mines:—

Name of Mine.	Tons.	Assay in Zinc.	Remarks.
Slocan Star	4,093	33.5%	Concentrate
Lucky Jim	4,600	54.0	Lump Ore t
Lucky Jim	7.45	48.0	Concentrate
Ivanhoe	541	46.0	"
Ruth	1,000	38.0	"
Jackson	1,150	38.0	"
Bell	130	50.0	"
Idaho	61	37.4	"
All others (estimated.	1,000	40.0	"
Total	13,320	42.0	

It may be safely estimated that the shipments of zinc ore from British Columbia since the beginning have been approximately as follows:—

Year.	Tons.	Year.	Tons.
1899.	1,600	1903.	2,564
1900.	none	1904.	2,828
1901.	none	1905.	8,561
1902.	1,282		

The actual production in 1905 was possibly 3,000 to 4,000 tons more than the shipments, but this is largely ore held for treatment by magnetic separation for the enrichment of its grade in zinc, which will correspondingly reduce its weight.

The zinc ore so far produced in British Columbia has been blende. No calamine has been shipped, and the existence of any important supply of that class of ore has not been reported. The blende has been shipped partly as hand-sorted lump ore; partly as mill-concentrate. The former has been of the highest grade in zinc. The grade of the mill-concentrate is reduced by the intermixture of siderite (spathic iron ore) and pyrites (pyrite and pyrrhotite), which occur commonly with the blende of the Slocan, and cannot be satisfactorily separated by ordinary mechanical concentration.

The blende of the Slocan is commonly of the

variety known as "black jack," and is generally of bright luster. The black coloration of blende is not necessarily an indication of high content in combined iron; for example, the blende, of Wisconsin, is sometimes black, but is low in combined iron. Blendes which are black in color and of brilliant lustre are apt to be high in combined iron, but not always. The Slocan blendes do not appear to be high in combined iron as a general thing; nor are they, as a rule, high in cadmium.

The analysis of Slocan zinc ores show that they contain few objectionable impurities, and none of them in excessively large quantity. The percentage of iron is moderate and the percentage of lead is low. As a general thing, the ores are rather low in cadmium; some of them contain a little manganese, but not much. The percentage of lime is very small. Fluorspar is entirely absent. Arsenic and antimony are present in some of the ores. The coarser portions of the solid zinc ores can be hand-sorted up to a tenor of 50 per cent. zinc. By combined wet and magnetic concentration ore assaying as high as 55 per cent. zinc can be produced, and 50 per cent. zinc ought to be a fair standard of practice with regard to a large class of ores.

The zinc ore which has been heretofore produced in British Columbia has been marketed chiefly in the United States, the smelters at Pueblo, Colo., and at several points in Kansas having been the principal buyers.

A comparatively small quantity of ore has been exported to Europe. Since about the end of November, 1905, a smelter at Frank, Alberta, has been in the market for these ores. There are, therefore, three markets open to the ores of British Columbia, viz.:—(1) the American; (2) the European; (3) the Canadian, which, however, is still in a tentative condition. With respect to these markets widely different conditions obtain.

The value of a zinc ore depends chiefly upon its tenor in zinc and objectionable impurities; especially iron, manganese and lime, which increase the corrosion of the retorts; and lead, arsenic, and antimony, which contaminate the spelter. The value of the ore is also affected by its character, whether oxidized or sulphide, or a mixture of both; the sulphide ore must be roasted, but yields a diminished weight for the subsequent treatment, which is the more expensive part of the process; the oxidized ore escapes preliminary treatment, unless it be carbonate, but suffers no diminution in weight. The preliminary treatment of ores which are mixtures of sulphides and oxides, is often troublesome. The value of an ore is, moreover, affected by its physical character. Lump ore is subjected to an additional expense for crushing; fine slimes are more expensive and troublesome to roast than coarser concentrates. Some ores roast and distil easily; others with more difficulty. All these factors are given consideration by the zinc smelter. The chemical composition of the ore is, however, the most important factor in determining its value.

In determining the treatment charge on the ore purchased, the smelter starts with the cost of smelting a ton of the ore of average composition, that is to say, the mixture on which he proposes to operate his furnaces on the same charge, for various reasons, to this smelting charge he adds the profit that he ought to make to obtain a proper interest on his investment allowing for the necessary amortization of his outlay in plant.

The further addition of the freight on the ore to his works, and on the spelter product to its market, with allowances for the cost of buying the ore and selling the spelter, gives the returning charge which he must make against the ore in buying on the basis of f.o.b. cars at the mine or mill where produced.

The ores purchased will be of various kinds. Few will correspond exactly with the ore which is aimed to charge into the furnaces. Some will be higher in zinc; others will be lower. Some will be too high in iron; others too high in lime. The very desirable ores can perhaps be purchased only at a small margin. The deficiency must then be made up from the price of the less desirable ore. Inasmuch as the various kinds of ore may not be bought contemporaneously, the smelter effects this balancing in price by arbitrary additions to the returning charge on certain kinds of ore, according to the percentage of objectionable impurities contained. It may be necessary under certain contingencies to put a less advantageous charge into his furnaces, when the cost of smelting will be directly increased, and the percentage of metal extraction decreased, by greater destruction of retorts, higher zinc tenor of the residues, or some other factors which have a powerful influence on the ledger.

It is the custom of European smelters to pay for ores according to a sliding scale, which combines three elements, viz.: The price of spelter and zinc content of the ore, which are variables, and the returning charge per ton of ore which is fixed. This sliding scale is embodied in a convenient formula, from which any seller of ore can readily compute the value, the returning charge having previously been agreed upon in the contract.

American smelters compute the value of ore in practically the same way, but in purchasing custom lots of ore they make, usually, a direct bid of so much per ton, and in purchasing ore on contract they frequently employ an involved sliding scale, which is generally equitable, though less simple than the European.

The cost of smelting ores is but imperfectly understood by those who have not had experience in the business. This does not refer only to the smelting of zinc ores, but also to the smelting of other kinds of ore. I may go further and say that it is imperfectly understood even by many metal-

lurgists who are practically engaged in the business. The operating cost per ton of ore smelted is one thing; this is comparatively easy to determine, but it tells only part of the story. The total cost of smelting is quite another thing, and is not so easy to determine; this includes not only the direct operating cost, but also the allowances for administration of the business, interest on the money invested, and amortization of the capital laid down in plant construction. The capitalists who invest their money in a metallurgical plant not only expect to receive a proper interest on it, but also expect to preserve the principal intact. The subject has been discussed so thoroughly in industrial economics that it is unnecessary to go into it here to any further extent than will outline the fundamental principles.

There have been instances where plants have been erected for the specific purpose of working up a definite supply of material, only that and nothing more. Assuming it to be contemplated that such a purpose will be consummated in two years of time, it is obviously necessary to charge one year's operation with one half of the cost of the plant. Ordinarily, however, the calculation for amortization is not so simple, because the life of the plant can not be so definitely foretold, but even under the most favorable prospects as to continuance of the supplies of raw material, and the conditions which govern the operation of the works and the marketing of its products there are considerations as to the life of the plant, both in part and as a whole. Some of its apparatus, in spite of the most liberal outlay for repairs and renewals, will wear and become useless, often in a comparatively few years. Other parts may, perhaps, be kept in excellent condition for many years, but may become unprofitable through advances in the art, whereby the competition of more modern and superior methods of machines may render the old ones practically useless. This consideration, which has aptly been referred to as "depreciation due to the advance in the state of art," applies not only to particular machines and methods, but also to the plant as a whole. Anyone who will look around in the industry with which he is most familiar, and will observe the number of plants of no more than ten years' construction, which have become idle and out of date, will appreciate the importance of this industrial calculation.

It is a common practice among engineers in considering the probable standing of a new metallurgical project to reckon an amortization period of ten years, i.e., the first cost of the plant must be reimbursed in that time, not necessarily with a view to the distribution of the original investment among the subscribers, but rather with view to the maintenance of the value of the plant to the possible extent of a complete replacement at the end of the time reckoned. Prudence seldom permits the estimate of a longer amortization period than ten years. In some cases it is unsafe even to reckon so long a time as that. The assumption of an amortization period of ten years implies that 10 per cent. of the first cost of the plant must be added annually to all the cost of direct operation, and, moreover, a certain interest charge must be added in order to arrive at the actual cost of the production. Reduced to the basis of a ton of ore the relative magnitude of these charges depends upon the cost of plant per ton of annual capacity. For example, the cost of a first-class copper smelting plant of 1,000 tons daily capacity, or, say, 350,000 tons per annum, is about $600,000, which is about $1.70 per ton of annual capacity. The cost of a silver-lead smelting plant of the same capacity is about $800,000, which is about $2.50 per ton of annual capacity. The cost of smelting a ton of copper ore in such a plant is roughly about $2.50; the cost of smelting a ton of silver-lead ore is, roughly, about $3.50. In the former case about 15c per ton should be added to the smelting cost for amortization; in the latter case 23 cents per ton; in both cases the amortization charges are only about 7 per cent. of the direct operating cost. In zinc smelting the conditions are quite different, not only in this, but also in other respects.

The metallurgy of zinc is frequently spoken of as a backward art, the smelting process still being expensive as compared with that of lead and copper ores, while the proportionate extraction of metal is greatly inferior. This idea rests, however, on false standards of comparison. The zinc smelter, as a rule, deals with ore which has already been enriched to a high degree, so that this practice is comparable to that of the smelter of galena concentrate, or of black tin ore, rather than to that of the silver-lead or copper smelter, who has to treat a very large quantity of ore for a comparatively small production of metal. In other words, while the copper smelter makes commonly a concentration of 20 to 1 and even 50 to 1, the zinc smelter makes a concentration of only 2 to 1 or 3 to 1. In handling the less quantity of raw material, it is generally permissible to utilize wheelbarrow and shovel to a greater extent; but if the cost of the process be referred to the basis of the crude ore raised from the mine, the smelting expense may not appear unduly heavy.

The addition which is lent to the value of zinc ore by a silver content is a matter of both interest and importance in connection with the ores of British Columbia, inasmuch as they are generally silver-bearing; occasionally silver-bearing to a high degree. The highly argentiferous ore, however, is much smaller in proportion than the ore which is comparatively low in silver. In some cases the ores run very high in silver, but such occurrences exist elsewhere, especially where tetrahedrite (grey copper ore) or similar silver minerals are associated with the blends. These high silver-zinc ores, how-

ever, are commonly considered not as material for the zinc smelters, but for the silver-lead smelters, to whom they are disposed of.

There are comparatively few American smelters who are equipped, or are in a position to extract silver and lead from the zinc ore which they treat. There will doubtless be, however, an extension of interest in this direction. In such cases as the smelters are especially in the market for this class of ore, the practice of purchasing is similar to the European. Thus, one contract for Canadian ore provided for the payment of silver in excess of 8 oz. a ton at the rate of 50 per cent. of the New York quotation for silver. On an ore assaying 20 oz. silver per ton, 40 per cent. zinc, and over 5 per cent. lead, a price of $9.50 per ton f.o.b., Sandon, was made in August, 1905; with a zinc variation of 75c per unit above or below 40; and a silver variation of 40c per oz. above or below 20 oz.

A vast amount of ingenuity, energy, and money has been spent, since 1860, upon the development of hydrometallurgical processes of zinc extraction, the idea being to bring the zinc into solution (usually as sulphate); separate the solution from the residue (which will contain the silver and lead of the ore, together with the gangue); precipitate the zinc by suitable re-agents, and pass the product on to the smelting furnaces, or precipitate it in metallic form by electrolysis; and pass the insoluble residue on to the lead furnaces.

Electrometallurgical processes of this character are hopeless, save under certain especially favorable conditions, primarily because of the high amount of power that is inevitably required to electrolyze solutions of any of the salts of zinc. Vast sums of money have been expended in proving by the erection of large works for the operation of such processes the fundamental principles, which could have been worked out in the office, and the practical behavior of the scheme working, which could have been determined in the testing-laboratory, for one per cent. of the money. The conditions under which processes of this character may prove workable are: (1) in the case of processes affording a useful anode reaction, the application at places where advantage can profitably be taken of it; and (2) the availability of very cheap water power.

It is extremely doubtful if any hydro-metallurgical or electro-metallurgical process, even under the most favorable conditions, could show a commercial superiority over the present combination of standard methods in the treatment of such an ore as has been referred to. Starting with an ore containing 24 per cent. zinc and 6 per cent. lead, separated magnetically or electro-statically at a cost of $1.00 per ton, approximately 0.33 ton of zinc ore, containing 50 per cent. zinc, or nearly 69 per cent. of the zinc in the original ore, and 0.55 ton of lead-iron ore containing 9 per cent. lead, or approximately 82.5 per cent. of the lead in the original ore, are obtained. Carrying the computation forward to the final extraction of the metals, good practice should yield about 60 per cent. of the original zinc and 78 per cent. of the original lead, at an aggregate cost not to exceed $7.00 per ton of crude ore, disregarding freights, interest, amortization of the plant, etc. A complete analysis of this plant would be quite complicated, but the above figures will give a rough indication of the present state of the art.

THE LA PLATA.

By Alfred W. Dyer.

The story of the progress of the Molly Gibson (La Plata) mine is a story of great progress under tremendous difficulties. In the first place the mine is situated at the foot of a glacier, 20 miles from Nelson, and ten miles from the nearest shore of the west arm of Kootenay Lake, 7,500 feet above sea level, and, therefore, nearly 6,000 feet above the level of the lake. Further, the ore is contained in a vein which, though strong and continuous for several thousand feet, is yet of varying width. Its value, after being gophered for years, is about $13 per ton, the returns being chiefly in silver. As transportation by waggon to the lake is about $4.00 a ton, and the further freight and treatment, $12, it will be seen that the company was facing a difficult problem, when the further development of the property was decided upon two years ago.

Then Captain Trethewey was placed in charge. He found that the old tramway, connecting the mine with the end of the waggon road, 2,500 feet below, was down, that the mine buildings were destroyed; that a mill would be needed to treat the ore, and that a lake had to be dammed and a flume constructed to get the necessary power. Moreover, it was necessary to first place a sawmill on the ground.

All these things have been done. The mill made its first run in June and completed a month's work with an average saving of over 80 per cent. after the failures of the inception are neglected. Now the company is installing a compressor.

The vein runs east and west for 10,000 feet. It has been opened by a series of tunnels, eight adits in all, showing the ore body to be continuous from the extremities of the workings for 2,500 feet. This also gives a depth of 750 feet. The management thinks it has sufficient ore in sight to keep the new mill going for the next ten years, without any further development.

The ore runs from 15 ounces up to 100 or more with about 2 to 4 per cent. of lead, with a zinc content that seldoms exceeds, in the concentrates, the ten per cent. limit now imposed by the Kootenay smelters. The country rock is a felspathic granite with unusually large felspar crystals. There is some intrusive diorite but the vein is little disturbed.

The mill is fed by an aerial tramway 8,450 feet in

length. It is of the button and clutch type, built by Fraser & Chalmers. The ore is dumped on a grizzley, the oversize passing into a Blake rockbreaker, and thence on to an 80-foot travelling belt, where a certain portion, something less than a fourth, is taken out, as clean ore and fit for direct shipment. The remainder falls through a chute into a Star crusher, and is automatically hoisted to the top of the mill. At the crusher a sample of the heads is taken. The sampler passes through the ore flow twice, and hence takes double the portion from the surface, the lighter and less valuable part of the flow, than from the bottom. Hence the head samples show less than the value of the ore. At the top of the building the ore flow is directed through trommels. All oversize, not being able to pass the ½-inch mesh, is sent back to the crusher, automatically. From the trommel the flow passes to the first and second jigs, of two and three compartments respectively. The remainder in the first jig is conducted directly to the ore bins, the second compartment containing the middlings. In the second jig the first compartment saves the clean ore, and the second and third the middlings. The overflow from both jigs is waste and goes directly out of the mill. One-fourth of the feed is thus thrown out of the mill at an early stage in the working. About five-eighths is treated as middlings and one-eighth is directly saved. The tailings seldom run over an ounce, and it is to this system that Captain Trethewey places the high recovery of the mill.

The middlings go through a second crusher, through a second trommel, exactly as before and thence through four hydraulic classifiers. The coarser particles are sent through launders to three five-compartmented jigs, the waste eliminated and the remainder sent back to a five-stamp battery, but it is only a very small percentage of the original mill feed which is thus expensively treated.

From the battery the flow is again directed to hydraulic classifiers, jigs, settling tanks, Overstrom tables and Frue vanners. The remainder passes away as tailings. In these tailings the chief loss is made. The more perceptible, the higher the zinc content. The management have under consideration various methods of impounding these tailings for future recovery.

The concentrate thus made runs six or seven to one. For the last week in June the mill feed ran 17½ ounces silver; three per cent. lead; one per cent. zinc. The concentrates represented 107 ounces silver, 29 per cent. lead and 12 per cent. zinc.

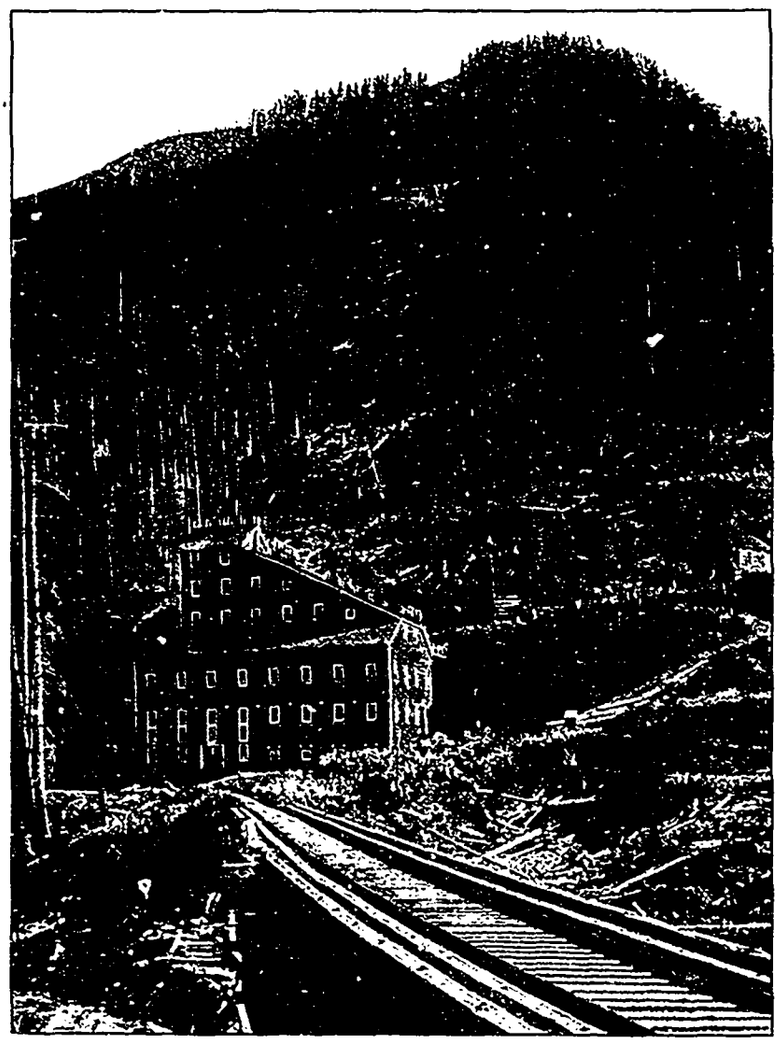
The mill is run by water power obtained by damming a glacier fed lake, 300 feet above and about three and one-quarter mile distant. A Pelton wheel, of 15 h.p. runs belt and breaker, and another wheel of 50 h.p. runs the mill. Two men run the whole of the mill proper, with another man on the ore belt; another sacking ore, and a third running the tramway. The capacity, one shift a day of 12 hours, is between 50 and 60 tons, which is the output of the mine for the present and until the compressor can be installed for steam drilling.

MINING LAWS.

By Dr. W. S. Goodwin.

Ore deposits differ from every other large asset of a country in a very important respect. They are not in any way reproducible. Agricultural products are continuous year after year so long as the soil remains fertile naturally or is kept up to its fertility artificially. Fish reproduce as fast as they are caught, so long as the catching is done in a regulated conservative way. With a proper system, the forest yields its crop from generation to generation without any tendency to exhaustion. But, once an ore deposit is removed (with one or two exceptions), it is not replaced within any period which comes under human observation. This peculiarity gives valuable minerals the character of hidden treasures, to be found and used. It is on this account, no doubt, that in most countries, mineral rights are reserved to the Crown when surface rights are granted, sold, or leased by a government; and the laws under which mineral rights are disposed of by a government form a problem with which all mineral countries have wrestled. Mineral resources, to be available, must first be found, and they must next be developed and mined. Here is where the difficulty arises in framing a mining law. On the one hand the law must give encouragement and fair play to the men who search for and find the valuable deposits. On the other, it must so guard and define the general public interests that development and mining shall not be retarded or indefinitely postponed. It should be noted that development and mining may be interfered with in two very different ways: (1) by a law which makes such burden some conditions that the tempting profits of mining operations disappear, and (2) by a "wide open" law, which allows large areas of mineral lands to be held undeveloped for speculative purposes.

Perhaps the most difficult problem of all in mining legislation is that of the conditions upon which a mining claim is allowed. There are two extremes: (1) the enaction of a *bona fide* discovery, and (2) granting the mineral rights merely upon application. The former implies inspection by a properly qualified government officer. That this is the case is shown by the universal experience in countries where discovery is required by law, but where the affirmation of the applicant is taken as sufficient. In all such cases that part of the law has become a dead letter and many applicants lightly perjure themselves as a matter of use and wont. This has been well illustrated by a number of cases to which attention has been lately called in Ontario. Experience and common sense agree in the verdict, that if discovery is required it must be accompanied by



Ivanhoe Mill.

inspection. To require discovery without inspection is to make a law and leave it to work itself. That such laws always become a dead letter is a well-recognized fact in legislation. Factory acts imply inspectors. So do liquor license laws, stumpage, etc., ad infinitum. Inspection is thus a necessity; but it is also regarded by many as a boon to the *bona fide* prospector. He gets for a nominal sum the report of an expert on his discovery. This puts upon governments the necessity of appointing none but the best men to such positions.

Undoubtedly hard cases arise when discovery is required as a condition for granting a claim. It is a nice question sometimes to decide whether or not a discovery of valuable mineral has been made. The inspector must be a man of cool judgment and discrimination. But so must be every judge and administrator of the law. It would be difficult to find any law which does not, here and there, in the course of its administration bear hardly upon individuals. The law is often blamed for what is really the bad luck of the prospector,—which is after all quite according to human nature.

But does it improve matters to grant claims without any proof of discovery? On the whole, experience answers in the negative. The "blanketting" of large tracts is a practice objected to both by prospectors and by investors.

If a prospector has made a discovery of any value he can always find sale for it. If he claims a lot upon which he has not made a discovery, it seems unreasonable to give him the exclusive right to the minerals which may possibly be found on that lot. It can hardly be argued that he has earned the right. That he has gone over a great deal of rough country, endured hardships and spent time and money in the search, is hardly an argument, unless it is granted that a man should be rewarded in this way for hunting for minerals.

Is there any middle ground between discovery and inspection and no discovery, as requirements? It is often claimed that rigid working conditions may be well substituted for discovery; but an analysis of the case where a first discovery has been made in a new district shows that working conditions with no discovery favor the man with money and practically exclude the poor man. The more rigid they are, the worse it is for the man with no capital. Now it is certainly due to the prospector that any law regulating the staking of mining claims should give an equal chance to all.

The mining law at present in force in Ontario has been lately subjected to criticism. There have been public meetings and resolutions passed asking for modifications; but there seems to have been a good deal of difference of opinion as to the modifications, particularly at a meeting held in Cobalt, where a resolution was passed opposed to those carried in other places. As Cobalt is a very important prospecting and mining centre just now, the conclusions reached by a meeting called by public notice in that place should be carefully weighed. These conclusions seem to have favored the law as it now stands with such small modifications as experience of its workings should point out. The chief objections urged against the law are (1) the provision for inspection, (2) the long time (60 days) between the giving of notice and the granting of a working permit, and (3) the registration of numerous applications for the same claim pending inspection of the claim. The latter is rather a criticism of the administration of the law than of the law itself, which implies, although it does not clearly state, that only one application for a claim shall be received by the recorder and that this application must be disposed of adversely before another can be received. The practice in the Cobalt district was to receive all applications; but the recorder has now been directed to receive hereafter only the first application and to refuse all others, unless the claim is thrown open after inspection.

It is claimed by advocates of free staking without discovery that the man who stakes out a claim should be considered to have acquired by that act and by the performance of certain other conditions exclusive rights. This seems to be open to objection. It may be asked whether such a claim would differ from a claim to any other public property based upon a similar performance of certain acts. It may be accepted as a general principle that a man should do something considerable to earn a share of such property. Being the first to arrive on the spot and planting four stakes hardly fills the bill. The law gives a special reward to the man who makes the first discovery in a new district, because his work has extended the known mineral area of the country, but surely the next comer and all those who follow should be required to show that they too, have added to the known mineral deposits before they are allowed to have exclusive possession of a mineral claim.

It is held by some that so long as a man is willing to go on working a claim he should have exclusive possession. It may be asked, what are you to do with the other men who are willing to work and spend money on that claim? What has the first comer really done to give him the exclusive right to search there? There may be a difference of only a day or an hour in the arrival of two claimants. Can it be justly argued that the first comer, simply because he is first, has acquired an exclusive right? It must not be lost sight of that the laws for the distribution of property vested in the Crown should be so framed as to advance the general as well as the particular interests. This is the spirit of the law for distributing agricultural lands. A man who takes up a lot is required to live on it and clear it to a certain extent. In return for his possession of the land he increases its value and begins to add to the production of the country. The case is different

with mineral lands. Until a real discovery has been made, the only work which is of any use is exploration. It would be difficult to frame a law of working conditions based on this idea. But the principle is at least recognized in the mining law now in force in Ontario. See sections on Working Permit (142), and Prospecting Permits (183), where an attempt is made to reconcile the rights of the single prospector exploring at large with those of the investor who is prepared to make a more complete, expensive, and thorough exploration of a limited area, provided that he can secure undisturbed possession while doing so. As the law is, the working permit is not granted until sixty days after notice is given. Thus, anyone is free to prospect for sixty days. After that the holder of the working permit has exclusive rights.

To our mind, the whole difficulty lies in making a law which shall duly regulate and restrain, not the real prospector, who makes a discovery, but the crowd who follow him and get all around to share in his discovery without themselves adding anything to it.

The ideal mining law would secure the widest possible distribution of original private ownership. That is, it would distribute to the many, rather than concentrate on the few. If economic development required concentration, this would naturally take place by purchase afterwards. A "wide open" law seems to allow this concentration at the beginning. It might be argued that a large investor could hire a number of prospectors and so secure large areas at the start. This answers the same purpose, if discovery is required. Experience shows that investors get the best results in such cases by giving prospectors a share in their finds, and thus distribution is secured.

In all this discussion it must not be forgotten that a very grave difficulty presents itself in defining what shall constitute a discovery. Inspection might perhaps be dispensed with and the definition left with the prospector, were it not for the blanketter who follows on his heels. But the duties of an inspector are so difficult, delicate, and, at the same time, authoritative, that it is imperative that only men of the highest possible qualifications should be appointed.

It is claimed by some that capital is scared away by the inspection requirement. Capital is hardly so timid when the capitalist has a *bona fide* mining property before him; and it never does a country any permanent good, but the contrary to attract a lot of capital to schemes which turn out failures. A few may benefit by the sale of claims which never yield any returns, but it is at the expense of the many whose property is depreciated by such failures. A mining law which attracts the capital referred to in the proverb "A fool and his money are soon parted," is not the best law for a mining country.

RECENT PROGRESS IN METALLURGY.

By Prof. A. E. Outerbridge.

During the year past the production of all metals has been phenomenally large. The rise and fall in the production of pig iron has long been regarded as a sort of barometer of business prosperity for allied lines of industry, and all previous records fade into insignificance when compared with those of the year ending June 30th last, for in that period of time the production of pig iron in the United States amounted to no less than 24,432,106 tons. The production in the State of Pennsylvania alone was, in 1905, 10,579,127 tons, or about two million tons more than the total production in the United States in 1896. Those who are interested in such matters will, no doubt, remember the astonishment that was caused when the statistics of production of pig iron in 1898 were published, showing a total of 11,773,394 tons, or nearly one million tons a month. Since that time we have advanced by leaps and bounds until now we are actually producing over two million tons a month of pig iron.

An interesting improvement in the pig iron industry, to wit: the Gayley Dry-Air Blast Process is worth noticing. The process has proved itself to be highly economical and will doubtless be largely introduced. During the year 1905 there was produced 276,000 tons of pig iron by this method, and several large plants are now in course of construction.

The per capita consumption of pig iron in this country has risen to 620 pounds, as compared with 68 pounds as the average consumption of the total production in the world in 1905.

The remarkable activity here noted is not confined to iron, but extends to all metals, gold, copper, aluminum, etc. In 1880 the production of copper in the United States amounted to about 25,000 tons, or about one-sixth of the world's output. In 1905 the production was 397,909 tons, or about one-half of the world's output.

There is an unlimited demand for copper, just as there is for gold (due, however, to a different reason), and this has caused the price of copper to rise greatly, notwithstanding the fact that the cost of refining has been much reduced through the modern electrolytic methods. It is estimated that the aggregate profits of the producing industry in twenty-five years have amounted to the enormous sum of $675,000,000 on a total production of 9,000,000 tons. By far the largest proportion of these profits have been made within ten years.

The metal aluminum, once called "the metal of the future," is now entitled to a high place in the list of economic metals of to-day, the production having increased from a few pounds ten years ago to about 5,000 tons in 1905. Owing to the discovery of the electrolytic method of refining the cost of the

pure metal has declined from $8 to less than 50 cents a pound.

Statistics were given to show that the remarkable increase in production of metals in 1905, as compared with previous years, was not confined to the United States, but was world wide. Canada, for example, showed an increase of no less than 171 per cent. in output of all kinds of steel ingots and castings in 1905 as compared with 1904, and an increase of more than 72 per cent. in crude pig iron.

The production of pig iron in Great Britain in 1905 was the largest in the history of the United Kingdom, being 9,592,737 tons, as compared with 8,562,658 tons in 1904.

The increase in output of Bessemer steel ingots in the same period was shown to be about in the same proportion and of open-hearth steel ingots in larger proportion.

In Germany production is recorded in metric tons, and there was a considerable increase in output of pig iron, steel ingots and castings in 1905 as compared with the previous year.

In France the increase in output was comparatively small, and the same is probably true with respect to Russia, Spain and Italy, though accurate statistics for these countries are not yet available.

Reference was made to the great progress made in recent years in recovering so-called waste products in various metallurgical operations, one of the most promising of these is the prospective utilization of vast accumulations of blast furnace slag in the manufacture of high-grade cement. The possibility of this has been talked of for years, for the reason that slag contains a great deal of lime, a material used in making cement, but, unfortunately, the sulphur in the slag is a deleterious element. Recently the United Steel Corporation has perfected a process, it is said, for eliminating sulphur and making fine cement from slag.

When we realize that the demand for cement is increasing every year, and has now reached enormous proportions (the output of cement in 1905 in this country exceed forty million barrels), we can appreciate the importance of this new undertaking It is stated that a subsidiary company has been very recently formed under the title of the Universal Portland Cement Company to manufacture cement from blast furnace slag.

The use of ferro-alloys in the manufacture of "high speed" steel for cutting tools has made great progress during the past year and has been extended in various directions with remarkable results. Large and costly milling cutters are now being made of this steel, as well as planer and lathe tools and drills. Improved methods of hardening and tempering this kind of steel have also been devised.

The use of ferro-alloys in the foundry is likewise extending. The simple method first described in the speaker's address given before the metallurgical section of the Institute a year ago for softening iron for castings to any desired degree has been continued, with exceedingly beneficial results, in his daily practice.

The speed of turning pulleys has been largely increased and the time required to complete the machine work upon them has been reduced, and in other light castings as well. In addition to the material improvement in the strength of the metal by this treatment, there is a decided decrease in shrinkage, so that some castings of irregular shape which are difficult to make without cracking in cooling owing to unequal strains are now made without this tendency by this process. Other advantages accruing from the addition of a very small amount of high-grade ferro-silicon (containing about 50 per cent. of silicon) have been observed. Among these may be mentioned the cleaning action upon the molten metal which the alloy effects by its deoxidizing influence. Singularly also it is found that commercially pure silicon does not produce these results, neither does the ordinary grade of ferro-silicon, containing about 20 per cent. of silicon.

In the case of pure silicon the specific gravity of the material is too low and its melting point too high to permit it to become incorporated with the molten iron in the ladle; in the other case the proportion of silicon is too low to permit a sufficient amount to be dissolved in the iron to produce a radical change in its quality without causing dull iron in the ladle.

There is, said the speaker, no doubt that when the merits, simplicity, certainty of action and other of this process of treating molten iron in the ladle are better known and appreciated it will come into very extensive use, for it enables the founder to modify the character of his iron to suit individual castings, a matter of considerable importance and value. This is accomplished without expense, for the cost of adding silicon to the iron in this manner is actually less than by the usual method of adding an equal amount of silicon to iron in the form of pig iron comparatively high in silicon added in the cupola. For example, pig iron containing 6 per cent. of silicon costs at the present time, let us say, $20 per ton, and we may estimate for comparative purposes $3.33 per unit of silicon; ferro-silicon containing 50 per cent. silicon costs at the present time in powdered form $100 per ton, or $2 per unit of silicon on the same basis of calculation.

Furthermore, there is no loss of silicon when added in the ladle as there is when melted in the cupola, and this partly accounts for the fact that a given quantity of silicon, when added in the ladle, is much more effective as a softener than the same quantity charged into the cupola. Silicon added in the cupola always weakens the iron, while silicon added in the ladle always strengthens it.

The output of gold has quadrupled in the past twenty years, and stands, as regards its rate of de-

velopment, above all other metallurgical industries, iron alone excepted. In a recent résumé of two papers by M. de Launay, an eminent French mining engineer, and professor at the Ecole Supérieure des Mines, published in the Revue Générale des Sciences, the *Engineering Magazine* says: "The enormous increase in the rate of production of gold is one of the remarkable industrial and economic phenomena of the present time. The curves representing the production of other metals have shown upward tendency, more or less marked, but the line showing the gold production of the world shows such a remarkable upward tendency that at times it almost approaches the vertical. When the curve is separated into its three components, representing respectively the three principal sources, the Transvaal, the United States and Australia, it is seen that there is a marked similarity between them, interrupted only by the break due to the war in Africa. The figures for the year 1905 given by M. de Launay, in francs, are: Transvaal, 524 millions; Australia, 432 millions; the United States, 436 millions; a total of 1,392 million francs, or about 278 million dollars. These three countries produce 72 per cent. of the world's total, which reaches 1,908 millions of francs.* * * It is largely because of the improved process of extraction that the production of gold has increased at the rates already given, since it is by the wholesale application of modern methods that the lowest grade deposits can be commercially worked. Thus, in a large and accessible mine it is assumed, on an average, that the material can be treated for about 12 francs per ton. Very often, however, the cost reaches double this figure, according to location and operative difficulties. In the great workings in Dakota, on the contrary, the cost has fallen as low as 2.10 francs per ton, and at the Alaska Treadwell mine to the minimum of 1.12 francs.

It is interesting to recall the fact that many years ago the assayers of the mints found that gold was uniformly distributed in very minute division in the bed of clay underlying the city of Philadelphia, and they made the astounding statement in a paper published in the Proceedings of the American Philosophical Society that there was more gold underlying the streets of the city than had been taken at that time from California and Australia combined. There was enough gold (according to their calculations) in each brick, if hammered into leaf, to make a sheet of gold two inches square and about one-three hundred thousand of an inch thick. It was, of course, stated that the cost of extracting the gold would be far in excess of its value, but modern methods of refining low-grade ores had not been discovered at that time, and it may come to pass that the aluvial gold in the clay may yet have a market value. This, however, is a mere speculation at present. Certain it is that the vast increase in production of gold in modern times is due to the economical methods of reclaiming the gold from lean ores that had no value whatever at the time this interesting paper was published.

The increase in production of copper in the United States in recent years can be truly described as astounding, the output having risen from 25,000 tons in 1880 to 413,070 tons in 1905.

In the former year we produced about one-sixth of the world's output and in 1905 more than one-half. The enormous increase in production has been stimulated largely by the increased demand since the development of electric lighting and electric power. The price of copper has risen coincidentally with increase in production, notwithstanding the fact that modern methods have greatly reduced the cost of refining copper.

In 1880 the electrolytic method of refining was in its infancy; there was, in fact, no refining by this method recorded in this country in that year, while in 1905 the output of electrolytically refined copper in the United States was 304,000 tons, as compared with 46,000 tons in Europe.

The electrolytic process of refining copper is one of extreme simplicity; it depends primarily upon the passage of an electric current between two plates of copper suspended in a tank containing copper sulphate in solution. As only the copper in the crude metal can act as a carrier of the current the impurities are left behind, and pure copper alone is deposited on the plate of metal by which the current leaves the vat.

The impurities frequently consist of gold and silver in sufficient quantity to more than pay all cost of refining the copper by this process.

Referring to the new theories of matter which are now agitating the scientific world, the speaker said that the classic investigation of Sir William Crookes on "Radiant Matter," published more than a quarter of a century ago, paved the way for an entirely new conception of matter, for they seemed to prove that particles of matter existed and were even revealed in his high vacuum tubes very much smaller than the so-called "atom" which was at that time thought to be indivisible.

It is now believed that such particles, called electrons, are so minute that it would require one thousand of them to make one atom of hydrogen gas.

Not only is the heretofore accepted indivisibility of the atom disputed, but the stability of the atom has been attacked, and it is even maintained that the remarkable element radium has been actually seen to change, while under observation in the spectroscope, into another rare element called helium.

In studying these abstruse theories we are brought face to face with the fact of our ignorance regarding the true nature of matter and to a realization of how little we know of the forces of nature.

If the kinetic energy contained in a mass of ra-

dium is, as we are told, sufficient to raise its own weight of water to the boiling point every hour, there is here evidence of a stupendous force, the nature and power of which are unknown to us, and these are among the greatest of modern mysteries calling for future solution.

CORUNDUM IN ONTARIO.*

By D. G. Kerr.

Introduction.—The discovery of corundum in economic quantities in 1897 and 1898 by Prof. W. G. Miller, in the counties of Peterborough, Hastings and Renfrew, Province of Ontario, Canada, attracted considerable attention at that time. The corundum was found in more or less quantity along a belt of rock, about 50 miles long and from ½ mile to 3 miles wide.

The most important occurrence is in pink syenite, an acidic rock: felspar being the principal constituent, with a little white and dark mica, iron-pyrites, hornblende, 5 per cent. of magnetite, a small quantity of rubies, sapphires and garnets. The next occurrence in importance is in nepheline-syenite along the York Branch River, and it is stated that in no other country has corundum occurred in nepheline-syenite. The pink syenite carries the best corundum-ore, of a higher percentage and less impurities.

The corundum-bearing rock occurs in layers running almost east and west, dipping to the south 25 degrees from the horizontal, and at some points lying on the face of a hill exposed by glacier-action, the glacier having cleaned off the overburden, and at other points the corundum-bearing rock also, as large corundum-boulders are found many miles to the south-west, some in the valleys, while others have been left on the top of the hills. There is only a portion along a dyke exposed in this way at another point, as the overburden was too great or a greater dip of the dyke prevented it from being all exposed.

Mines.—There are two companies working on this dyke: the Ontario Corundum Company, in Carlow township, Hastings county, and the Canada Corundum Company, in Raglan township, Renfrew county, the last-mentioned company having taken over the well known Craig mine and other deposits, covering an area of 2,000 acres in the counties of Renfrew and Hastings. At present, the works are confined to Craigmont, where the crushing and concentrating plant is situated, and corundum-ore is quarried from the southern face of the hill, 500 feet high. In some places, considerable stripping is done, of sand and gravel to the depth of 5 feet; at some points, the corundum-bearing rock crops out, showing the corundum-crystals imbedded in the rock and polished down level with the rock by glacier-action. At other points, where the corundum-bearing rock has been exposed to the weather, the corundum-crystals stand out boldly. The mineral is quarried in a series of benches up the hill, the faces running from 1 foot to 15 feet thick, and it varies in richness from 8 to 17 per cent. There are rich zones in the dyke going down diagonally south-east; in these zones, rich pockets of big nodules of almost pure corundum are found associated with crystals of white mica. Cutting through this deposit, a number of dykes are observed carrying hornblende in the same form as the corundum-crystals and readily mistaken for corundum. This dyke varies in thickness from 2 to 10 feet, when the corundum comes in again higher up the hill. In a series of little pockets of corundum-bearing ore, the width will run from 40 to 100 feet, and the ore is found in layers or in benches. The surface-rock will be ore; beneath this is a thickness of barren gneiss-rock, varying from 1 foot to 6 feet; beneath this occurs another layer of corundum-bearing ore, 3 to 4 feet thick; another layer of waste and corundum-ore follows in succession, until a depth of 25 to 30 feet is attained. A granite rock occurs below, but it has only been penetrated in three or four places: at one place, within a distance of 32 feet, no sign of corundum-ore was found.

On the property of the Ontario Corundum Company, 6 miles to the west of Craigmont, the occurrence and composition of the dyke are practically the same, with narrow bands of black micaceous schist and coarse pink pegmatite in the syenite. A rock-bluff is worked with a perpendicular face going in east on the dyke, with an average of 10 per cent. of corundum-crystals in the face.

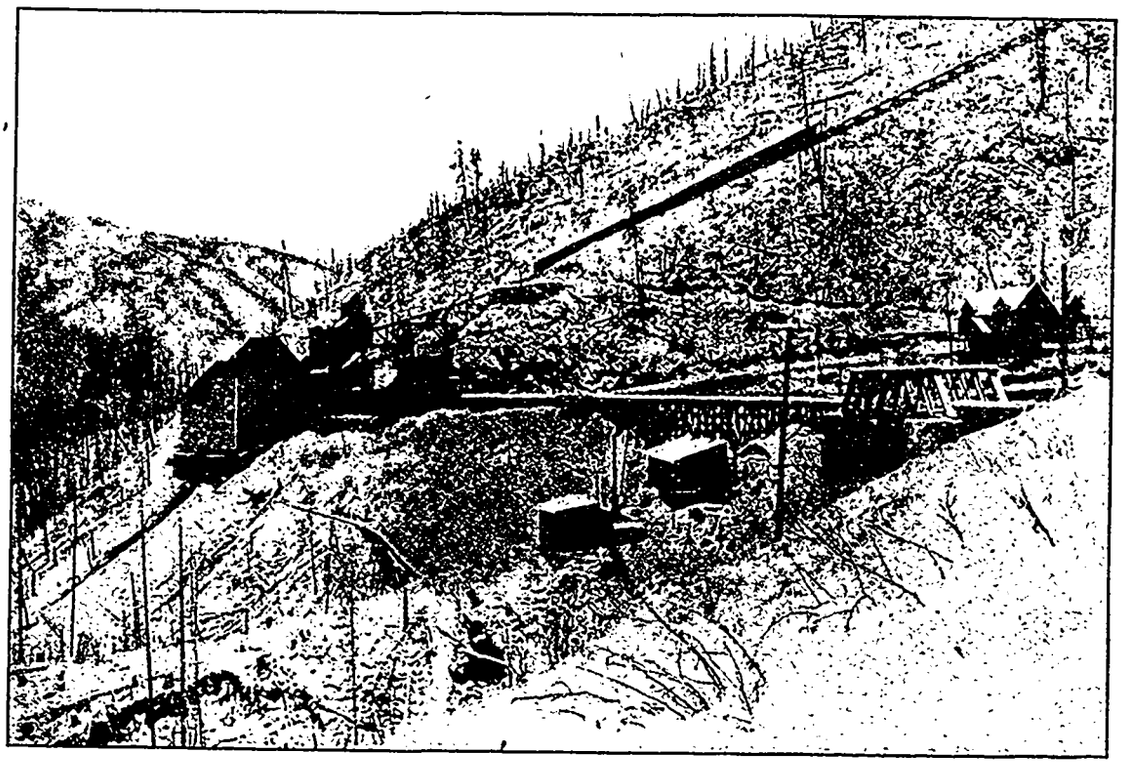
The following analyses of corundum-crystals show the purity of the mineral:—

Sample	Alumina Al_2O_3.	Ferric Oxide Fe_2O_3.	Insoluble Matter.	Loss on Ignition.
I.	92.62	—	1.13	2.04
II.	93.29	0.36	—	1.91
III.	94.72	0.32	—	1.14

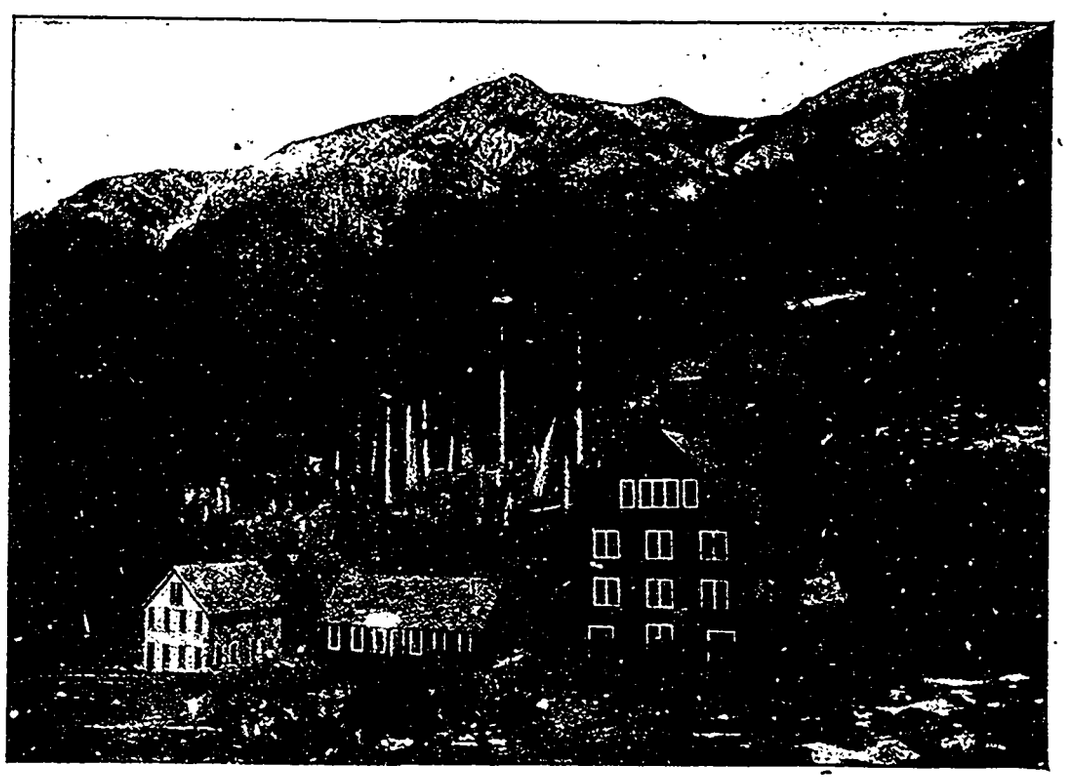
The assay-tests are made for crystalline alumina and magnetic iron and for loss on ignition. In clean corundum-crystal, a small percentage of iron, from 0.5 to 2 per cent., is found combined with the corundum.

On the property of the Canada Corundum Company, the mining is done in the usual way by means of air-drills and dynamite. The holes are drilled 14 and 15 feet deep, and a series of as many as twenty holes are sometimes fired off by means of the electric battery. A large quantity in big pieces is thrown down, and they are block-holed and bull-dosed with dynamite down to suitable sizes for handling by the cullers, as it is very necessary to cull or select the ore. The percentage of corundum does not run high enough to allow of milling all the

* A paper read before the North of England Institute of Mining and Mechanical Engineers, at the general meeting at Newcastle-upon-Tyne, October 14th, 1905.



.Payne Lower Terminal.



Noble Five Concentrator, Sandon, B.C.

ore coming from the mine, without sorting out the low grade, as the lowest grade of ore fed to the mill requires to be higher than the amount which is lost in the tailings; it is also necessary to prevent as much as possible large pieces of magnetite, iron-pyrites, or hornblende, from going to the mill, as they are difficult to remove when concentrating to 95 per cent.

In the very fine fissures, thin splashes of molybdenite (running high in molybdenum sulphide) are found, but this ore does not occur in any quantity, enough for samples only. It is stated that there is a vein of molybdenite in the neighborhood.

The drilling of the corundum-bearing rock, either by hand or by rock-drills, is not difficult; but the diorite or crystalline limestone offers greater resistance to fast drilling.

From the open quarries on the face of the hill, the ore is brought down in stone boats and trucks by teams to the tramway where it is loaded on to cars, carrying 3 to 4 tons. The cars run on a tramway into the top of the mill; before entering the mill the car-load is weighed and an exact tally kept of the number of tons which go into the mill every day (in wet weather, an allowance is made for the moisture in the ore). The cars are drawn by horses, and can handle 150 tons in 10 hours.

Mill.—The mill is situated at the east end of the southern face of the hill on which the corundum-ore is quarried. The tramway, already mentioned, comes from the weighing-machine and enters at the top of the mill: the cars are of the flat-top type and tip on both sides into the bin below. The bin is square and flat-bottomed, with a capacity of 400 tons. The shute for feeding the crusher is near the centre of the bottom of the bin, and comes out to the ore-crusher; and alongside of this shute, a man stands and feeds the crusher, of the Farrell type of Blake crusher, 15 inches by 24 inches, running at 250 revolutions per minute and crushing down to 2½ inches. The ore, after being crushed, drops on to a Robbins conveyor-belt, 18 inches wide and 85 feet long, travelling at a speed of 300 feet per minute, with 20 per cent. of an elevation to the delivery-end.

The stream of ore coming from the conveyor-belt is divided into three, and fed by short shutes into three smaller crushers, two of them being the Farrell type of Blake crushers, 6 inches by 20 inches, and one a Gates gyratory type A crusher. These three crushers reduce the ore to ¾ inch and less, and drop it into another large bin underneath of 400 tons capacity.

From the underside, at the face of the bin, the ore is fed into coarse rolls by means of a Challenge-feeder, the ore dropping from the disc of the feeder into the screen-shute and straight into the rolls; the screen taking out all fines allows the rolls to do better work. The Challenge-feeder stood below the centre of the ore -bin, and the ore was carried to the rolls by a belt-conveyor; but this was discarded, owing to the amount of ore spilled, and in order to permit of the attendant getting to the back part of the rolls so as to tighten the springs.

The ore, after passing through the coarse rolls, drops down, and is divided between two trommels, 13 feet long and 3 feet in diameter, running at 20 revolutions per minute, sloping 1 inch to the foot, the screens having 4 millimetre holes. The undersize passes downward into the vertical elevator, and the oversize passes to two sets of rolls and then into the same elevator. The elevator is an indiarubber-belt, with buckets bolted on (the buckets being 18 inches long, 6 inches wide and 6 inches deep), running at 350 feet per minute. All the crushed ore is raised by this elevator in the form of a watery pulp to the top of the mill, where it is divided into two sets of five trommels in each set. Each trommel, 3 feet in diameter and 13 feet long, 20 revolutions per minute and slope 1 inch to the foot, is driven by a sheave-pulley and rope-drive on the over-size end.

The pulp enters the two coarse trommels, the first 6 feet being covered with screens perforated with 4 millimetres holes, 4 feet with 6 millimetres holes, and 1½ feet with 8 millimetres holes. All pulp passing through the 4 millimetres holes goes to the next trommel, that passing the 6 millimetres holes goes downward to two sets of double three-compartment iron Hartz jigs; and that passing through the 8 millimetres holes passes downward through wooden spouting lined with steel-plate to a set of double two-compartment wooden Hartz jigs. The over-size, from these two trommels, goes downward to the roll-floor and, being recrushed, comes back through the same elevators. The pulp passing through the 4 millimetres holes on the first set of trommels passes to the second trommels, covered for the first 6 feet with screens having 2 millimetres holes, the pulp passing through the 2 millimetres holes goes on to the next set of trommels, and that passing over the 2 millimetres holes is sized on the next 5 feet of the trommel with 2½ millimetres holes; the pulp passing through the 2½ millimetres holes is treated on six Overstrom tables: this size is a little large for these tables, but it is done in the meantime for lack of jigs. The over-size of the 2½ millimetres holes goes downward to a double three compartment iron Hartz jig. The pulp passing through the 2 millimetres holes on the second set of trommels then passes to a third set, of which the whole length is covered with screens having 1½ millimetres holes; the undersize goes to the next set of trommels and the oversize to three Overstrom tables. The fourth set of trommel-screens has 1 millimetre holes, the undersize going to the fifth set and the over-size to the concentrating-tables. The pulp passing through the fifth trommel and the ¾ millimetre holes goes into a V box, and (the heavy particles settling) is fed to a concentrating-table and the surplus water is run

into the tail-race. The twenty Overstrom and four Wilfley concentrating-tables, the two sets of double three-compartment iron Hartz jigs, and the double two-compartment wooden Hartz jigs, are placed on the floor below the trommels. The screen-area of the iron jig is 24 inches by 36 inches, and the screens are of the same sizes in the hole as the trommel which supplies the material, but the top of the screen has 1½ inches of over-size material for a head. The speed of the jigs is 220 revolutions per minute; for the fines, up to 170 revolutions per minute; for the coarser sizes, the stroke is ¾ to 1 inch.

The product of the jigs' first hutch goes to the finishing-rolls on the roll-floor below, where it is crushed and goes to bin, being finished in the crushing part of the mill; the second and third hutches of the jigs, not being so clean, go to the rolls again and are crushed finer, and, owing to the want of a separate elevator and screen, they have to go back into the main elevator where, if fine enough, they will go to concentrating-tables, and if coarse, will be returned to the jigs. Tests made on the product of the jigs showed that the first hutch cleaned it to about 50 per cent. of corundum, and the second and third hutches to 35 or 45 per cent. of corundum: that is, from an ore which carries 10 per cent. of corundum and 6 to 7 per cent. of magnetic iron. The tailings from the jigs showed a loss of 3 per cent., but, as they were much overloaded, this did not give a fair showing; and, no doubt, with ample jig-capacity, the losses would be reduced by 50 per cent.

The following is about the average percentage of corundum in the end-products:—

	Per cent.
Ore fed to mill	10½
Jig-concentrates	50
Jig partial-concentrates	40
6 millimetres screen, jig-tailings.	3
4 millimetres screen, jig-tailings	3
2½ millimetres screen, jig-tailings.	3
Table-concentrates	60
2½ to 2 millimetres, table-tailings.	2
2 to 1½ millimetres, table-tailings.	2
1½ to 1 millimetres, table-tailings.	2
1 millimetre to zero, table-tailings.	2
Magnet-tailings, coarse	7
Magnet-tailings, fine	3
Average	5
Rewash-table tailings	5
Total mill-tailings	5

The corundum is cleaned to 90 or 95 per cent.

On the same floor as the jigs, are the Overstrom and Wilfley concentrating-tables; and on an intermediate floor are six more Overstrom tables, to treat the middlings from the preceding Overstrom tables.

The losses from the concentrating-tables vary from 1½ to 2 per cent., principally carried off floating in the water; as, in the crushing of the corundum-crystals, owing to the hardness and the strain which is required to crush it, a percentage of the corundum goes to very fine powder and floats off in the water. The product from the concentrating-tables and the finishing-rolls is spouted into a small elevator, which raises it to another trommel for sizing, before being run into storage-tanks. No. 12 mesh is the size of screen on this trommel, and all coarser than this to No. 10 mesh is rejected, and goes back to the finishing-rolls and is crushed smaller. The corundum-concentrates are now deposited in the five storage-tanks; they are also used as filter-tanks to take off the moisture, and are fitted with a little false bottom for drainage. The corundum-concentrates, which now run about 50 per cent. of corundum, are then sent from the crushing department to the grading room.

In the crushing part of the mill, there are four sets of heavy rolls, 14 inches by 40 inches, with shafts, 10 inches in diameter, fitted with brass slieves, which slip on to the shafts and take all wear. The roll-shells are made of Hadfield manganese-steel, and do the work with very little wear, and the jaw-plates on all the crushers are made of the same material.

The Gates rolls, 14 inches by 24 inches, crush the product from the second and third hutches of the jigs. Adjacent are the Colorado or finishing rolls, 6 inches by 30 inches. There is another set of smaller rolls, but they have not been set to work yet.

The intention, when this part of the mill was built in 1903 and finished in the beginning of 1904, was to crush everything in the rolls small enough to concentrate on the Overstrom and Wilfley tables. This was found to be impossible, owing to the high percentage of fines, and the large amount carried off in the tailings in the form of fine slimes; the demand for the very fine sizes is small, and they are not so easily cleaned as the coarser sizes.

The crushing part of the mill containing the aforesaid machinery is a building 145 feet long, 36 feet wide, and 85 feet high, with five floors. On the second main floor is the machine-shop, equipped with a lathe, drilling-machine, and two small shearing machines worked by hand.

The engine-house is equipped with a Corliss engine of 225 horsepower, a Corliss engine of 125 horse-power, and an auxiliary engine of 20 horsepower.

The first engine transmits power by means of six cotton-ropes, 1½ inches in circumference, to the main shaft on the same floor for driving all the jigs and concentrating-tables, trommels and the large elevator in the top of the building, also driving all the grading machinery in the grader-building by a rope-drive from the same shaft. The other six grooves on the engine-pulley drive the main shaft for the roll-floor by means of one continuous rope with a tightener-pulley and a balance-weight. This arrangement is being taken out, as in the event of this rope breaking, all the machines on this engine are stopped until the rope is straightened out and replaced. This means a lengthy stoppage of several

hours, whereas, if the ropes were all single drives, the breakage of a rope would cause no stoppage, as the other five would have sufficient power to drive the full load until the first stop, when another rope could be slipped on to it, having been prepared and spliced over the two shafts. From the main shaft of the jig and table floor, a rope-drive goes back into the engine-room to drive a small dynamo of 220 lights of 16 candlepower capacity. The little auxiliary engine runs this dynamo by means of a belt and countershaft, in the event of any stoppage of the large engine, and at the same time it runs the machine-shop for repairs.

The second engine, of 125 horsepower, runs the crushers and a small Root pump. The power is transmitted from the engine to the countershaft by a continuous manilla rope, 1½ inches in circumference, with a tightener-pulley: this also is being changed to single ropes.

In the same room as the engines, is a cross-compound air-compressor with intermediate and after-coolers, condenser, and air-receiver, having an air-capacity of 1,700 cubic feet of free air per minute and compressing it to 100 pounds per square inch, thus providing the quarries with sufficient air to run about thirty drills.

Steam is supplied to the engines from three return tubular boilers, 5 feet in diameter and 18 feet long, built up with bricks. Wood fuel is used, dry pine, maple, birch and poplar being the principal woods, the consumption amounting to 25 to 30 cords per 24 hours. The boilers are placed in a building apart from the mills.

The water to supply the crushing and concentrating part of the mill, is pumped by a Root pump from the basement of the grader-building, to a tank placed behind the first set of coarse rolls. This pump has a capacity of 1,000,000 gallons per 24 hours, and throws it against a head of 60 feet. From this tank, the water runs to the rolls, tables, jigs and launders. A jet of water is used to feed the ore into the rolls, and to keep down any dust.

Grader-building.—The grader-building is 135 feet long, 60 feet wide, and 80 feet high. The concentrates are brought into this building by a conveyor, and dropped on to a dryer.

The double-decked dryer, made of iron-pipes, 1¼ inches in diameter, is heated by exhaust and live steam. The wet concentrates are distributed from the conveyor upon a No. 4 mesh wire-screen, and as the stuff drys it drops through, on to a conveyor-belt, thence to an elevator, and is raised to the top of the building. The stream of concentrates is then divided over magnetic separators, one being of the cone and the other of the drum type. The concentrates contain 12 to 15 per cent. of magnetic iron; the non-magnetic concentrates go down to the spilter on the floor below and the magnetic iron, containing 4 to 5 per cent. of corundum, is dropped outside of the building for further treatment.

Roughing splitters, with three screens, divide the concentrates into three sizes: No. 1 takes all sizes, from 8 to 24 meshes inclusive, and sends them to No. 1 graders; No. 2 takes all sizes, from 30 to 70 meshes inclusive, and sends them to No. 2 graders; and No. 3 takes all sizes from 80 to 200 meshes inclusive, and sends them to No. 3 graders.

The roughing grader gives sizes passing through the screens; No. 1 is divided into sizes 24, 20, 16, 14, 12, 10 and 8 is over-size; No. 2 into sizes 70, 60, 54, 46, 36, 30 and 24 is over-size; and No. 3 into 200, 180, 150, 120, 100, 90, 80 and 70 is over-size. These products all go into bins above the rewashing tables and Hooper air-jigs. Steel-wire screen-cloth is used, from 8 meshes to 30 meshes; and silk screen-cloth is used for all of the other sizes, from 36 meshes to 200 meshes.

The Hooper air-jig is a good machine for concentrating dry-sized concentrates; it works well on concentrates from 24 meshes to 70 meshes, and gives four grades of produce from 50 per cent. corundum, as follow: Firsts or heaviest portion, magnetite and pyrites which have escaped the magnetic separators are extracted and sent to piles outside of the building. Seconds or lighter portion, is clean corundum 90 to 95 per cent. pure. Thirds or middlings, are held for retreatment, until a quantity is accumulated. And fourths, tailings or waste carrying off 4 to 6 per cent. of corundum. The clean corundum passes from the Hooper jigs to an elevator, which raises it to the top of the building.

Five Wilfley rewash-tables are used for cleaning up the coarse and the fine sizes. The Wilfley tables, running at 250 revolutions per minute, treat the fines, and the Wilfley table treating the coarse sizes runs at 215 revolutions per minute; the coarse tables have a stroke of ¾ inch and the finest table a stroke of ⅜ inch. The products are: Firsts, on the high side of the table, a little magnetite and pyrites. Seconds are clean corundum, 88 to 90 per cent. Thirds or middlings are retreated on the same table. And fourths, tailings or waste containing 5 per cent. of corundum.

The clean corundum from the rewash-tables is carried to the second deck of the dryer, dried and dropped down to the conveyor, taken to the clean elevator, and goes to the top of the building along with the corundum from the Hooper jigs; then it goes over the finishing magnetic separator, drops through the floor, and passes the final magnetic separator. The process leaves a corundum carrying from 1 to 2½ per cent. of iron, in the form of combined iron in the crystal corundum.

The corundum leaving the magnetic separator goes to the finishing splitters, of the same type as those already mentioned. This last operation must be carefully effected, as the exact sizing is very important to wheel-makers and users of loose corundum.

From the finishing-grader, the product drops into

bins in the floor, from which it is drawn into bags containing 100 pounds. Samples are taken from all the sizes each day, before the bags are sewn up, and as soon as the results are sent from the assay-office, the grade of quality is marked on each bag, and it is then ready to be sent to market.

Three grades are made to suit the wheel-maker. The vitrified wheel requires the highest grade, the silicate-wheel takes the next grade, and the third grade goes to the cement-wheel maker and the polishing trade. The corundum for vitrified wheels varies from 90 to 95 per cent. pure. The silicate or chemical wheel is made with silicate of soda as the binding material. The binding-materials used in the cement-wheel are shellac, indiarubber, linseed-oil, etc.

The cost of producing finished corundum, including mining, milling, concentrating, sizing, packing, office-expenses, insurance and general charges, has not yet been reduced below £8 ($40) a ton; but with a well-equipped mill, crushing 150 tons per 24 hours of a grade of ore containing 10 to 12 per cent. of corundum, the cost should not exceed £6 to £7 ($30 to $35) per ton.

THE EVA GOLD MINE.

The report of the Eva Gold Mines, Ltd., for the year ending July 31, 1906, has been published. The manager, Mr. A. H. Gracey, states:—

Work has been steadily prosecuted at the mine during the whole period with no unusual interruptions except for two days last August when by an accident one of our employees lost his life.

The mill has been running continuously except for delays occasioned by washouts referred to later.

Nothing exceptional since my last report has developed and the following tables will give full information, under their respective heads, of what has been accomplished in the different departments.

Development has been carried on as vigorously as our circumstances would permit, and the following summary shows the amount and distribution:

Drifts, 430 feet; raises, 299 feet; crosscuts, 158 feet; total, 887 feet.

The total average cost per foot was $13.51.

Distribution throughout the mine workings was as follows:—1 A drift, 245 feet; 1 A raises, 221 feet; 1 B drift, 97 feet; 1 B raises, 78 feet; 6 A drift, 78 feet; sundry crosscuts, 158 feet, and 7 A drift, 10 feet.

Mining.—The total tonnage mined and sent to the mill was 11,181 tons from different portions of the mine, as follows, while approximately 200 tons in addition are broken in stopes.

Glory holes and Stopes.

1 A Stopes	5,466 tons.
H.M. Glory Hole	1,801 "
1 B Glory Hole	311 "
5 A Glory Hole	275 "
	7,853 "

Development.

1 A Drift	1,088 tons.
1 A Raises	1,172 "
1 B Raises	692 "
Sundry Development	376 "
	3,328 "

The total amount of waste handled during the year was 1,469 tons.

With the exception of 275 tons from No. 5 A level all the above ore was transferred over both trams to the mill because it came from the upper sections of the mine. This added to the tramming cost.

Both trams worked to our entire satisfaction except that the traction cable on the main tram has not lasted as long as it should have and we are under the necessity of putting on a new cable.

Milling.—The tonnage milled is estimated by keeping count of the number of buckets of ore lowered on the tram and weighing occasionally average loads. There is a chance in consequence that the tonnage estimate is not accurate, although the discrepancy will not be serious.

According to these estimates we have put through our 10-stamp mill during the year 11,130 tons. The net running time was 336 days, making an average of 33.1 tons per day.

The total time lost was 29 days made up as follows:—

Regular monthly clean-ups	4 days 6 hours.
Flume washouts (mud and snow slides)	11 days 18 hours.
Construction pipe line	11 days.
Sundry (inc. 1½ days on account of accident)	2 days.
Total	29 days.

The values recovered in the mill were as follows:—

Bullion by amalgamation	$46,925.29	per ton	$4.21
Concentrates (280 tons)	8,792.00	per ton	0.79
	$55,717.29		$5.00

The average assay value of the tailings (samples taken automatically and continuously) was 69 cents per ton. The gross value of the ore was, therefore, $5.69 per ton.

The average of the daily battery samples by assay was $5.51 per ton so that the gross recovery plus the tails loss was greater by 18 cents than the average assays showed.

The following table gives the detailed costs in total and per ton. The per ton costs are figured on the tonnage milled. As there were approximately 11,400 tons mined the mining cost per ton would be a little less than shown in the table.

	Total.	Per Ton.
Mining	$17,808.73	$1.600
Tramming (both trams)	2,022.45	.181
Milling	7,340.35	.659
Repairs and Maintenance	1,951.56	.175
Marketing Product	3,659.28	.328
Taxes and Insurance	1,586.03	.133
Office and General	1,861.19	.167
Management	2,900.00	.260
	$39,129.79	$3.503
Development	12,141.00	1.090
New Construction	834.03	.074
	$52,104.82	$4.667

Summed up the results of the year's work are as follows:—

Bullion Recovered	$46,925.29	$4.210
Concentrates Recovered	8,792.00	.790
Sundry Receipts	845.64	.076
Total Receipts	$56,562.93	$5.076
Total Cost Operating	39,129.79	3.503
Profit	$17,433.14	$1,573

Of this profit we have spent on new development which is still an asset and on new construction as above $12,975.03, or $1.164 per ton, leaving still a balance of $4.458.11 over and above all expenditure.

Since the mill was installed there have been mined and treated 25,300 tons of ore producing $116,274.19 in bullion and $12,064.35 worth of concentrates, a total of $128,338.54, which makes an average of $5.08 per ton.

Preparations are now under way to install the first half of a Duplex Air Compressor plant which would have a total capacity sufficient to operate 15 large drills. The concrete foundations are completed and we expect the machinery to arrive by the end of September.

We have received permission to use a portion of the air pipe line belonging to the Oyster-Criterion mine, adjoining the Eva, and we have completed connections with same from our mill to the mine workings.

It is a difficult matter to make close estimates of our present ore reserves because several of the large masses are not yet completely blocked out by crosscuts and raises. However, it is safe to say, after making due allowance for this, there are considerably over 100,000 tons which little more work will make available. A complete system of crosscuts and raises from our present levels should add to the reserves a very large tonnage and this necessary work should be now under way.

Were we operating on a scale commensurate with the size and value of our ore bodies, the results would be of a much more satisfactory nature and I hope this will be a possibility of the near future.

Balance Sheet, 31st July, 1906.

Assets.

Mine		$262,795.04
Balance carried forward	$249,820.01	
Development	12,141.00	
New Construction	834.03	
Tools and Movable Plant		2,141.22
Stores on Hand		2,661.69
Boarding House Equipment		436.43
Insurance Unexpired		253.04
Shareholders' Liability		3,059.09
Sundry Debtors		121.28
Cash on Hand		7,772.07
		$279,239.86

Liabilities.

Capital Stock		$262,845.75
221,000 Shares at $1.00	$221,000.00	
68,517 Shares at .25	17,129.25	
49,433 Shares at .50	24,716.50	
Sundry Creditors		2,846.84
Profit and Loss (as per account)		13,547.27
		$279,239.86

Profit and Loss Account.

Debit.

Balance Brought Forward	$ 4,024.57
General Expense	812.94
Concentrates Charges	4,525.61
Bullion Charges	439.28
Office Expense	1,048.25
Legal Expense	86.16
Bank Exchange and Interest	16.34
Management	2,900 00
Insurance	970.00
Mining	17,808 73
Tramming	2,022.45
Milling	7,340.55
Maintenance of Plant	1,951.56
Two Per Cent. Tax	616.03
Balance Carried Forward	13,547.27
	$58,109.74

Credit.

Bullion	$46,925.29
Concentrates	10,338.81
Sundry Receipts	845.64
	$58,109.74

Nelson, B.C., 22nd September, 1906

I hereby certify that I have audited the books and accounts of the Eva Gold Mines, Ltd., to 31st July, 1906, and that the above statement represents the true position of the company.

F. W. SWANNELL,
Auditor.

The Mines Act of Ontario, 1906, requires thirty days' work to be performed within ninety days of the claim being recorded; sixty days during each of the next two years, and ninety days in the third year; or two hundred and forty days work altogether in three years and three months. The work may all be done, however, within a shorter period, if desired.

FIRST REPORT OF THE C. M. & S. CO.

The Report of the Directors of the Consolidated Mining and Smelting Company of Canada, Limited, for the six months ending June 30th, 1906, has been issued. The president, Mr. W. D. Matthews, in his address to the shareholders, says:—"The company's fiscal year has been changed so as to end on June 30th, it being found more convenient to take inventory at the reduction works at that time of the year. A number of additions and improvements are now being made to your property, which when completed will involve, including of the "Iron Mask" mine, an expenditure of about $322,000, and to provide for this expenditure and for the general purposes of the company including the further enlargement and improvement of the plant and the acquisition of new properties have under consideration the issue of capital stock out of the $801,200, still remaining of the authorized capital, as they deem it to be necessary. A by-law increasing the number of directors from 7 to 9 will be submitted to your approval."

The present board of directors consists of president W. D. Matthews, Toronto; vice-president, Geo. Sumner, Montreal; managing director, W. H. Aldridge, Trail, B.C.; E. B. Osler, Toronto; Chas. R. Hosmer, Montreal; H. S. Osler, Toronto; W. L. Matthews, Toronto; J. G. Hodgson, Montreal; Jas. Cronin, Spokane.

Managing Director's Report.

The managing director's report to his fellow directors is as follows:—

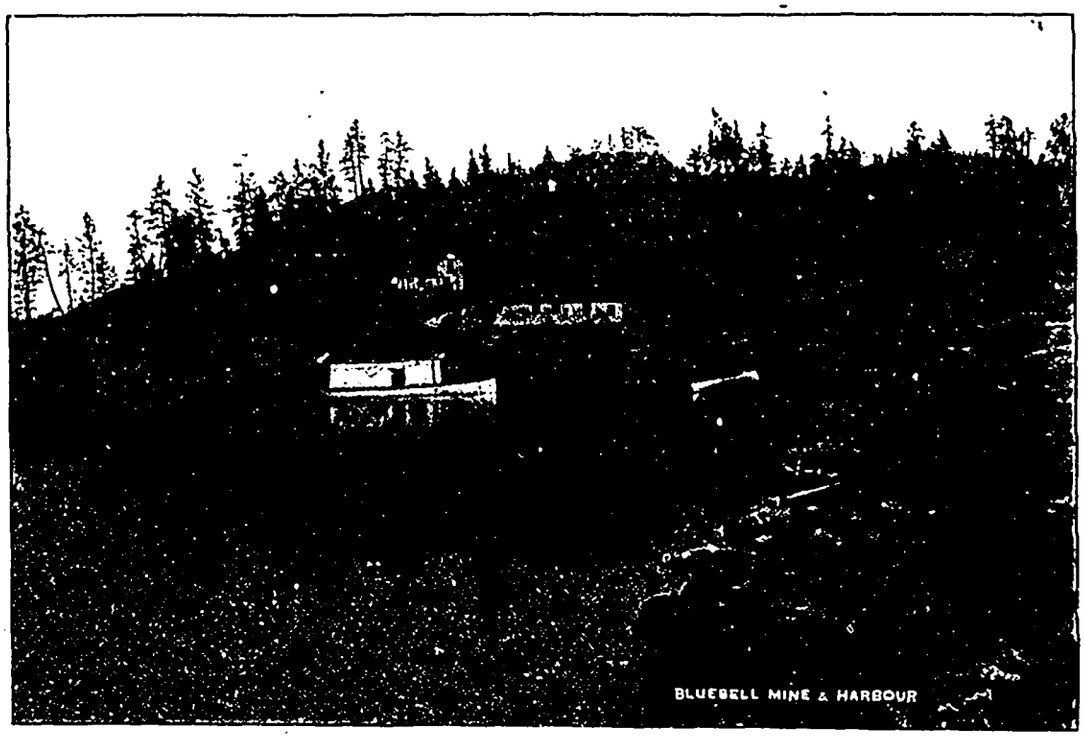
I beg to submit the results of the Consolidated Company's operations for the six months ending June 30th, 1906, including balance sheet, profit and loss account, production, and general report, with maps showing the groups of claims controlled or operated by the Consolidated Company, and vertical projections of the principal producing properties.

Financial Statement.

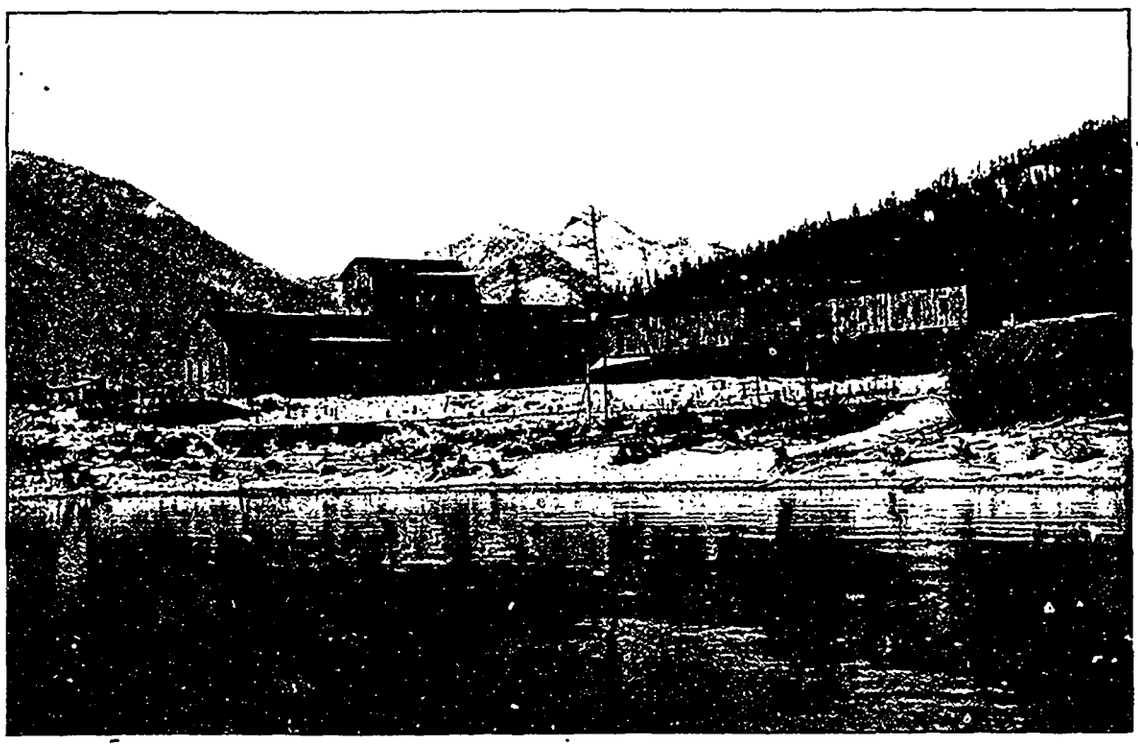
After writing off expenses of incorporation and $45,905.00 as depreciation upon plant and equipment, the operating profit shown is $325,854.93. From this profit a special reserve of $20,000.00 has been provided, and two dividends amounting to $234,940 00 have been paid, leaving a balance at credit of profit and loss account of $70,914.93. In determining the values of the metals and products on hand, quotations considerably lower than the market prices of June 30th, 1906, have been used, to provide against a possible decline in the metal market.

Production.

Following are the productions of the different properties controlled by the Consolidated Mining and Smelting Company of Canada, Limited, for the first six months of 1906, and the total production to date, as far as can be ascertained. It will be noted that the gross value of metals produced by the company's smelting works has been over $22,000,000, and that during the six months the gross value



Bluebell Harbour and Pier.



Monitor Mill, Brockman, B.C.

was about $3,000,000, of which $1,622,450 came from the company's own properties:—

Six Months of 1906.

	Tons Ore.	Ozs. Gold.	Ozs. Silver.	Lbs. Lead.	Lbs. Copper.	Total Value.
Centre Star and War Eagle.	81,267	30,669	26,938	.....	976,528	$ 823,790
St. Eugene, Ore	84,066	.....	418,084	17,288,649	.....	798,660
" Conc. ..	15,497	.....	.....	.....	.....	.....
Snowshoe—Nil.						
	Smelted.					
Trail Smelter	157,640	64,590	1,074,255	15,133,683	2,399,161	2,994,927

Total Production Since Commencement of Operations in 1894.

	Tons Ore.	Ozs. Gold.	Ozs. Silver.	Lbs. Lead.	Lbs. Copper.	Total Value.
Centre Star and War Eagle.	842,684	456,882	660,094	.....	20,053,385	$12,831,033
St. Eugene, Ore.	397,482	.....	2,682,273	105,459,720	.....	4,489,343
" Conc. ...	88,931	.....	.....	.....	.....	.....
Snowshoe	92,330	8,402	26,775	.....	2,400,580	806,000
	Smelted.					
Smelter	1,068,613	508,974	9,078,833	82,288,440	25,393,446	22,014,085

Note.—Trail Smelter production does not cover period the smelter was operated by B.C.S. & R. Co., which was previous to March, 1898.

Development.

There are about fourteen miles of underground development or narrow work in the Centre Star and War Eagle and nearly eight miles in the St. Eugene. During the six months 8,573 feet have been driven in the Centre Star and War Eagle, and 6,888 feet in the St. Eugene.

In the Centre Star most encouraging results have been obtained on the eleventh or lowest developed level (1,388 feet below the collar of the shaft, and measured on the dip of vein 70 degrees).

In the War Eagle fair tonnages of ore have been found on the fourth, fifth and sixth levels, while good ore is being developed on the bottom or eleventh level (1,582 feet below the collar of the shaft, and measured on the dip of the vein 64 degrees).

At the St. Eugene the discovery of a new cross shoot, known as Fourth Avenue, connecting the main and south veins, will probably prove to be the most valuable find made during the six months at that property.

A small shoot of high-grade ore has been found in the Richmond-Eureka group at Sandon, formerly owned by the War Eagle Company, and a few carloads will be shipped as soon as raw hiding is possible.

The ore reserves have been increased in the Centre Star and War Eagle Due to a lack of compressor capacity and drills, development in the St. Eugene has fallen behind somewhat, but the sinking of the main shaft and other important work is now well under way.

Construction and Improvement.

Due to lack of skilled labor, the new construction and improvements have not been completed.

During the six months $130,979.28 have been expended upon these accounts, which expenditure will not only reduce costs, but will increase the tonnage which can be economically handled at the mines, smelter and refinery. The main enlargements and improvements are as follows:

An increase in the electrolytic lead refinery from a capacity of fifty tons of pig lead per day to seventy-five tons per day; the installation of an electric crane, and the introduction of a new process for the treatment of the silver slimes.

The addition of a new copper furnace 22 feet long by 42 inches at the tuyeres, having a capacity of over 400 tons daily of Rossland ore.

The patent rights and installation of the Huntingdon-Heberlein process for the treatment of lead sulphides, which process is reducing the costs of treating the St. Eugene lead product, copper matte and other sulphides.

The building of additional large flues for catching dust from the copper furnaces.

Additional transformers and other electrical machinery incidental to the increasing of the capacity at the smelter and the refinery.

The principal installation at the mines consists of a new Nordberg hoist at the Centre Star, of a capacity of 1,350 tons per ten hours from a depth of 3,000 feet (cylinders 28 in. x 60 in., drums 10 feet, skips 4½ tons, horsepower 1,100), which will permit of the handling of all of the Centre Star, War Eagle and Iron Mask ore through the one shaft, in place of operating three separate shafts. In this connection the head works of the War Eagle will be abandoned, the War Eagle compressor removed to the Centre Star compressor house, where both will be electrically driven. In the new Centre Star hoist house a complete sorting and sampling plant is being installed.

New Properties.

Snowshoe Mine.

In order to secure a regular supply of desirable smelting ore, an agreement has been made with the Snowshoe Gold and Copper Mines, Limited, by which the Consolidated Company will operate that property under a lease. Reports by Professor Brock, of the Canadian Geological Survey, indicate that there are about 100,000 tons of ore which can be profitably mined, and it is believed that development work may materially increase this tonnage.

In consideration of this lease, the Consolidated Company has guaranteed an overdraft of the Snowshoe of $78.000. The proceeds from ore shipments will be applied by the Snowshoe Gold and Copper Mines, Limited, to this overdraft, so that it should be entirely repaid in about one year.

Iron Mask.

Negotiations for the purchase of the Iron Mask Mine, Rossland, have been concluded since the close of the fiscal year. This property adjoins the War Eagle on the east and the Centre Star on the north. The Iron Mask Mine shipped 19,405 tons of ore at a gross assay value of over $25.00 per ton (nearly $500,000), and has 11,850 tons of probable ore containing $20.46 gross assay value ($242,-451,). The War Eagle east drifts will be connected with the old Iron Mask workings. There was considerable expensive litigation between the Centre Star and Iron Mask, which was concluded in 1901 by a somewhat indefinite agreement. The purchase of the Iron Mask removes all chance of future difficulties between the properties.

Examinations.

One or two engineers are kept in the field looking up new properties, and it is hoped that other promising properties in other districts will be secured.

Management and Staff.

Owing to personal business, Mr. James Cronin resigned the active management of the mines, and was replaced by Mr. R. H. Stewart as manager of mines, under whose supervision the mining results have been most satisfac-

tory. The favorable condition of the company's properties are also due to Mr. Jules Labarthe, manager of the Trail Smelter and Refinery; William Chambers, superintendent of the smelter; S. G. Blaylock, metallurgist; John F. Miller, superintendent of the refinery; R. Purcell, superintendent of the Centre Star Mines; W. P. White, superintendent of the St. Eugene Mines; T. W. Bingay, comptroller, and John M. Turnbull, mining engineer.

Respectfully submitted,
W. H. ALDRIDGE,
Managing Director.

Profit and Loss Account.

To Metals and Product at Smelter, January 1st, 1906		$ 902,144 20
" Ore in transit to Smelter, January 1st, 1906		10,316 40
" Customs Ore and Lead Bullion purchased.		1,893,737 36
" Freight on Ore from Company's Mines.		47,845 86
" Mining, Smelting and General Expenses:		
St. Eugene Mine	$209,924 87	
Centre Star Mine	195,743 38	
Crown Point Mine	2,294 91	
Trail Smelter	582,946 40	
		990,909 56
" Development Expenses:		
St. Eugene Mine	$ 72,297 57	
Centre Star Mine	172,321 33	
Richmond Group	557 97	
		245,176 87
" Depreciation—General Plant and Equipment		45,905 00
" Directors' Fees		2,100 00
Balance, profit		325,854 93
		$4,463,990.18
To Appropriations:		
Reserve for Claims in process of adjustment	$	20,000 00
Dividend No. 1, paid May 1st, 1906		117,470 00
Dividend No. 2, payable August 1st, 1906		117,470 00
Balance carried down		70,914 93
	$	325,854 93
By Sales of Smelter Product, Profit on Refining, etc.		$3,182,593 98
" Sales of Ores		127,071 22
" Smelter Product on hand, June 30th, 1906, and in transit from Smelter to Refiners—Pig Lead, Matte and Gold..		397,320 69
" Ore in transit to Smelter, June 30th, 1906, and in process of treatment at Smelter and Refinery; at cost or less estimate for refining cost		750,912 81
" Lead Bounties		1,834 17
" Rents and Sundry Revenue		4,257 31
		$4,463,990 18
By Balance brought down	$	325,854 93
	$	325,854 93
1906, June 30th.—By Balance	$	70,914 93

Auditors' Report.

We have audited the accounts of the Consolidated Mining and Smelting Company of Canada, Limited, for the period of six months ending June 30th, 1906, including the Mine and Smelter Accounts maintained at the offices at Moyie, Rossland and Trail, B.C. The values attached to ores, smelter products and materials at June 30th, 1906, are as certified by managers and storekeepers, reserves having been made for contingent expenses, fluctuations in values and estimated cost of refining products in course of treatment. Subject to the foregoing, we certify that the preceding balance sheet is in our opinion properly drawn up so as to exhibit a correct view of the financial position of the company as at the date of closing the accounts to June 30th, 1906.

CLARKSON, CROSS & HELLIWELL,
Chartered Accountants.

Vancouver, B.C., August 31st, 1906.

LEASING IN THE SLOCAN.

The Review has already referred to the advantages of the leasing system, as applied to the Slocan, and we are pleased to see that Mr. S. S. Fowler, M.E., of Nelson, one of the best authorities we have, agrees that this system is one that is applicable to the Kootenays, and has so expressed himself in the course of an interview granted a representative of The Canadian.

Mr. Fowler is reported to have said:—

"The greatest and also the most obvious advantage of the leasing system is the great saving of expenditure. The mining operations of a big company necessarily involve an office staff of fair salaried men, accountant, clerks, manager and engineer. Where the authority of the manager is limited it also involves frequently costly delays in obtaining consent and approval for projected operations.

"The system has been in vogue for some years in Colorado and has been successful there. The returns of printed contracts show that the lessees pay a much higher royalty in Colorado than has so far been paid in British Columbia. There the companies usually do a certain amount of development work, sink a shaft and equip it, and start drifts. Then they lease parts of the drifts, making it a condition of the lease that the lessee shall do a certain amount of development work before he begins to stope ore.

"As to the royalties paid, the figures I have apply to two years ago, but I think there has been no material change since. The royalty is on a sliding scale, from 10 per cent. on the gross returns in the case of $25 ore to 70 per cent. for $200 ore, with the average of 45 per cent. on $100 ore. In British Columbia the rate is usually only 25 per cent. on $100 ore and calculated on the smelter returns.

"The first leases in British Columbia were generally taken on developed mines by former employees, who knew the location of small ore bodies and got leases merely to take them out, paying a small percentage of the returns. Such lessees were usually, though not always, working miners.

"That condition, however, is rapidly passing. It had many defects. Such lessees seldom had any capital. They had to work on credit, with a merchant sharing the risk, and they did no development work. The mine owners derived no benefit.

"The new condition is creating a class of lessees with small capital and usually with enough mining and business experience to satisfy the owners that the work undertaken will be well done.

"A recent contribution to the subject has advocated the formation of small syndicates, of 25 miners, each contributing $10 a month for development. Well, $250 a month will not go far to develop a mine.

"Few working miners have enough capital to really accomplish anything worth while. The lessees of the future will be men who can afford a few thousand dollars. They may then sub-lease special parts of the properties.

"It has been found that employees of a lessee do better work than men working for a big company. There is a definite object in view. They know that unless the work is successful it will stop and their occupation will be gone. In many cases, of course, where they are sub-lessees, they have a direct financial interest in the success of the work.

"Now, of course, the system cannot be followed with success in all fields. A big low-grade property—in which operation on a very large scale is necessary for profits, can only be handled by a company or individual with large

capital. Even a high-grade property requiring big and costly development work, such as the long tunnel of the Rambler-Cariboo, will never, I think, be done by lessees.

"But it seems to me that the Slocan is peculiarly fitted now for successful application of the leasing system. There are many small high-grade properties already opened up, with ore bodies definitely located if not actually in sight, and many of them are equipped with mills, or are near to concentrating plants of some kind. Such properties will probably never be able to pay expenses of company operation with its costly incidentals, and pay interest on investment too, but they may give excellent returns to working lessees. If it be granted that a company manager and a working lessee are equal in efficiency, the latter has an immense advantage in economy.

"With the close supervision that is only possible with a small force, many other economies besides the saving of superfluous salaries may be effected. It is possible to see that all ore taken to the mill is clean ore, and there is every incentive to do so, as the returns depend entirely upon what is mined.

"One difficulty in the way at present is the scarcity of miners. The general prosperity of the West on both sides of the line has created a big demand for labor, and good miners are hard to get even at the highest wages.

"So far mining lessees in British Columbia have enjoyed very favorable terms. They have paid a low royalty as compared with that paid in other districts, and little in the way of development work has been required of them. There are no indications of any increase in the royalties, but the mine owners are now becoming keener as to the financial ability of the lessee to fulfill his contract, and do work that will benefit the property as well as himself and give the owner a substantial return in development as well as the small royalty, which amounts to little more, in some cases, than interest on capital already expended.

"With its limitations clearly understood and the need of economy and efficiency thoroughly appreciated, there is a splendid field in the Slocan for mining on the leasing system."

AT THE SOO.

The Lake Superior Corporation has issued its annual report for the year ended June 30, 1906. The income account compares as follows:—

	1906.	1905.	Changes.
Int. on invest. secur.....	$1,102,044	$543,455	Inc. $558,589
Miscellaneous net income.	36,700	42,084	Dec. 5,384
Total income	$1,138,744	$585,539	Inc. $553.205
Coupons from 1st mtg. bonds outstanding	452,200	452,175	Inc. 25
Int. accd. 1st mtg. bonds..	37,683	.....	Inc. 37,683
Balance	$648,861	$133,364	Inc. $515.497
General expenses, taxes, etc.	91,981	98,562	Dec. 6.581
Surplus	$556.880	$34,802	Inc. $522.078

The report of President Charles D. Warren to the shareholders of the Lake Superior Corporation, says:—

"During the year the important plants of the operating companies have been actively employed, and, in this direction, the expectations of your directors have been realized. It is hoped that the current year will see other of the plants in operation and that the results to the corporation will be more profitable."

Referring to the blast furnaces and steel rail plant, President Warren says: "This, the principal industry, demands the largest share of attention, and absorbs in its operation the greater proportion of the financial resources, while its further needs are inadequately met. It is most gratifying that this branch of the work shows great development and improvement. The estimated production of 150,000 tons of steel rails for the year has been exceeded by about 10,000 tons. The record output of steel rails for a day—1,004 tons—and 17,877 tons during August, 1906, shows the possibility of the plant and proves the advisability of a further capital expenditure on the steel work.

"Your directors would like to provide at the earliest possible date for another blast furnace having a daily output of at least 400 tons. This would nearly double the present production of pig iron and thereby furnish material adequate for the most advantageous operation of the rail mill. The present blast furnaces operated during the past year have made 130,902 tons of pig iron, which is considered a very satisfactory showing.

"The construction of two thirty-ton open hearth furnaces has been authorized and their completion is expected early in December, 1906. This extension will make way for the profitable use of a large amount of 'scrap' which has been accumulated, and furnish additional material needed in the operation of the rail mill. This new open hearth plant has been planned with a view to extension.

"Less ore has been taken out of the Helen mines during the preceding year. Several causes have combined to produce this result, among which may be named labor troubles and a fire which destroyed the hoisting apparatus and machine shop, all of which have since been replaced. The development work continues. Considerable bodies of pyrites have been found for which a ready market is available at profitable figures.

"The two railways and the fleet of steamers have been profitably operated, and, as in the previous year, mostly with company freight.

"The two traction companies together have shown increased business and better results. An extension of the route on the American side is under consideration. It is believed that the usual history of street railways in cities —an increase of business from year to year—will be realized from these operations.

"The Tagona Water & Light Co. has made its usual good record.

"Propositions in regard to the nickel properties from outside parties have been considered, but as yet nothing has been presented which seems worthy of acceptance.

"The Michigan Power House has furnished power to the Carbide Co. during the year. Unavoidable circumstances have delayed the construction of the works necessary to make the power house secure under the development of the maximum horsepower. It is expected that the necessary work will be under way next year.

"For the two years ending June 30, 1906, $527,883 has been expended for betterments and extensions to property and plants.

"On June 30, 1906, the total inventory of materials and supplies and outstanding accounts receivable held by the subsidiary companies amounted to $4,129,672."

THE A. B. C. OF SMELTING.

Bulletin No. 1417, an illustrated publication of 48 pages on "Smelting Furnaces and Accessory Equipments," has been issued by Allis-Chalmers Company of Milwaukee, represented in Canada by the Allis-Chalmers-Bullock Co. of Montreal. It contains information that will be of value to those who contemplate the erection of smelting plants. The pamphlet has been prepared by an expert on the subject and is as full of information as the ordinary text book on this branch of metallurgy.

"Smelting is that metallurgical process in which ores are melted or fused for the purpose of separating their valuable metal constituents from the gangue or worthless portions. It consists essentially in subjecting the ores, mixed with suitable fluxes, constituting a "charge," to the action of intense heat, whereby the "charge" is rendered fluid, the gangue combining with the fluxes to form a slag or scoria, while the valuable metals combine to form an alloy or matte. The separation of the matte and the

slag takes place while the materials are in a molten condition, by reason of the difference in their specific gravities.

Smelting is performed either in a blast furnace where the fuel (coke or charcoal) is mixed with the charge, or in a reverberatory furnace in which the fuel (coal, wood, gas or oil), is burned in a fire-box adjoining the smelting chamber.

Smelting may be roughly divided into two classes: "Copper Smelting" and "Lead Smelting." As the terms imply, these mean that the predominating valuable metal in the charge is copper in the one and lead in the other. In lead smelting the valuable product is "lead bullion." In copper smelting, it is "copper matte," when sulphide ores are being treated, the "black copper" when oxide, or carbonate ores are being smelted. The lead bullion, copper matte or black copper, contains also whatever gold or silver was in the ores constituting the charge.

For smelting, the charge, or mixture, of ores and fluxes, must be of such a composition that the resulting slag will be sufficiently liquid to allow the valuable metal or its compounds to separate from the mass readily and to flow freely from the furnace. The slags produced in smelting consist mainly of silica, ferrous oxide and lime, with which there are frequently small quantities of zinc oxide, alumina and other materials. The amount of these materials in a slag are more of a commercial proposition than a metallurgical one, as the composition of a slag may be varied widely without seriously affecting the running of the furnace, or the extraction of the valuable metals.

Custom smelters buy ores of many kinds, mixing them together in proper proportions to form furnace charges of the required composition, thereby making one ore the flux for another. Independent smelters, whose own mines do not produce ores of the composition required for fluxing purposes, endeavor to secure such ores from other sources, as otherwise they would have to add barren fluxes to the charge. These cost as much to smelt as ore and give no results beyond their fluxing powers. Conditions are, however, rarely so favorable that no barren fluxes need to be added. Limestone, iron ore, and, in some cases, silicious material, are nearly always necessary to make a charge. For this reason it is desirable to locate smelters in localities where these fluxes may be easily secured.

The fuel used in blast furnaces is coke or charcoal, or a mixture of the two. Coke is preferable, as it does not crush as readily as charcoal under the weight of the charge in the furnace shaft. The quantity of fuel required by a blast furnace depends upon the character of the ore to be treated, the nature of the fuel itself and the process of smelting involved. In modern lead smelting, the quantity of coke required is, on an average, about 12 per cent. of the weight of the charge. In copper smelting with cold blast, from 8 per cent. to 12 per cent. coke is required, while with hot blast and ores running high in sulphur, as little as 2 per cent. of coke has given good results.

For reverberatory furnaces, coal, wood, oil or gas may be used as fuel. The quantity required depends upon the character of the ore, the nature of the fuel itself and the design and size of the furnace. In large, modern reverberatory furnaces using ordinary run-of-mine bituminous coal, 500 to 1,000 pounds of fuel are used per ton of ore smelted.

An important advantage of smelting is that nearly all ores, when properly fluxed, can be treated by this process. The extraction of the valuable metals in smelting depends principally upon the character of the ores, but is also largely dependent upon the man in charge of the plant. Ordinarily it is safe to figure that practically all of the gold, ninety-five per cent. of the silver and ninety per cent. or more of the lead or copper will be saved. The cost of smelting depends upon the character of the ore, the cost of coke and labor, the size of the plant and its equipment and arrangement. In some large plants, equipped with the most modern machinery and operating under very favorable conditions, a cost as low as $1.25 per ton has been attained, while with small plants in remote localities, where fuel and labor are expensive, the cost will run up to $15.00 per ton or higher.

Success in smelting is primarily dependent upon having a plant equipped with the best and most modern machinery. The arrangement of the plant should be such that ample working room is provided around the furnaces. Rehandling of materials should be avoided as far as possible, and hand labor eliminated wherever it is practicable to put in mechanical means for performing the work. A smelting plant should be carefully designed, and every condition that will influence the cost of operation should be carefully considered when the equipment is being decided upon and the plans made. It is often the case that a few additional dollars spent in equipment will mean the saving of thousands in operating expense. Even in a small plant a saving of but a few cents per ton of ore handled amounts to a considerable sum at the end of a year's run.

Plants completely equipped with Allis-Chalmers machinery can be seen in operation in every state and territory in this country where mining is followed. They are to be found in Mexico, Canada, Central and South America, Africa, China, Japan, Korea, Russia, Spain, India, Norway and in many other foreign countries. In fact, whereve there is even a pretense to modern methods in the min[illegible]g or reduction of ores, Allis-Chalmers machinery may be found in operation.

We are informed by the Geological Survey that Part I, Vol. X on Temagami district, and Part H, Vol. XIV, a bulletin on nickel, both by Dr. Barlow, are out of print. No applications for these pamphlets can be entertained until new editions shall have been issued.

BOOK REVIEWS.

The Mineral Industry, founded by Richard P. Rothwell, has come to be an indispensable volume to all those who are interested in any way in the mineral production of the world. Volume XIV., covering the statistics of the industry for the year 1905, has just issued from the press of the Engineering and Mining Journal. This volume was edited by the well known authority, Walter Renton Ingalls, who is also editor of the Engineering and Mining Journal in New York.

The scheme of the volume corresponds to that of its predecessor, that is to say, it covers the field very thoroughly. In the preparation of the statistics for this volume, the figures previously reported for 1904 have been revised in the light of later and more minute investigation, therefore, it is important for students to observe the caution to use always the figures in the latest volume of The Mineral Industry. There are no statistical reports of this nature which are absolutely correct, owing to the practical impossibility of obtaining accurate reports from all the producers in some extensive and greatly subdivided industries, the absence of records on the part of many producers, which prevents them from making returns, the unwillingness of a few to give their figures, and the confusion as to the stage in which many products are to be reported. The last difficulty is especially likely to lead to errors in values, some producers estimating the worth of their product at the pit's mouth and others reporting it in a more or less advanced state of completion, including thus not only the cost of carriage, but also the cost of manipulation.

We are pleased that The Mineral Industry has returned to its original promptness of publication, though, as the editor explains, owing to this very celerity, some of the statistics may require revision, although reasonable commercial accuracy is believed to have been attained.

Two of the most important products—coal and coke—are excellently handled by Mr. Frederick Hobart, who is associated in the editing of the Engineering and Mining Journal with Mr. Ingalls.

The price of the volume is $5, and it is published at 505 Pearl Street, New York.

MINING NOTES.

With a view of meeting the growing scarcity of copper to which the recent rise in price is ascribed, several old workings in England, Wales and Ireland have been re-started. Many new shafts have been sunk in Cornwall, where it is also claimed satisfactory yields are being obtained from the coarse sea sand.

Hugh Armstrong, M.P.P., and W. Richardson, of Portage la Prairie; Dr. Willoughby, Saskatoon; T. C. Bullock, Crystal City; C. H. McNaughton, Archibald Wright, Mr. and Mrs. J F. Campbell, Dr. and Mrs. Clark, J. R. Boland, Thomas Hurtley, S. Tupper, J. D. Fraser, and E. R. Fraser have left Winnipeg in a special car. The party intended to go to Grand Forks and thence west to Spokane, spending a day in that place, and afterwards a couple of days at the Winnipeg and Belcher copper mines.

The Iron Age says of the iron and steel outlook:—"Returns to us from the coke and anthracite blast furnaces show that pig iron production in the thirty days of September was 1,970,962 gross tons, as compared with 1,926,736 tons in August, with thirty-one days. The daily rate was 65,699 tons in September, an increase of 3,546 tons a day over the average in August. September has thus substantially checked the decline in production which has been noticed month by month since March. The weekly capacity of 310 furnaces, active October 1, was 469,665 tons; on September 1, it was 441,426 tons. A monthly increase of 120,000 tons is thus indicated.

Altogether, the sales of basic pig for delivery during the first half of 1897 amount to nearly 125,000 tons, with further inquires in the market. Eastern Pennsylvania steel makers have purchased between 25,000 and 30,000 tons, heavy melting scrap, at $18 to $18.50. Some good sales of foundry iron are reported in this section, and quite a good deal of forge iron has also been marketed. The southern iron makers do not seem to be pushing sales in any direction. Importers have been studying the chances of placing Middlesboro and Scotch irons, and some moderate business has been done. It is understood that quite a tonnage of pig iron warrants has been bought for American account, but it is yet an open question whether the buyers will take the profit available from the rise, or will ultimately decide to ship the iron. Only moderate transactions in steel rails are reported, but it is probable that some important negotiations now pending will be closed at an early date. There has been quite a good run of contracts for structural material. In bridge material the most important transaction now being closed is for 19,000 tons for the Canadian Pacific Railway. The plate makers are booking a good deal of business, and specifications are rolling in freely. In the merchant pipe trade, makers are figuring on some good orders for line pipe.

NEWFOUNDLAND.

The copper mine at St. Julien's, north-east coast, owned by Messrs. Kawaja and Parrell, has been acquired by a big New York mining capitalist, through the agency of Sir E. P. Morris, the solicitor for the owners. The deposits have been inspected by experts and favorably reported upon and the capitalists and a competent engineer will visit the colony shortly to view the property and arrange for operating it on a large scale next spring as the copper market is now up and this is believed to be one of the finest deposits in the land.

NOVA SCOTIA.

A tract aggregating 100,000 acres of land in Inverness County, was leased for twenty years by the Cape Breton Prospecting, Mining and Developing Company, Ltd., of Sydney, on October 10.

The property was acquired from Mr. W. H. Harrington, of North Lake Ainslie. The property is said to hold natural gas and oil. Twenty men are now employed, and inside of a fortnight the company expects to have all the necessary machinery installed and work going on vigorously

Land has been bonded in Inverness on which wharves and piers will be erected, the facilities for shipping being all that could be desired.

The Cape Breton Prospecting, Mining and Development Co. was incorporated under the Nova Scotia Companies' Act last April, and is composed of local men. Following are the officers: C. J. Stewart, president; Z. Tingley, vice-president; F. W. Morley, secretary; F. O. Patterson, treasurer; John P. Joy, manager. The company is capitalized at $500,000, and one of the conditions upon which the Inverness property was acquired, is that this capitalization be increased to $1,000,000.

NEW BRUNSWICK.

Mr. Einar Lindeman, who was sent by Superintendent of Mines, Dr. Haanel to examine three promising iron ore deposits in the vicinity of Bathurst, N.B., after completing his work discovered from the intensity lines of one of the deposits another ore deposit hitherto unknown of much larger extent than those he had been asked to examine. The first report is that the new deposit is 75 feet deep, 80 to 100 feet wide, and extends 1,800 feet down to the Nipissiquit River, which it crosses. This discovery is a striking exemplification of the method of examining magnetic iron ore deposits which was inaugurated by Dr. Haanel.

ONTARIO.

A discovery of copper ore is reported from the Bruce Mines, upon property until lately owned by that corporation. A vein 18 feet wide has been stripped for 500 feet. The ore is bornite and copper pyrites.

It is stated that the American Madoc Mining Company, which is working iron pyrites mines in the township of Hungerford, is preparing to erect large chemical works for the manufacture of sulphuric acid, etc. The mines are near Bogart, P.O., and at present are employing a staff of from 40 to 50 men, which will be increased from 150 to 200.

The Lake Superior Corporation will build an addition of 500 feet to its ore dock as the steel plant dock, which is now 900 feet in length, is not large enough to accommodate the business at the ore docks. An additional blast furnace is also being considered by the directors, the furnaces now in operation being unable to supply enough pig iron for the plant.

Minneapolis is to be directly interested in new and extensive mining operations to be started in Canada on Lake Superior next spring. R. J. Anderson of Minneapolis, is in charge to-day, with E. V. Douglass.

The Lake Superior Company will take all the ore that the new company can mine. It is to be known as the Thunder Bay Iron Co.

St. Paul capitalists have taken an option on 6,000 acres of iron ore property at Loon Lake, Ont. They will commence development work this fall, erecting a large number of shanties to house sixty men during the winter. It will be one of the largest iron ore camps in the world in a short time, so Port Arthur people have been assured. Ore docks will also be built this year.

Strange, weird stories, which rival the wildest dreams of imaginative depicters of adventure in forbidding places of the world, are told by returning prospectors from the north. According to report there are scores of men wandering around in the woods, over rocks and cliffs, by river and lake, treading where white man has hardly gone before, all in search of signs of mineral. With the passion for wealth, mingled with a craving for excitement, the chase is persistently kept up. Some of these prospectors lack even a common woodsman's experience, and numerous instances are recorded where men were found in a starving condition, miles from any human habitation. Sometimes they even forsake their canoes and take to the woods in a vain effort to meet a fellow-man. A story was told in New Liskeard by a man named Albert Connell

La Plata Mine and Terminal of Upper Tram.

La Plata Mill and Tram.

about a prospector who became so weak that he was unable to carry his rifle, but who was rescued in the very nick of time. What proportion of these stories is true it is impossible to tell.

Mr. E. D. Ingall, mining engineer of the Geological Survey, has just returned from a tour amongst the copper mines of northwestern Ontario. The conclusions at which he arrived will shortly appear in the department's summary report, but meanwhile it is no secret that Mr. Ingall was considerably impressed by the renewed activity in the copper districts, due to a large extent to the present high price of that metal, but also to their being more easily accessible than formerly.

Mr. Ingall says that prospecting for copper ores is just now very active and that development and exploratory work are being prosecuted at a number of points along the north shores of Lakes Huron and Superior.

Underground development is being actively continued at the Tip Top Mine, near Lake Shebandowan, west of Thunder Bay, as well as at the Heminia, Dean Lake, Superior, Echo River, and at various points distributed along the the range of country lying adjacent to the north shore of Lake Huron and between the well known nickel-copper district of Sudbury on the east, and the eastern shores of Lake Superior.

The wide distribution of copper ores throughout this region was pointed out in the earliest publications of the survey and interest attaches to the recent reopening of the Bruce Mines series of veins These were operated as far back as the year 1847 and mining was successfully continued for a period of some twenty-eight years when the difficulties due to their isolated situation and the drop in the price of copper caused a cessation of mining. Now, after a long period of rest and various vicissitudes these old and interesting mines are being reopened by an English company and it is believed that, with higher prices for the product, together with the great improvements in methods and machinery and in the general conditions of this district, operations can be carried on with profit.

The already proved prevalence of copper ores over so extensive a territory, together with the present activity in exploring and the promising nature of some recent discoveries justifies the hope that the problem of profitably treating the sulphuret ores of north-western Ontario will be solved at an early date.

The discovery of gold on Larder Lake, north of New Liskeard, is now confirmed. To Dr. R. Reddick, who comes from Winchester, Ontario, goes the credit for the discovery of this new field, though the first actual find was made by Mr. Edward Flynn of Chesterville. Dr. Reddick has just returned from the north, and told a correspondent of the Globe this story. After describing how he obtained preliminary information concerning gold the doctor said:—

"On the 13th of July last John Hummel of Hilliardton, Edward Flynn of Chesterville, and William Knott of Hilliardton and myself started from Haileybury for the north to prospect for gold. We left Tomston on the 16th and arrived at Larder Lake by trail and canoe on the 20th. Immediately we commenced to prospect, and we received many discouragements. Prospectors were returning with stories of barren rock. I knew gold had been found at Opisatita, in Quebec, and accordingly we moved as near to the boundary line as possible. We also knew gold had been found, though in uncertain quantities, in Boston and Playfair townships, west of Larder Lake. We got in a line between Opisacita, and these finds, which turned out poorly. On July 29 we found the first signs of gold while on our way to visit Chamoney, Quebec. There was only a speck of gold rose quartz. Ed. Flynn found the first sign. Two days afterwards a large body of this quartz was found by myself on the north side of the north-east arm of Larder Lake. Actual gold was found on the last day of July. I named the rock formation Reddick Lode. There had been one claim staked near there for copper, but there was one full claim between this stake and where the gold was found. I named my first claim the Annie R. Gold was visible in quartz, and we could knock this off with our picks. I will admit we were somewhat excited, and four or five assays were made. This will run from $122 to $1,868 in gold per ton of quartz. All we staked were seven claims. Gold is treacherous. I know that by experience, and we said to ourselves seven claims would be sufficient, and if good there would be enough returns for us all. Other parties from Chesterville followed us, and they were Herman Hummel, W. G. Barkley, J. T. Kearns, and W. J. Elliott. You can imagine that we never sought any publicity, because secrecy is the best thing in such cases, and this is the first time I ever told this story, knowing that it would reach the world. I am certain whereof I speak."

COBALT.

The town of Cobalt still continues to be overcrowded by representatives of leading mining firms of America, and their friends. The town has also many visitors, who come up to inspect the Nipissing and other properties in which they hold stock.

An interesting incident in connection with the rich LaRose mine occurred recently when the owners sold the dump or refuse ore at $25 per ton, a transaction which will net, at a conservative estimate, $250,000. The dump ore will be taken to Providence, R.I., for treatment.

The Buffalo mine is showing up excellently, and there is a steadily increasing output of good quality ore from its working veins. The Cobalt Silver Queen is fast coming into line as one of the good shippers of the camp, and the Trethewey properties are in better working order than ever.

The Hudson Bay have given an option of one million dollars for the 200 acres of land they held after the sale of the Silver Queen. This price, however, does not include any of the assets of the company, other than the unproven ground comprising the 240 acres, so it will not be surprising if this deal is not consummated.

Asked as to his opinion relative to the depth of the silver-bearing veins in the district, Mr. John Hayes Hammond is reported to have said that there seemed to be no question as to their deep-seated origin, and added that there was every probability that they would continue to hold approximately their present values for several hundred feet.

The shaft of the Silver Queen is now down 140 feet, and at the bottom of the shaft they have 18 inches of high-grade ore. The Silver Queen is looked upon as one of the soundest propositions of the camp, but it is to be regretted that more of the surface of its property has not been prospected, for, since the big vein was first discovered, it has monopolized the attentions of either set of owners.

Mr. E. T. Corkill, mining inspector, has returned from the Gillies Limit and reported on the progress of prospecting to the Department of Lands, Forests and Mines. The entire attention of the engineers is being devoted to trenching. The 75-foot shaft alongside the newly-discovered vein, ordered by the Government has been sunk about 30 feet, and will be finished about the first of December. Regarding the reports that prospectors had discovered numerous veins, Mr. Corkill stated that if they did they never produced the goods. The Government engineers, he said, had discovered a dozen or more likely veins which were not reported to the Department. The health of the camp is excellent.

In the Kerr Lake district the Drummond property is perhaps the largest shipper in point of tonnage, although

some of this ore is not so high grade as that which is shipped from the immediate vicinity of Cobalt Lake. The Foster property is now in much stronger hands and shipments from it will show considerable increase during the winter months. Everything on the property is in good shape for the winter.

A company known as the Cleveland Cobalt Mines, Limited, is being organized and has taken over several of the claims in the vicinity of Clear Lake. On some of the holdings of the new company there are calcite veins carrying a very fair percentage of silver, and it is not improbable that the Clear Lake district will swing into line next summer as a shipper. Considerable diamond drilling has been done on several of these properties.

Stoping on the Lawson Vein Extension of the Silver Leaf has been commenced, and there is reason to believe that from one to two cars a week of high-grade ore will be taken down and shipped. Arrangements are being made for machine drills to work in the end of the drift, continuing to block additional ore, so that these shipments should be continuous when started—which will probably be not later than the middle of November.

Mr. W. R. Smyth, M.P.P. for Algoma, a member of the company owning the Nancy Helen mine, in the town of Cobalt, says the shaft-house, sleeping-house and other buildings at the mine are finished, twenty to twenty-five men are constantly at work, and two carloads of high-grade ore are awaiting shipment. The company has recently purchased a claim, which is regarded as a most excellent one, in the township of Buck, and will soon commence mining operations on it.

The Nipissing's air compressor is on the ground, and being installed, and it will be in working order about the first of the year. The main shaft is now down about 40 feet, in the vein, commonly called the big Bonanza, and it is the intention of the management to rush this to the first level with all speed that levels may be run, and stoping undertaken. Vein 27 of this property, which is also a remarkable vein, were it not overshadowed by the gigantic values shown on 49, is producing ore right along, and it is the intention of the management to sink on this vein also. This vein has been turning out some remarkable specimens of wire silver and other forms of the white metal of scientific interest.

Guggenheim interests, which are already the largest silver products in the world, have acquired control of the Nipissing mine at Cobalt, Ont. The Guggenheims have committed to the Cobalt silver field for some months a corps of their engineers, including John Hayes Hammond, who returned only a few days ago from an extended investigation of their property, and on the basis of their report the Guggenheims closed on Oct. 30 an option on 400,000 shares at $25. In addition to the block of stock acquired, amounting to one-third of the capitalization, the Guggenheims are said to have acquired sufficient stock to give them control. It is believed they will make other acquisitions in Cobalt district.

A new silver field district, and at a considerable distance from that of the Cobalt district, is the possibility opened up by the finding of silver in the Temagami forest reserve. The discovery was made at a point in the southwest angle of the township of Auld, where twelve claims have been already staked, all but one of them on discoveries of cobalt, The exception is a claim held by the White Brothers, of Muskoka, and it is reported to contain large quantities of native silver, similar in quality to that of the Larose and Nipissing properties in the Cobalt area. The White brothers broke several specimens from a thirty-pound lump of ore on top of a silver vein and these were found to contain a large percentage of native silver. The new field is reached from a point on the Montreal River, about twenty miles from Latchford, thence overland fifteen miles. As all the smaller lakes in the district are now frozen over, it will be a difficult matter to get into the new field before next spring.

ALBERTA.

Captain Walker of the Royal North-West Mounted Police has arrived in Edmonton from a four months' trip in the country between Lake Winnipeg and Hudson's Bay, where he has been establishing police posts, which will keep up monthly communication between the two bodies of water. Patrols will also connect with the C. N. R., which is being built toward James Bay. The distance from Norway House to Churchill is close to 500 miles. Captain Walker believes that the James Bay country has great mineral possibilities, and prospectors are already going into that country from Winnipeg and Ontario points. Fort Churchill is also reported to have unlimited coal fields.

BRITISH COLUMBIA.

The new machinery for Slough Creek, Limited, is arriving slowly. Its installation has been much retarded by the heavy rainfall during the month of September. Work in the drain tunnel proceeds as rapidly as the difficult character of the ground will permit.

The month of September was very wet in Cariboo, and most of the hydraulic mines about Barkerville got a satisfactory fall piping with which to augment the clean up next summer. August was a dry month, the rainfall being only 1.16 inches, while the precipitation for the first 27 days of September was 7.38 inches, according to the weather record of Meteorological Observer James Stone.

According to the Toronto News of October 27th, there was a meeting of Granby directors this week, and a rumor arose that several of the largest stockowners had sold out, giving the control to new and less reliable interests. A diligent canvass of directors and officers resulted in establishing the fact that nothing of the kind has taken place, nor is any change in control considered even remotely possible. Granby has had a clean record under its present control, and as any change would undoubtedly cause uneasiness among stockholders, it may be well to give the emphatic denial obtained yesterday.

Mr. R. T. Ward, a director in the Beaver Valley Oil Company, is down from Horsefly. He says the machinery for boring is all on the ground and in the course of installation. The pipe has not all arrived yet, but is expected to be on the ground by the time it is needed. Mr. Ward has disposed of his boring machine to the P. Burns Syndicate, who own 60 miles of dredging ground on the Fraser river, extending from Big Bar to the mouth of the Chilcoten river. Mr. Kirkwood, the manager for the syndicate, said that as soon as he had tested the ground several big dredges would be set to work. Mr. Kirkwood is a well known engineer of New Zealand, and for several months past has been operating dredges at Lillooet and Lytton.

YUKON.

Two hundred samples of quartz were put through the government assay office at White Horse the last six weeks. The demand on the office for assays is constant and heavy.

Governor McInnes states that while there is no government assay office in Dawson, all Klondikers are at liberty to send quartz samples to the White Horse assay office for testing. No charge is made for the test. An assay office was formerly maintained at Dawson, but has been closed, and all the territorial assay work is done at White Horse.

The new strikes in the Conrad, Watson river and White Horse districts have kept the prospecting fever high. While the quartz enthusiasm has abated near Dawson, it has augmented near White Horse. Considerable interest also is maintained in the copper properties near White Horse. Some of the heaviest development work yet undertaken there is now under way.

Col. Budd, manager of the English Company, which recently bought several miles of Walker's Fork property for dredging purposes, states that 450 tons are being shipped by his company to Fort Cudahy, at the mouth of the Forty-Mile.

"I plan to have this dredge placed on the Walker's Fork property this winter," says Col. Budd, "and to get three more dredges for the ground this winter. The present dredge has a capacity of 3,000 cubic yards daily, but I should like to get three more for next year."

COAL NOTES.

NOVA SCOTIA.

The October output of the Dominion Coal Company was 350,009 tons. The shipments were 337,139 tons.

The Cumberland Railway & Coal Co.'s shipments from collieries for the month of October were 32,221 tons.

The Dominion Coal Company's output for the month of October surpasses any previous record for the company by several thousand tons, and reaches the high total of 350,009, as compared with 323,732 in September. This in spite of the loss of coal at Reserve on account of the destruction of the bank-head. No. 1 being double-shifted in some sections, increased the output. There was a gain, however, all along the line. Labor is now much more abundant than during the summer.

The Maritime Coal Company will introduce an electrical plant near their coal mines, seven miles outside of Amherst, N.S. Here they will generate electricity and supply the big manufacturing and other concerns in Amherst.

Senator Mitchell, president of the Coal Company, has signed a contract with the Canadian Westinghouse Company for the supplying of apparatus. This company will install a 750-horse power generator and transformer and other necessary apparatus. The coal will be burned in furnaces right alongside the mine, and the electricity generated at that point. The power line is nearly finished, and the plant will be complete and in operation before the first of the year.

The electric current will be carried to Amherst on a high tension wire, and it is possible that within a short time the power will be carried on to Moncton, a distance of forty or fifty miles. It will be then supplied to towns within a radius of seventy-five to one hundred miles of the central station, situated at the mines outside of Amherst.

It is reported semi-officially that the Dominion Coal Company have acquired over two hundred acres of land near Lingan and Barrasois, Cape Breton. Evidence for months have pointed to the opening of a mine in the neighborhood, as for instance, surveys and work started to build a branch railway from the S. and L. main line. The land referred to above overlies three valuable seams of coal. The Barrasois seam, which crops at the seashore and is 9 feet thick; the Victoria seam, 200 feet farther down, which is 7½ feet thick, and Lingan seam 480 feet below that again. All these seams were worked to some extent years ago—notably the Victoria seam which produced a fine domestic coal. Lingan seam coal is a specially valuable cooking coal. The Barrasois seam is believed to be a continuation of the seam on which the Hub colliery is being worked. Those who should be in a position to know state that a new colliery will be opened up in the neighborhood above indicated not later than next spring.

The company have a force of men at work on the new shipping piers here and should have them completed and ready for shipping coal inside of two months. The shipping pier is 250 feet long, will contain two tracks, one for full cars with a transfer table to shift empties to the other track. The fulfilment of the long-talked-of project will add materially to the prosperity of this section of the town along the harbor front.

Dominion No. 6 colliery is now producing 600 tons of coal per day and will produce 1,000 per day very early in next season.

THE MINING AND INDUSTRIAL SHARE MARKET.

(Specially reported for the CANADIAN MINING REVIEW by ROBERT MERRDITH & Co., Mining Brokers. 57 St. François Xavier St., Montreal.)

The market for British Columbia mining stocks is now almost entirely controlled by operatives in the Far West. A great deal of stock has been bought in this market and shipped West during the past month, notably International Coal, Denoro and California.

The local interest has gone into the Cobalt region, and aided by the activity of these stocks on the "curb" market in New York, prices have advanced very sharply.

In the industrial stocks, the most active has been Dominion Iron & Steel. The business of the company has been increasing considerably, and the stock moved in sympathy with it, but the recent difficulty with the Coal Company has given it a bit of a setback. There has been a quiet absorbing of the bonds of this company, presumably for investment purposes.

The report of the Consolidated Mining & Smelting Company, just published, is an indication of the steady improvement in mining, in the western province. It is an interesting document, and an evidence of the success of consolidation in reducing the cost of production.

The latest quotations are as follows:—

	Bid.	Asked.
Consolidated Mines	137	140
Can. Gold Fields	7½	8¼
Granby Consolidated	13¼	13½
Rambler-Cariboo	29	32
North Star	13	18
Monte Christo	2½	3½
White Bear	9½	11
California	5½	6½
Virginia	5	6
Deer Trail	...	2½
International Coal	65	68½
Sullivan	10	12
Jumbo	17	18
Cariboo-McKinney	4	5
Denoro	9½	15
Novelty	3½	4¼
Diamond Vale Coal	17	20
Dominion Copper	6	6¼
Dominion Coal (com.)	63½	65½
Dominion Coal (pref.)	114	115
Dominion Iron & Steel (com.)	28	28¼
Dominion Iron & Steel (pref.)	76	78
Intercolonial Coal (com.)	...	...
Intercolonial Coal (pref.)	...	...
Nova Scotia Steel & Coal	67	69
Nova Scotia Steel & Coal (pref.)	...	...

INDUSTRIAL NOTES.

A branch of the Bank of British North America has been opened at Darlingford, Manitoba, under the management of Mr. C. C. MacRae.

The Jeffrey Manufacturing Company, Columbus, Ohio, have established a new Canadian Branch Office in Montreal, at Lagauchetiere and Cote streets.

The Canadian Copper Co., of Copper Cliff, has bought from Allis-Chalmers-Bullock, Limited, Montreal, a pumping plant, consisting of an 8-inch single stage turbine pump, driven by a 70 h.p. induction motor.

The Calumet Mining and Milling Co., Calumet, Que., has increased its plant by a 12¼ in. by 18 in. "Ingersoll" air compressor, driven by a 50 h.p. induction motor, both bought from Allis-Chalmers-Bullock, Limited, Montreal,

The Northern Pyrites Company, of Dinorwic, Ont., has bought from Allis-Chalmers-Bullock, Limited, Montreal, a mining plant, consisting of a one-half duplex "Ingersoll" air compressor, "Ingersoll" rock drills, "Lidgerwood" hoisting engine, boilers, ore buckets, etc.

The Ontario sales office of the Jenckes Machine Co., Limited, has been removed from 12 Lawlor Building, Toronto, to St. Catharines, Ont., where it will in future be operated in conjunction with the extensive branch works of the Company there. Mr. W. G. Chater, as formerly, will be in charge.

Among recent sales of crushing plants by Allis-Chalmers-Bullock, Limited, of Montreal, were a No. 6 Gates "K" breaker, complete, with a 40 h.p. engine, to Wallace & Sturtevant, Bancroft, Ont.; a "D" breaker, set "B" "Gates" tube mill, "Reynolds" Reliance Corliss engine, boiler, elevators, etc., to the Commercial Cement Co., of Rose Isle, Man.; and a "Dodge" crusher with "Gates" elevators, etc., to the Western Canada Cement & Coal Co., Limited, Exshaw, Alta.

The Canada Forge Company have begun the construction of their buildings at Welland, the contractors being the Welland Construction Company, who also have the construction for the buildings for the Ontario Iron & Steel Company, having been working on them for some time. The Forge Company will construct two buildings about 50 x 100 feet each, to be completed by November 15; other buildings will be added. They will begin manufacturing early in January. Electrical power will be installed at once, using about 75 horse-power. The capital of the company is $100,000.

The Iberville Lumber Co., whose headquarters are in New York City, are establishing a large saw mill at Sault-au-Mouton, Que., a point on the north shore of the St. Lawrence, some distance below Quebec. The contract has been placed with the Jenckes Machine Co., Limited, of Sherbrooke, covering the turbine plant to furnish power for the saw mill. This plant consists of two 20 in. special Crocker turbines, each developing 200 h.p., one special 15 in. Crocker turbine, developing 100 h.p., all operating under 52 ft. head. The three turbines are horizontally set in one large steel case to which the water is conducted through a steel penstock, 4ft. in diameter by 150ft. long. All of the turbines are of the cylinder gate type. Mr. A. N. Mercier, of Quebec, is the Superintendent of the Company.

The Maine & New Brunswick Electrical Power Co., which is developing a water power at Aroostook Falls, New Brunswick, have awarded contracts for the necessary equipment. The turbine plant will be built by the Jenckes Machine Co., Limited, Sherbrooke, Que., and will be composed of two 900 H.P. units, each consisting of a pair of special 21 in. cylinder gate Crocker turbines, each pair mounted on a cast iron draft tube discharging centrally set in concrete flume and running 600 R.P.M. under 72 in. head, developing 80 per cent. efficiency at full gate. The turbine runners are cast bronze and the construction throughout is of the most substantial character. One Lombard type "P" water wheel governor will be attached to each unit. A steel Penstock 6ft. 6in. diameter by 75ft. long, conveys the water from forebay to each unit. Each unit will be direct connected to a generator, the order for which was placed with the General Electric Co., Schenectady, New York. The headquarters of the Maine & New Brunswick Electrical Power Co. are at Presque Isle, Maine, and the order for the turbine plant was placed in Canada only after the most thorough investigation and comparisons with the product of American turbine makers who were tendering.

The Jeffrey Manufacturing Company, of Columbus, Ohio, have established a Canadian agency at the corner of Cote and Lagauchetiere streets, Montreal, with Mr. A. G. Walker, formerly with Williams & Wilson, in charge, and are ready to supply all kinds of chain, elevating, conveying, crushing, screening and power transmission machinery.

They intend to carry a stock of standard material, such as chain, sprockets, buckets, adjustable take-ups, pillow blocks, collars, spiral conveyors, elevator roots, etc., and are prepared to make up promptly a reasonable line of other conveying and elevating specialties.

Estimates, plans, information and prices will be furnished to all prospective buyers on application. With 25 years' experience they are prepared to furnish labor-saving appliances of the latest and most efficient construction.

A large and handsome catalogue of 370 pages will be mailed to those who desire information, with a view to purchasing. This Company also issues sectional catalogues and circulars, covering labor-saving devices, for different industries, such as cable conveyors, log, lumber, and refuse conveyors, belt conveyors, spiral conveyors, brick conveyors, bucket elevators, link belting, coal-washing machinery, coal mining machinery, crushing machinery, screening machinery, electric locomotives, etc., any and all of which will be sent cheerfully to interested parties.

The efficiency and popularity of Allis-Chalmers crushers and cement grinding machinery has once more been demonstrated by the receipt from Dr. Irving A. Bachman, acting for the Santa Cruz Portland Cement Company and for the Atlantic Portland Cement Company, of the largest single order for cement machinery equipment ever placed by one man at one time in the history of the cement-making industry of this country.

Allis-Chalmers machinery, which was furnished in 1901 to the Standard Portland Cement Company at Napa Junction, Cal., and which consisted of crushers, ball mills and tube mills, has been in continuous operation since then, giving such uniformly good satisfaction to Dr. Bachman, that in October, 1905, he placed the initial order for the Santa Cruz Portland Cement Company's equipment. There were included in it a No. 9 crusher, two No. 6 crushers, sixteen No. 8 Gates ball mills and twenty-two 5½ ft. x 22 ft. Gates tube mills.

Due to the increased demand for cement products on the Pacific Coast, following the destruction of San Francisco, the Santa Cruz Company has now ordered, through Dr. Bachman, an equipment which is practically a duplicate of the one already in service.

Owing to the successful operation of the Standard Portland Cement Company, which was Dr. Bachman's initial Pacific Coast venture, a number of San Francisco capitalists having come to have strong faith in the future of the cement industry on the coast, decided to put additional plants into commission. For this purpose, the Atlantic Portland Cement Company was organized and has ordered Allis-Chalmers equipment, consisting of a No. 9 crusher, four No. 6 crushers, twenty-two No. 8 Gates ball mills and twenty-six 5½ ft. x 22 ft. Gates tube mills.

MINING INCORPORATIONS.

NEW BRUNSWICK.

The Northfield Coal Company, Limited, head office, Northfield, Sunbury County, N.B. Capital, $20,000, divided into 20,000 shares, of $1 each. Incorporators:—James Barnes, M.P.P., of Buctouche, in the County of Kent, N.B., contractor; Charles J. Osman, M.P.P., of Hillsborough, in the County of Albert, manufacturer; James Kennedy, of Adamsville, in the said County of Kent, accountant; Edward Barnes, of Buctouche aforesaid, farmer; and Alexander P. Barnhill, of the city of Saint John, barrister-at-law.

QUEBEC.

Canadian Primelectro Company, Limited. Head office, Montreal. Capital, $1,000,000, divided into 10,000 shares of $100 each. Incorporators:—Arnley Quackenbush, M.D., Ottawa, Canada; Geo. G. Roe, Ottawa, Canada; Wm. Robertson, Montreal; Stephen L. Tingley, Providence, R.I., U.S.A.

ONTARIO.

The British American Oil Company, Ltd. Head office, Toronto, Ont. Capital, $200,000, divided into 2,000 shares of $100 each. Incorporators: William Austin Manion and Albert LeRoy Ellsworth.

The Superior Dock, Coal and Metal Company, Limited. Head office, Sault Ste. Marie, Ont. Capital, $75,000, divided into 750 shares of $100 each. Incorporators:—Francis Andrew Lucas, John Niven Oldham, and Agnes Spencer.

The Canadian Refining Company, Ltd. Head office, Ottawa, Ont. Capital, $2,000,000. Incorporators:—Henry Roy, Ottawa; F. N. Bolt, Rossland; J. J. B. Gosselin, Notre Dame de Stanbridge, and J. J. Fleutot, Frank, Alberta.

The Volcanic Oil and Gas Company, Limited. Head office, Chatham, Ont. Capital, $300,000, divided into 300,000 shares of $100 each. Incorporators:—Dennis Alexander Coste, Henry David Symmes and Joseph Thomas O'Keefe.

The great Central Oil and Gas Company, Ltd. Head office, Petrolea, Ont. Capital, $100,000, divided into 4,000 shares of $25.00 each. Incorporators: Herbert Etsel Crandall, John Wilfred Craise, De Witt Clinton Corey, Fred. Ashel Ansell, and Dinnett Ross Lovejoy.

Canada Minerals, Limited. Head office, Toronto, Ont. Capital, $100,000, divided into 1,000 shares of $100 each. Incorporators: William Bledden Bentley, Austin Russel Campbell, David Forbes Keith, Norman King Wilson, Maud Eva Crossley, all of Toronto, Ont.

The Larder Lake Gold Mining Company. Head office, Haileybury, Ont. Capital, $500,000, divided into 500,000 shares of $1 each. Incorporators:—Gordon McMurdo Petrie, druggist, and Frank Potage, and Percival John Montague, students-at-law, all of Toronto.

Pittsburgh Coal Company, Ltd. Head office, Port Arthur, Ont. Capital, $100,000, divided into 1,000 shares of $100 each. The provisional directors of the company to be James Steller Lovell, Robert Gowans, Ernest William McNeill, William Francis Ralph and Walter Gow.

Watts Mines, Limited. Head office, Toronto, Ont. Capital, $1,000,000, divided into 1,000,000 shares of $1.00 each. Incorporators: William Ruston Percival Parker, George McPhail Clark, John Alexander McEvoy, Gordon Russell and Ethyl Mabel Lindsay, all of Toronto.

The Progress Cobalt Silver Mining Company, Ltd. Head office, Cobalt, Ont. Capital, $500,000, divided into 500,000 shares of $1.00 each. Incorporators: Simon Peter Myers, Matthias Koch, Harris Wener, Gustave Orban, Harris Cohen, Archie Henry Jackson, all of Montreal.

The Nancy Helen Mines, Limited. Head office, Cobalt, Ont. Capital, $500,000, divided into 500,000 shares of $1.00 each. Incorporators: John Ferguson Black, of Sudbury, Ont.; Wm. Howard Hearst, John McKay, James Leland Darling, Robert Henry Knight, all of Sault Ste. Marie, Ont.

The International Cobalt and Silver Mining Company, Limited. Head office, Sault Ste. Marie, Ont. Capital, $500,000, divided into 500,000 shares of $1.00 each. Provisional directors to be George Kemp, Don Hernando Jacobi, Charles Frank, Samuel Frank and Frederick Niebuhr.

The Wet Process Reduction Company, Ltd. Head office, Toronto, Ont. Capital, $1,000,000, divided into two hundred thousand shares of $5.00 each. Incorporators: Geo. Edward Kingsley, Chas. Bagot Jackes, Herbert Morley Asling, Geo. Henry Bostock and Andrew Eadie, all of Toronto, Ont.

The Barron Brick Company, Ltd. Head office, Toronto, Ont. Capital, $50,000, divided into 1,200 shares of $50 each. Incorporators: William Wallbridge Vickers, Romeyn Lawyer, and Alexander Ritchie, of Toronto, Ont.; Alfred Ernest Barron, of Chicago, Ill., and George Plant, of Weston, Ont.

The Golden Park Mining Company, Limited. Head office, Windsor, Ont. Capital, $100,000, divided into 100,000 shares of $1 each. Incorporators:—Albert Van Schinck, agent; Charles Pohliman, manufacturer; James William Keenan, merchant, and Humphrey Eugene William, cabinet-maker, all of Detroit, Mich.

The Colonial Mining Company, Limited. Head office, Cobalt, Ont. Capital, $100,000, divided into 100,000 shares of $1 each. Incorporators:—John Shilton and William Halloway Wallbridge, barristers-at-law; James Charles Macklin and Charles Edward Kelly, accountants, and Frank B. McLean, appraisal agent, all of Toronto.

The Komnick System Sandstone Brick Machinery Company, Ltd. Head office, Toronto, Canada. Capital, $100,000, divided into 1,000 shares of $100 each. Incorporators: Robert Farquhar Kellock, of Perth, Ont.; Chas. Thomas Gordon Croft, Geo. Townsend, Herbert Lynn Douglas, Chas. Wilkinson, all of Toronto, Canada.

The Erie Natural Gas Company, Ltd. Head office, Dunnville, Ont. Capital, $40,000, to be divided into 400 shares of one hundred dollars each. Incorporators: William Webster Krick, Frederick Morton Waines, Arthur Abraham Root, all of Dunnville, Ont.; Absalom Hoover, Abraham Hoover and William Thomas Henderson.

The Silver Lion Mining and Development Company, Ltd. Head office, Cobalt, Ont. Capital, $500,000, divided into 2,000,000 shares of 25 cents each. Incorporators: Francis Watt, of Toronto; John Black, of Cobalt, Ont.; Alexander Goodsir Fowler, Ross, Robert Thomas Mullin, of Montreal, and Will Hale Potter, of Niagara Falls.

The Canada and the United States Oil and Gas Company, Ltd. Head office, Chatham, Ont. Capital, $30,000, divided into 300 shares of $100 each. Incorporators: Edmund Isaac Barnard, John Wm. Shay, of Pittsburgh, Mass; Philip William Roth, Frank Basden Barnard, of Buffalo, N.Y., and Russel James Straight, of Bradford.

New York and Ontario Oil and Gas Company, Ltd. Head office, Chatham, Ont. Capital, $30,000, divided into 300 shares of $100 each. Incorporators: Philip William Roth and Frank Basden Barnard, of Buffalo, N.Y.; William Lewis Norton and Luther Sprague Church, of Wellsville, N.Y., and Nolan Herbert Bowlby, of Chatham, Ont.

The Two Lakes Copper Mining Company, Ltd. Head office, Sowerby, Ont. Capital, $500,000, divided into 500,000 shares of $1 each. Incorporators: Clarence Webster Coulter, Louis Lourie Lucas, James Plews Russell, John Crawford Wilkins, Donald George Bailey, Frederick Watson Bailey and Stephen Ludlum, hereinbefore mentioned.

The Heathcock Mining Company, Limited. Head office, Dresden, Ont. Capital, $100,000, divided into 100,000 shares of $1 each. Incorporators:—Isaac Benjamin Webster, broker; John Turner, driver; Henry Bishop, contractor; and Dudley Bruce Wallen, merchant's clerk, all of Dresden, Ont., and Walter Mills, of Ridgetown, barrister-at-law.

The City of Cobalt Mining Company, Ltd. Head office, Cobalt, Ont. Capital, $500,000, divided into 500,000 shares of $1.00 each. Incorporators: Thomas Miles Birkett, Milton Carr, Felix Marie Devine, Arthur Sidney Goloska, Joseph Hendricks Hunter, William Drummond Hogg, Thomas William Albert Lindsay, John Cameron Stevenson and Alphonse Antoine Taillon.

The Waterloo Mining Company, Limited. Head office, Berlin, Ont. Capital, $200,000, divided into 200,000 shares of $1 each. Incorporators:—Robert Theophilus Winn, dentist, and Isaac Mickelborough Clemens, miller, both of New Hamburg, Ont.; Anson Stanley Green, photographer, and James Alexander Scellen, barrister-at-law, both of Berlin, Ont., and John Boek, of Buffalo, U.S.A.

Gordon Benson Cobalt Mining Co., Ltd. Head office, Sarnia, Ont. Capital, $300,000, divided into 300,000 shares of $1.00 each. Incorporators: William Springer, Chas. Edward Mudford, Delmar Cecil Kelly, Aaron Meyer Rose, Chas. Ashley Bailey, Daniel O'Brien, John Terney, Albert Edwin Stevenson, John Christopher Murta, all of Port Huron, Michigan, and Wm. Terney, of Roscommon, Mich.

The Ottawa Cobalt and Silver Mining Company, Ltd. Head office, Ottawa, Ont. Capital, $250,000, divided into 250,000 shares of $1.00 each. Incorporators: Robert Gorman, Frederick Weston Bindon, William James Fenton, Daniel O'Connor, William John Kidd, Alphonso Macfarlane, J. Ogle Carss, Samuel Fee, Robert Preston Robinson, Edward Theodore Van Nierop, James Wilson, and James Henry Gervan, all of Ottawa, Ont.

BRITISH COLUMBIA.

The American Boy Mining Company, head office, City of Spokane, State of Washington, U.S.A.

The Smith Creek Mine Development Company, head office, Revelstoke, B.C. Capital, $500,000, divided into 500,000 shares of $1.00 each. John Manning Scott, Revelstoke, B.C., attorney for the Company.

CATALOGUES.

The following catalogues have been received:—

Steel Sheet Piling, issued by the United States Steel Piling Company Chicago, Ill., U.S.A.

Conveying and Transmission, published by the Stephens-Adamson Manufacturing Company, Aurora, Ill.

Franklin Air Compressors, manufactured by the Chicago Pneumatic Tool Company, Fisher Building, Chicago.

Bulletin 134, Sturtevant Engineering Series, descriptive of Steel Pressure Blowers, as made by the B. F. Sturtevant Company, Hyde Park, Mass.

Circular No. 1136, issued by the Canadian Westinghouse Company, Ltd., of Hamilton, Ont., descriptive of automatic controllers for direct current motors.

Circular No. 1138, issued by the Canadian Westinghouse Company, of Hamilton, Ont., descriptive of Direct-Current Motors, manufactured by the Westinghouse Company.

The Rockwell Heating Machines for annealing, hardening, tempering, coloring, etc., by oil or gas fuel as manufactured by the Rockwell Engineering Co., 26 Cortlandt street, New York.

Catalogue No. 10, seventh edition, Huntington Mills, manufactured by Allis-Chalmers Co., Chicago, U.S.A., represented in Canada by the Allis-Chalmers-Bullock Company, Montreal.

We are in receipt of Bulletin No. 8, 4th series of the Geological Survey of Ohio, entitled Salt Deposits and the Salt Industry in Ohio, by John Adams Bownocker, D.Sc., Professor of Inorganic Geology, Ohio State University.

Receipt is acknowledged of the following pamphlets issued by the United States Geological Survey: Chas. D. Walcott, director:—

The Production of Mineral Paints in 1905, Edwin C. Eckel.

The Production of Barytes in 1905, Edwin C. Eckel.

The Production of Bismuth in 1905, C. C. Schnatterbeck.

The Production of Sand and Gravel in 1905, A. T. Coons.

The Production of Sulphur and Pyrite in 1905, Edwin C. Eckel.

The Production of Antimony in 1905, C. C. Schnatterbeck.

The Production of Lime and Sand-Lime Brick in 1905, Edwin C. Eckel.

The Production of Platinum in 1905, F. W. Horton.

The Production of Petroleum in 1905, W. T. Griswold.

The Stone Industry in 1905, Edwin C. Eckel.

The Production of Graphite in 1905, Geo. Otis Smith.

The Production of Manganese Ores in 1905, John Birkinbine.

The Production of Iron Ores in 1905, John Birkinbine.

The Manufacture of Coke in 1905, Edwin W. Parker.

Statistics of the Clay-Working Industries in the United States in 1905, by Jefferson Middleton.

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All mines belong to the government of the Province on all unsold lands and on all those sold since the 24th of July, 1880, but gold and silver are always reserved, whatever may be the date when the land was sold, unless it be otherwise mentioned in the patent.

The government grants PROSPECTING LICENSES for lands on which the mines belong to it, giving the holders of such licenses the first right to purchase the mines. In the case of lands where the surface alone is sold, the owner of the surface may be expropriated if he refuses an amicable settlement.

The price of prospecting licenses is $5.00 per 100 acres on surveyed lands and per square mile on unsurveyed lands. If the surface has already been sold, the price is only $2.00. They are valid for three months and are renewable at the discretion of the Minister.

When mines are discovered, they can be bought or leased from the government. The purchase price is as follows :

Mining for superior metals on lands situate more than 12 miles from a railway in operation, $5.00 per acre, and on lands situate less than 12 miles from such a railway, $10.00 per acre ;

Mining for inferior metals—the price and the area of the concessions are fixed by the Lieutenant-Governor in council.

The words "superior metals" include the ores of gold, silver, lead, copper, nickel and also graphite, asbestos and phosphate of lime ; and the words "inferior metals" mean and include all the minerals and ores not included in the foregoing definition and which are of appreciable value.

MINING CONCESSIONS are sold in entire lots in surveyed townships or in blocks of not less than 100 acres in unsurveyed territories.

Patents are obtained subject to the following conditions : The full price must be paid in cash : specimens must be produced and accompanied by an affidavit ; a survey at the cost of the applicant must be made on unsurveyed lands ; work must be bona fide begun within the two years.

Mining licenses giving the right to work the mine and dispose of its products, are granted on payment of a fee of $5.00 and a rent of $1.00 per acre per annum. Such licenses are valid for one year and are renewable on payment of the fee and of the same rent. They may cover from 1 to 200 acres for one and the same person and must be marked out on the ground by posts. The description or designation must, however, be made to the satisfaction of the Minister.

Persons working mines must send in yearly reports of their operations to the government.

The attention of the public is specially called to the new territory north of the height of land towards James Bay, which comprises an important mineral belt in which remarkable discoveries of minerals have already been made and through which the New Grand Trunk Pacific Railway will run.

The government has made special arrangements with Mr. Milton L. Hersey, 171 St. James Street, Montreal, for the assay and analysis of minerals at very reduced rates for the benefit of miners and prospectors in the Province of Quebec. Tariffs of assays can be obtained on application to him.

The Bureau of Mines at Quebec, under the direction of the Superintendent of Mines, will give all the information asked for in connection with the mines of the Province of Quebec and will supply maps, pamphlets, copies of the law, tariff of assays, etc., to all who apply for same.

Applications should be addressed to :

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TELEGRAMS—"Ropery Rutherglen." A B C, A I and Lieber's Codes used.

AGENTS IN CANADA:

Wm. Stairs, Son & Morrow, Ltd., Halifax, N.S.
W. H. Thorne & Co., Ltd., Saint John, N.B.
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John Burns, Vancouver, B.C.

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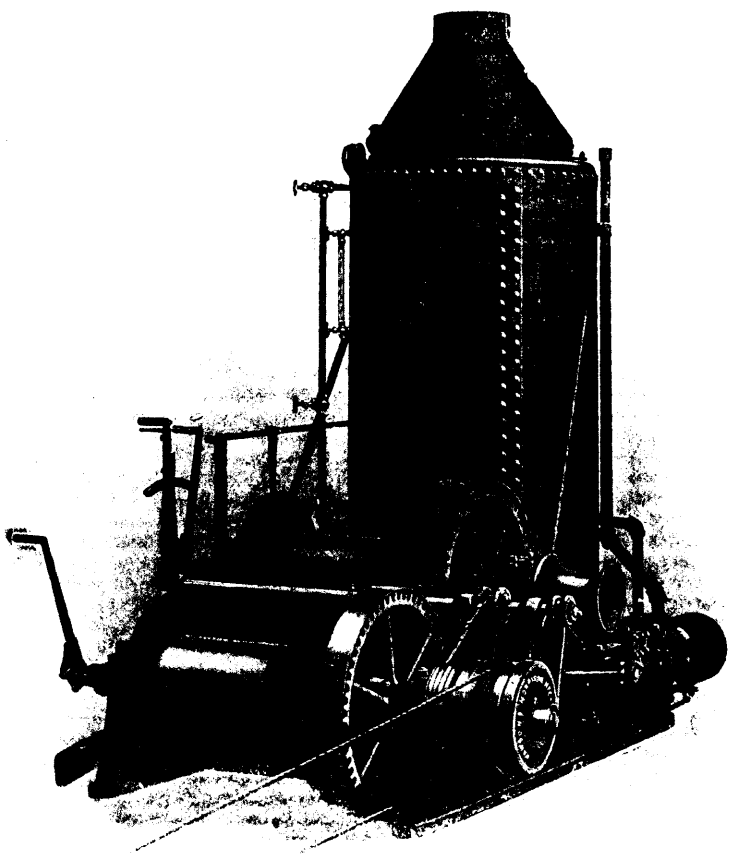

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