MARCH 1, 1917

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CANADIAN MINING JOURNAL

VOL. XXXVIII TORONTO No. 5

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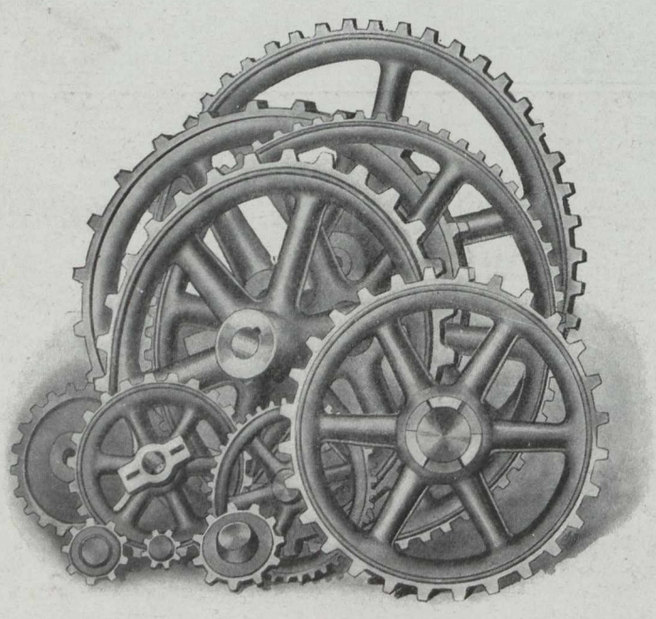

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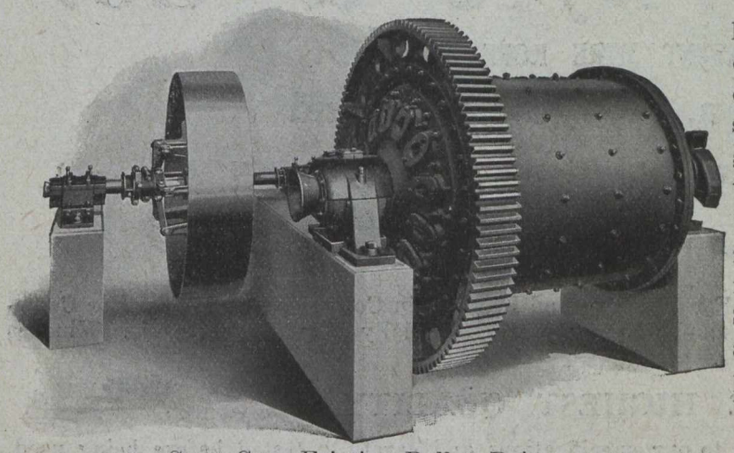

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See Bulletin 1813 for full particulars including operating data, screen analysis and flow sheet of actual installations.

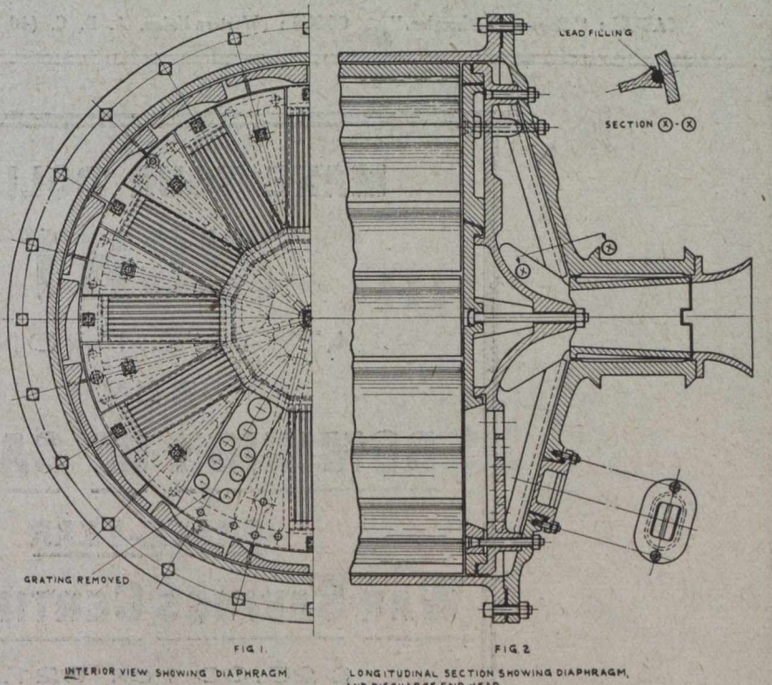

FIG 1. INTERIOR VIEW SHOWING DIAPHRAGM

FIG 2. LONGITUDINAL SECTION SHOWING DIAPHRAGM AND DISCHARGE END HEAD

The "G-H" Variable Discharge Diaphragm.

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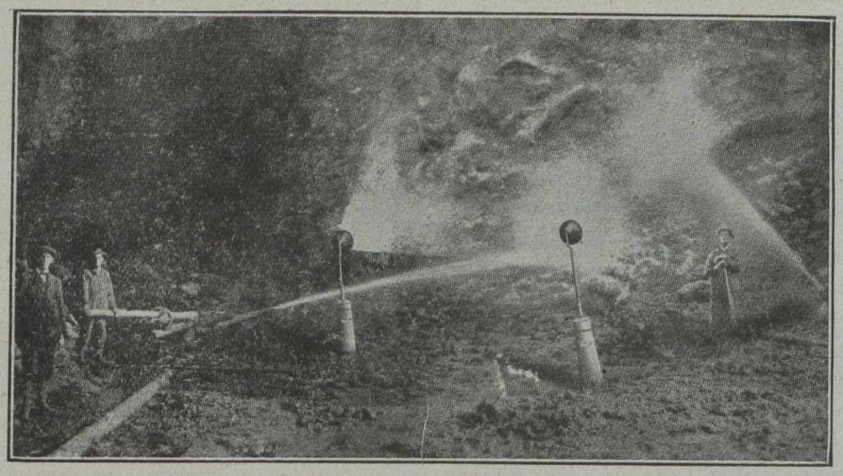

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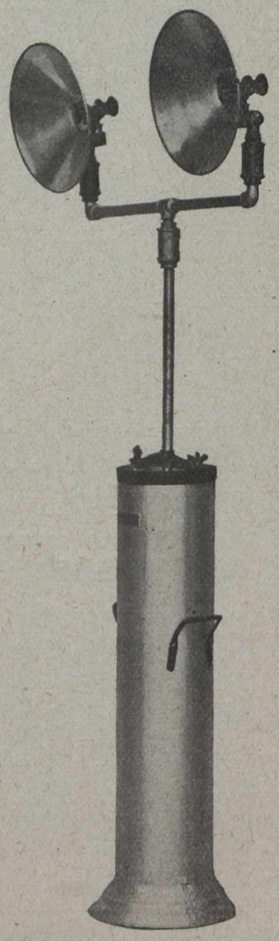

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THE CANADIAN MINING JOURNAL

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REGINALD E. HORE

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CIRCULATION

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CONTENTS

GOLD AND SILVER

This number of the Journal is devoted chiefly to a review of mining in Northern Ontario, special attention being given to gold and silver.

Ontario has for some years been known to mining men throughout the world as the world's chief producer of nickel. During the past decade the province has been also one of the world's chief producers of silver. Thanks to the recent discoveries Ontario is now becoming noteworthy as a producer of gold.

Ontario's chief gold mines are in the Porcupine district, where important discoveries were made in 1909. Three large mines, the Hollinger, Dome and McIntyre, have been developed in this district and will be large producers for many years. Several other properties have been developd and a few of these are regular producers, though small in comparison with the big three.

Kirkland Lake is Ontario's second gold district. One mine here, the Tough-Oakes, is a regular producer and several properties are nearing the productive stage. Recent developments in the Kirkland Lake districts have been especially encouraging.

Ontario's richest gold mine is the Croesus, in Munro township. This property is a phenomenal one, the ore being exceedingly rich. Some notes on this property will be found on another page. Our front cover illustrates the rich ore.

The Cobalt district is Ontario's chief silver producer. Important deposits have been worked at Gowganda, and during the past year a large body of high grade silver ore has been developed there. Most of our silver comes however from a small area near the town of Cobalt.

THE WORK OF THE COMMISSION OF CONSERVATION.

We have recently received a copy of the seventh annual report of the Commission of Conservation. Nine pages of this cloth bound volume are devoted to the work of the Committee on Minerals. From these pages it is apparent that the Commission still believes that one of its chief objects should be the publication of glowing accounts of the possibilities of imaginary resources.

Referring, on page 112, to the phosphate deposits at Banff, the committee on minerals says "though these beds are not commercially valuable at present, there is very little doubt that prospecting will disclose valuable deposits." As a matter of fact, there is very considerable doubt, and the Commission is or should be well aware of it.

Referring to the possibilities of producing potash in Canada, the Commission publishes, on page 114, the following: "we have, in our granites, enormous deposits of silicate of potash and feldspar. These are now awaiting the perfecting of a method to extract supplies from the old granite rocks." The Commission does not think it advisable however to remark that the old granites will likely be awaiting for some time.

THE UNITED MINE WORKERS OF AMERICA IN CANADA.

It is announced from Calgary that the coal operators of District No. 18 of the United Mine Workers of America have decided not to make any further agreement with this union. The decision to refuse any further signing of agreements is, the operators say, a result of the action of this union in disregarding its signed agreements by making new demands, more than once, before the expiration of the agreements.

The action of the Crow's Nest Pass and Alberta coal operators in signing agreements with the United Mine Workers of America has always—to use the mildest possible term—met with the disapproval of the operators in Nova Scotia, and on the British Columbia coast. The agreement which the United Mine Workers require an operator to make is one that no self-respecting British employer can properly sign, because it gives to the union and its representatives practical control of the discipline of the mine. In every case it substitutes the union official as the medium of conversation and negotiation between the workmen and the employer. The United Mine Workers further insist on taking into their ranks certain minor officials which in every mine in Great Britain and in Canada—other than those in Canada that have foolishly and weakly consented to this arrangement—are reckoned among the officials and therefore debarred from membership in a trades union.

The coal operators of Nova Scotia and Vancouver Island refused consistently to have anything to do with this alien organization, and when the operators of the Crow's Nest Pass and Alberta entered into agreements, they did so with their eyes open, knowing full well the record of the United Mine Workers. This organization has no place in Canadian matters. Its headquarters are in the United States, and as everybody knows, there is the gravest reason to suppose that recent disturbances of the coal trade in the Western Provinces have not been unconnected with German influences.

If the coal operators of that portion of British territory that this alien organization carries on its books as "District No. 18" have decided to have no further dealings with the U.M.W. of A., they will do the only thing that is possible, if they wish to stay in the coal business and manage their own collieries. Mistakes can be retrieved, and recognition of the U.M.W. of America anywhere in Canada was, is and always will be the beginning of trouble for the coal industry. Nothing more than a perusal of the record of this union in Canada since it first made its unfortunate entrance is necessary to convince the reader that the sooner its activities are confined to the United States the better for Canada, and for this record the reader is referred to the reports of the Department of Labor at Ottawa.—F. W. G.

PROPOSED JOINT ENGINEERING SOCIETY.

At the recent meeting of the Canadian Society of Civil Engineers a proposal was made to change the name of the society to "Canadian Society of Engineers" or "Canadian Institution of Engineers," and to extend the organization so as to include electrical, chemical, mining and mechanical engineers.

Commenting on the proposal "Electrical News" says:

"In favor of such a change it can be said that within narrow limits the word "civil" at the time of the organization of this society thirty years ago, was understood to include all kinds of engineering, which broad interpretation has gradually disappeared, however, as the other branches of engineering have developed. It could thus be argued that in dropping the word "civil" the new name would merely represent what the originators of this honored organization intended it should represent.

"There are other arguments too, doubtless, that must have more or less bearing on the subject. Take the electrical engineers for example. Failing a strong parent organization of Canadian origin, the electrical men have very largely associated themselves with a foreign society. The same is true of other branches, and this would seem to indicate, if nothing else, that the various engineering branches in Canada are not yet numerous and powerful enough to support separate Canadian societies. They should, however, be able to support one such, and the scheme which seems to offer the best promise of being of the greatest good to the greatest number is the change now being advocated for the Canadian Society of Civil Engineers—that is, make it a Canadian society of engineers, and let it here be governed by a board of representatives, elected by all the branches of the engineering profession in Canada, who should have equal standing. This surely means unity, and unity means better organization and more effective work."

So far as mining is concerned the above remarks are not applicable. The Canadian Mining Institute is undoubtedly one of the best organizations of its kind anywhere.

According to the accounts published in some of the newspapers of developments at some prospects in the Porcupine gold district marvelous orebodies are being developed. Strangely enough those who are familiar with the properties and with the operations seem to be unaware of the existence of this ore. It might be well for the shareholders to enquire for the facts on which the statements made in the daily press concerning such properties as Tommy Burns and Davidson are based.

During 1916 Hollinger Consolidated expended approximately $800,000 for supplies used in operations and $400,000 more in construction work.

Anyone who imagines that individual scientific research is not accomplishing anything in the mining industry in Canada will do well to read Mr. R. B. Watson's articles in this issue on recent advances in metallurgy at Cobalt. We recommend it to those who signed that memorandum in which it was stated that there is no scientific industrial research work being done in Canada except in the laboratories of a few manufacturers.

Shortage of skilled labor is making itself felt in Porcupine as in most other industrial centres. Unfortunately for the producers, the price of gold remains stationary while the cost of supplies keeps mounting. Unfortunately also many of the men now employed are not as good workers as those who are now in the army. It is not surprising therefore that some consider it inadvisable to offer increase in wages, even though it should result in a decrease in production or even in temporary suspension of operations.

Owing to the difficulty of getting work done as planned there has been recently considerable disappointment with the Hollinger production. The Hollinger is a splendid mine, one of the best in the world, and will make large profits for its shareholders; but it is handicapped by the difficulty of making huge dividends before it is suitably equipped with men and machinery. At the time of the announcement of the consolidation of the Hollinger properties, ten months ago, a plan for equipping the properties, at a cost of $750,000, for a large production was announced. It was then expected that by this time the earnings would be so large as to warrant the payment of a dividend of $240,000 every four weeks. The company has been paying this dividend in spite of the difficulties that have arisen; but it is evidently a very heavy burden. The directors doubtless are considering the advisability of reducing the dividend until the mine is in better shape to maintain the desired production.

The news of the award of the Military Cross to Lieut. Jas. G. McMillan, one of Ontario's mine inspectors, was received with delight by his friends here. That he would distinguish himself at the front was expected.

The increased cost of supplies for mining operations is indicated by an item of 10 tube mills and 100 stamps which cost the Hollinger company $93,045 in 1916. The cost in 1914 would have been $59,115. The import duty was $21,861 as compared with $11,699.

The annual meeting of the Canadian Mining Institute will be held in Montreal, March 6th, 7th and 8th. The excellent list of papers to be presented will doubtless bring out considerable discussion. It will be a meeting well worth attending.

Some of the best underground photographs ever taken are those of Cobalt silver deposits taken by Mr. A. A. Cole. In this issue we reproduce two of these with Mr. Cole's article.

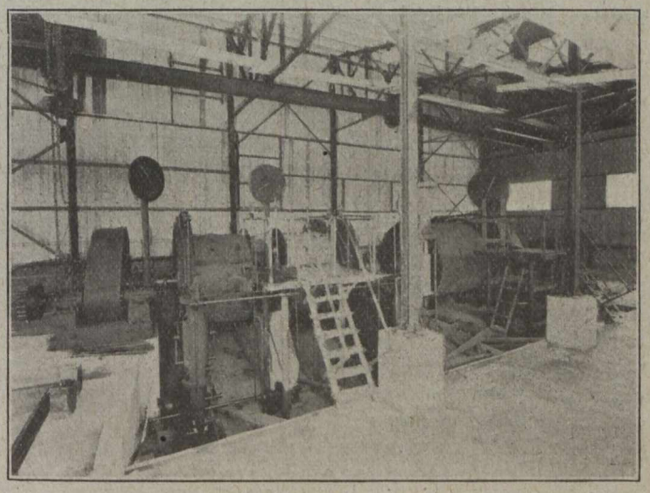
The piece of ore reproduced on our first cover is one of five purchased by the Ontario Bureau of Mines. This ore is so rich that it is difficult to exhibit it in the ordinary way. Thanks to the careful work of our press foreman, we are able to show an excellent picture of the ore.

Provided there are no great delays in deliveries of apparatus by manufacturers, Manager Robbins expects that the Hollinger will have plant ready to treat nearly 3,000 tons ore daily by the end of May.

EXTENSIONS TO HOLLINGER MILL.

In enlarging the Hollinger mill it was proposed a year ago to increase the capacity by 1,600 tons. This was cut down to 1,000 tons. It is now stated that the plant for the additional 600 tons will be completed as soon as possible after the present addition is in running order. Manager Robbins says in this connection.

"Several months ago we were forced to recognize two facts: first, that we could not hope to complete the entire 1,600 ton extension to the mill within the time expected, and, second, that with the limited amount of underground development being accomplished we should not be able to feed the entire mill even if it were completed. The obvious answer to these conditions was to reduce the capacity of the entire mill extension, and although we have completed the buildings and the machinery foundations for the entire extension, we are installing only sufficient plant at present to treat an additional 1,000 tons per day. It is our intention to complete the entire mill extension without delay after the first part of the addition is in running order. This plan will enable us to spread the cost of construction over a long period, while at the same time we shall have an opportunity to carry out the necessary work of developing the ore with which the mill is to be fed."



New hoist room, Dome Mine.

MINES OF THE FUTURE

By G. C. Bateman.

The development of the precious metal mines in Northern Ontario has taken place within a comparatively few years and this country still offers probably the greatest chances of any mining section in Canada for the discovery and development of new mines.

As a large number of former prospectors are now in the army or working in munitions factories and as greater attention is being given to production than to development, there were very few men out prospecting last summer. The development of the different camps has however been so satisfactory and the country still offers such opportunities that with the return of normal times and with a plentitude of money in Canada and the United States, which seems assured, prospecting will again be carried on vigorously. The different mining companies in the country are aggressive in their search for new properties, so that the prospector finds a ready market close at hand for what he may discover.

The areas that offer the greatest possibilities for the prospector and the purchaser are probably those in the vicinity of existing mining camps. A good place to search for a new mine is in the vicinity of known ones, provided however that the camp is still young.

In Porcupine, as the geological characteristics become better known and appreciated, the boundaries of the proven mineral zone are gradually extending. Further development on some of the known mines will tend to prove the value of adjoining properties; as is the case with the probable continuation at depth of the Dome ore bodies into the Dome Extension ground.

Of more immediate interest however is the work being carried on by new companies in the district. Here a number of properties are being worked in an effort to develop new mines. While some of these are being operated more with an eye to the stock ticker than to mine development, there are also many real efforts being made to develop mines. Some of these efforts are meeting with a fair measure of success, and it is not unlikely that proceeded sufficiently far to permit of a definite statement that the properties will become profitable undertakings.

In addition to the territory immediately contiguous to the producing mines there are large areas in the surrounding district where the geological conditions justify a much closer investigation than has yet been given them.

Kirkland Lake is the next most important gold camp to Porcupine and is in fact the second most important gold camp in Canada to-day. While production to date is comparatively small there is no other gold mining camp in Canada which has the same number of properties under development that give definite promise of becoming profitable mines. Development is proceeding on careful and intelligent lines and within the next year or so there should be at least four new producers in this camp. The developed area is small but the result of the work on the known properties justifies a more extensive campaign of exploration and development in the surrounding district.

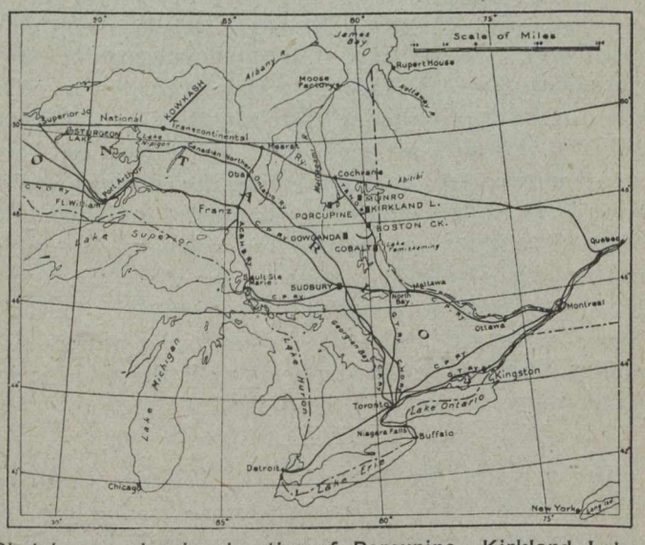
In addition to these two well known camps there are a number of places where promising results have been obtained. These sections are worthy of close study.

In the past few years most of the prospecting has been for gold but the report of a new silver discovery will always create excitement. On the Miller Lake-O'Brien property in Gowganda a remarkable vein was found a few months ago and this will undoubtedly create renewed interest in that section. More activity in Gowganda may be looked for in the spring.

In Cobalt the most important new discovery has been the finding of silver on the 1,600 foot level of the Beaver mine. Should this prove as important as it gives promise of being, it will result in further exploration at depth of adjoining properties and may result in the development of new mines.

With the gradual opening up of the country the field for the prospector is being correspondingly extended. To date practically all the prospecting and development has been confined to those sections close to the main waterways and to the railroads; but the prospectors are gradually going farther afield and will undoubtedly open up new and profitable fields for mining investment.

Geology is playing a more and more important part in prospecting and exploration work and the men in the field in Northern Ontario are greatly indebted to the Provincial Geologists for the very complete reports and maps issued by them.



Sketch map showing location of Porcupine, Kirkland Lake, Munro, Boston Creek and Kowkash gold areas.

HOLLINGER EMPLOYEES RECEIVE $100,000 MONTHLY.

The Hollinger mines employed 1,056 men during 1916 and paid wages amounting to $1,223,433 and bonuses amounting to $36,793. Each employee who has gone on overseas service with the British forces has been presented by the directors with 100 shares of stock in Hollinger Consolidated Gold Mines.

Important advances have been recently made in treating the Cobalt silver ores and our readers will find in this issue a very interesting article by Mr. R. B. Watson on the metallurgy of the Cobalt silver ores.

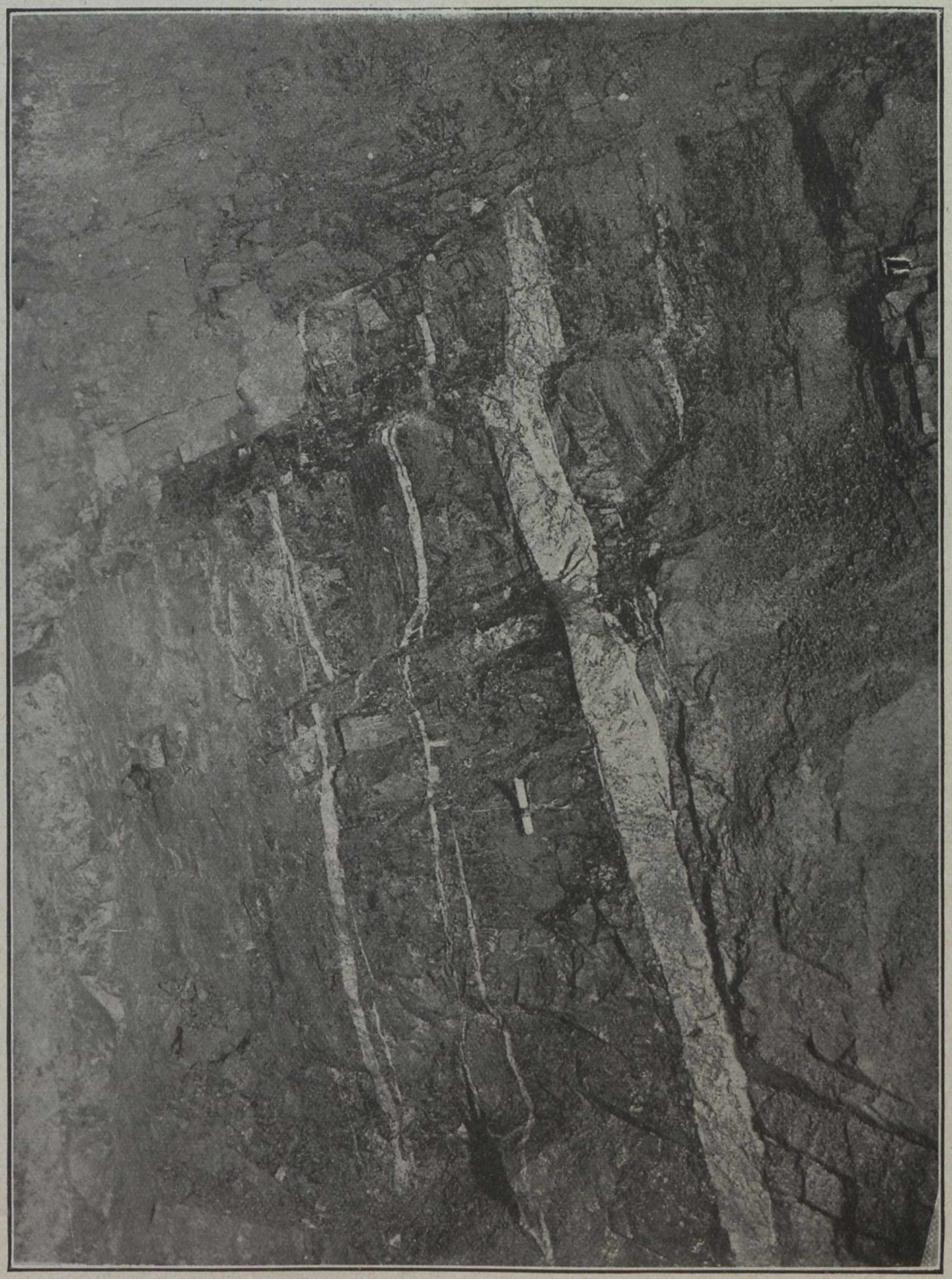
RECENT PROGRESS AT COBALT.

By A. A. Cole.

Two important factors have within the last year been working to stimulate the silver production of the Cobalt District, viz.: (1) rise in the price of silver, and (2) flotation.

(1) When we consider that the average price for 1915 was 49.68 cents per oz. and that a low level of 46.25 was actually touched, and then compare this with 65.66 cents for 1916 and 75.63 for January, 1917, it is self evident that such a rise in the price of silver is bound to quicken production. Even when we take into account the increased cost of production, such a rise will mean in many cases a 50 per cent. increase in profits.

(2) Oil flotation for the concentration of low-grade silver ores has already gained a strong foothold in Cobalt. It is not at all likely that this method of concentration will supersede the standard methods of concentration already in use in the camp, but in many eases it can be made a valuable addition to the existing plants and the extraction bettered with only a small additional cost.



A COBALT SILVER DEPOSIT.

These smaltite veins in the McKinley-Darragh Mine assayed 2,200 oz. silver per ton. Wall rock 10 in. wide is of milling grade. Ore shoot over 2,000 ft. Veins cut off by fault, throw 40 ft.

Mr. Thomas R. Jones, general manager of the Buffalo Mines, was the pioneer in flotation experimentation in the Cobalt District. A 50-ton unit was installed and run for eight months at the Buffalo mine, and in that time demonstrated the applicability of oil flotation for the concentration of Cobalt silver ores. Then this was replaced by the present plant of 600 tons daily capacity. This example was followed by other mills adding flotation to their equipment, till at present the daily capacity of the flotation plants of the district amounts to 1,800 tons, and this amount will doubtless be still further increased in the future.

In making up ore reserves certain wall rocks or low grade veins which have previously been rejected as too low grade to work may now be included on account of the rise in the price of silver and the introduction of flotation. In some cases this will actually double the tonnage of the ore reserves.

The handling of the flotation concentrate was another real problem that had to be grappled with and solved before the full benefit of oil flotation could be realized. Here again Mr. Jones blazed the trail. With a chloridizing roast and using the Holt-Dern roasting process it is confidently expected that the difficulty of preparing this flotation concentrate for market will be overcome.

The war has been responsible for a rise in the prices of most of the supplies used in winning the metals and this is particularly the case as regards certain mill supplies. At the Nipissing mill large quantities of aluminum dust were formerly used to precipitate the silver from the cyanide liquor. With the rise in the price of aluminum a cheaper method of precipitation was looked for.

Mr. J. J. Denny, who is in charge of the Nipissing Company's research department, has worked out a continuous method of precipitation with sodium sulphide, with a final desulphurisation with aluminum in a caustic soda solution. This it is claimed is so much cheaper than the aluminum dust precipitation at present prices that it is now regularly installed and has been working satisfactorily in the Nipissing mill for several months.

The geology of the Cobalt District has always been a fruitful source of speculation and has been particularly interesting to the operators. It has long been considered axiomatic that the ore was more likely to occur in paying quantities in comparative proximity to either the upper or lower contact of the diabase. At Cobalt proper only the lower area was left as the upper contact and in most cases the diabase itself was eroded. In South-east Coleman, from the Hargraves south, the area near the upper contact was available and it was here that the main ore shoots of the Temiskaming and Beaver have been found. Mr. Frank L. Culver, general manager of the Beaver and Temiskaming Mines, has for several years been planning a campaign of sinking through the diabase and prospecting the lower contact. This necessitated the installation of heavier hoisting machinery and a large expenditure for sinking before the area to be prospected could even be reached. This required a large faith; but Mr. Culver had it, and he has recently had the satisfaction of cutting a silver vein carrying good silver values at a depth of 1,600 feet from the surface. This will give welcome encouragement to pioneer work and will doubtless induce owners of other properties in the vicinity to undertake some work which to this camp is deep mining.

MINERAL PRODUCTION OF ONTARIO, 1916.

(Extracts from a bulletin just published by the Ontario Bureau of Mines.)

Summary of Mineral Production for 1916.

The following table, subject to revision, summarizes the mineral output of Ontario for 1916:

Product.	—1916— Quantity.	Value.
Metallic—		
Gold, oz.	497,830	$10,339,259
Silver, oz.	19,874,970	12,622,849
Copper ore, tons	858	24,638
Copper (in matte) (a), tons	22,430	8,299,051
Nickel (in matte) (b), tons	41,299	20,649,279
Iron ore (exported), tons	121,495	.....
Pig iron (c), tons	118,165	1,646,010
Cobalt ore, tons	337	75,195
Cobalt (metallic), lbs.	328,563	288,614
Cobalt oxide, lbs.	691,681	473,713
Nickel oxide, lbs.	100,013	16,915
Nickel (metallic), lbs.	42,411	17,847
Other nickel and cobalt compounds, lbs.	350,831	60,956
Molybdenite (concentrates), lbs.	17,956	19,541
Lead, lbs.	689,882	60,038
Metallic Totals		$54,936,605
Non-Metallic—		
Arsenic (white and other forms), lbs.	4,320,890	$ 200,103
Asbestos, lbs.	500	100
Brick (fancy, pressed and paving), M.	31,742	318,942
Brick (common), M.	58,541	498,896
Tile (drain), M.	16,562	302,080
Tile (porous fireproofing) (d), M.	4,451	176,953
Cement (Portland), bbls.	2,143,949	2,242,433
Corundum, tons	67	8,763
Feldspar, tons	12,965	42,159
Fluorspar, tons	1,283	42,159
Graphite (refined), tons	3,446	249,586
Gypsum (crushed, ground and calcined), tons	36,668	116,206
Iron pyrites, tons	175,508	471,555
Lime, bushels	1,367,005	243,942
Mica, tons	266	55,407
Natural gas, M cu. ft.	16,767,910	2,235,513
Petroleum (crude), Imp. gals.	6,890,681	387,846
Pottery	.....	42,025
Quartz, tons	94,267	158,583
Salt, tons	128,495	698,835
Sand and gravel, cu. yds.	1,129,189	407,438
Sewer pipe	.....	216,749
Stone (building, trap, granite, etc.)	.....	711,243
Talc (crude and ground), tons	11,810	111,489
Non-Metallic Total		$9,906,992
Add Metallic Total		54,936,605
	.....	$64,843,597

(a) Copper in the matte valued at 18c per lb.
(b) Nickel in the matte valued at 25c per lb.
(c) Production from Ontario iron ore only.
(d) Included in 1915 with fancy, pressed and paving brick.

A considerable expansion took place in the production of minerals in Ontario last year, particularly in gold, nickel, copper, cobalt, molybdenum, pig iron and lead. This was in large part a result of the war and consequent high prices for metals. The increase in valuation over 1915 is confined to metallic products, the total for non-metallics showing a small decrease.

Gold.

In 1916 there was produced 497,830 ounces of gold worth $10,339,259, an increase over 1915 of 86,242 ounces or $1,837,868. The production according to camps is appended herewith:

	Tons Milled.	Gold, oz.	Value.	Recovery per ton.
Porcupine	1,330,562	452,095	$9,397,536	$7.06
Kirkland Lake	39,865	33,991	702,761	17.63
Munro Township	477	2,495	51,578	108.13
Long Lake	26,847	9,236	187,003	6.97
Dryden	.....	6	130	....
Copper Ores	.....	13	251	....
Total	1,397,751	497,836	$10,839,259	

In addition to the gold production, 91,872 oz. of silver were recovered, worth $60,118.

The chief producers are given in the following table:

Mine.	Ore Milled, tons.	Gold, oz.	Value.
Hollinger Consolidated	601,854	244,139	$5,046,652
Dome Mines	444,900	103,809	2,142,939
McIntyre-Porcupine	120,191	46,744	1,022,999
Tough-Oakes	39,865	33,991	702,761
Porcupine-Crown	51,273	27,877	575,725
Schumacher	46,463	10,844	224,157
McIntyre-Jupiter	15,484	8,710	180,044
Porcupine-Vipond	43,041	8,508	175,874

Other producers were Dome Lake, McIntyre-Extension, Canadian Exploration Company at Long Lake, near Sudbury, Croesus in Munro Township, and a small shipment from the Rognon, near Dryden.

The new gold camps at Boston Creek and Kowkash are giving good promise under the development now going on. Gold has also been found in Cairo, Powell and Alma Townships, an area lying about twenty miles to the north of Elk Lake. The pre-Cambrian formations of Northern Ontario offer prospectors as good inducements as any part of the continent, especially for gold.

The aggregate value of gold produced in Ontario to December 31st, 1916, has reached $33,663,648.

Silver.

During 1916 the total shipments of silver amounted to 19,874,971 fine oz., of which 91,872 oz. were recovered from auriferous ores, and 299 oz. from copper ores. As compared with 1915, the output shows a decrease of 4,871,563 oz., or nearly 20 per cent. Notwithstanding this the valuation exceeds that of last year.

The return to the mining companies was $12,622,849 or an average of 63.511 cents per oz. High prices for the metal have stimulated production, despite the labor shortage and high cost of materials incident to the war. The average New York price for the year was 65.661 cents per oz. as compared with 49.69 cents in 1915. The lowest figure in 1916 was 55 7-8 cents and the highest 77 1-4 cents. As pointed out in last year's bulletin the enhanced price of the metal is due chiefly to the great demand from belligerent countries where silver is being coined at an increased rate to replace gold withdrawn from circulation.

The production according to camps was as follows:

	Oz.	Value.
Cobalt, including Casey Township	19,414,500	$12,302,183
South Lorrain	7,629	5,020
Gowganda	360,670	236,817
Silver recovered from gold and copper ores	92,171	60,346
Total	19,874,970	$12,622,849

Shipments of ore and concentrates from Cobalt to refineries in the United States contained less than two million oz., the bulk of the output being treated in the mills, concentrators and reduction works at Cobalt, or in the refineries located at Deloro, Thorold and Welland.

	Oz.	Value.
Ore	7,179,159	$4,155,574
Concentrates	7,629,350	4,945,778
Bullion	4,974,290	3,461,151
Total	19,782,799	$12,562,503

Shipments made in 1916 were not all marketed, but in cases where bullion was stored, for instance, in New York, the average price of the metal for the year has been taken as a basis of computation, and the ounces and value included in the total shipments.

Since the discovery of silver at Cobalt in 1903 the total shipments from the camp and outlying silver areas have been as follows:

Year.	Oz.	Value.
1904 to 1915	235,407,189	$123,186,373
1916	19,874,971	12,622,849
Total	255,282,160	$135,809,222

Nickel and Copper.

The production of nickel-copper matte at the Copper Cliff and Coniston smelters again shows a large increase. Figures for 1916 are 80,010 tons as compared with 67,703 tons in 1915, and 57,150 tons in the pre-war year of 1913. As in 1915, the producers were the Canadian Copper Company and the Mond Nickel Company. Ore smelted in the year amounted to 1,521,689 tons. The nickel and copper contents of the matte produced were 41,299 and 22,430 tons respectively. Metallic nickel produced from cobalt ores, and shipped by the Deloro Smelting and Refining Company amounted to 42,411 pounds, and was marketed at a price of 42 cents per pound. The chief shipments of copper ore in 1916 were from the Tip Top mine, west of Port Arthur, and the Mine Centre Copper Company, Rainy River district, the price received averaging 25 cents per pound. The Massey mine was also a producer. New York prices for copper averaged 27.20 cents per pound. Shipments of copper ore from Bruce Mines and the Howland mine to the Mond Nickel Company are included in the nickel-copper figures.

In the Township of Falconbridge, concession V., lots 10-12, the E. J. Longyear Company has discovered by diamond drilling a large pyrrhotite ore body. An overburden averaging 100 ft. in thickness had to be penetrated before bed rock was reached. The British America Nickel Corporation, which is controlled and partly financed by the Imperial Government, have broken ground for a smelter at Murray mine. Already the refinery of the International Nickel Company at Port Colborne is well under way.

NOTES ON METALLURGY AT COBALT DURING 1916

By R. B. Watson.

The Flotation Process.

The outstanding development in the metallurgy of Cobalt ores in 1916 was the largely increased use of the flotation process. Plants are now in operation or in course of construction at the Buffalo, McKinley-Darragh, Dominion Reduction, Coniagas, Beaver, Trethewey, Northern Customs Concentrator, National and Nipissing.

Notwithstanding the uncertain situation as regards the patents controlling this process in Canada, most of the mills have gone ahead with the installation of a few cells to treat the slime resulting from the original crushing, and some companies have more ambitious plans in view. The Buffalo company has the largest plant of this kind, one rated at 600 tons per day. In it the large pile of concentrator tailing will be reground in tube mills and subjected to flotation, along with the current production of mine ore. For the most part, however, flotation is confined to the treatment of the very fine material which formerly went to the slime tables. On this material, which runs about 6 oz. to 8 oz., the slime tables made a very poor extraction. By the new process, the tailing can be reduced to 1 oz. to 2 oz., or even lower.

Equipment for Flotation.

The equipment necessary to float the regular concentrator slime is cheap, and the feed comparatively rich, so a good profit results. The next step will be more costly; that is, the recrushing of the sand table tailing in tube mills, followed by flotation. This requires a more expensive installation; the working cost will be higher; and the feed will average much lower —probably around 3 oz. The profit on this product will, therefore, be much less; but with the present high price of silver, the balance should be on the right side.

The Callow pneumatic cell is used generally throughout the district. Its simplicity and low working cost recommend it.

Machines of the impeller type have not been given much of a trial, though there are several Groch machines working, or being installed. The Kraut-Kolberg machine has also been tried.

The Callow cell has acquired many frills depending on the ideas of the mill man. Transverse baffles reaching to within two or three inches of the bottom prevent surging. In several mills the froth is allowed to overflow only at the tailing end of the cell; in another the froth is at four different levels in the cell and cascades over the baffles from one compartment to the other, finally overflowing at the feed end. These two devices raise the grade of the concentrate on this ore. Whether they will result in a higher tailing remains to be seen.

Flotation After Cyanidation.

While flotation of the tailing from water concentration gives a good extraction, the flotation of the residue after cyanide treatment is another matter. A great amount of experimenting has been carried out at the Nipissing to solve this problem. Many variations of oil, tonnage, dilution, temperature and the addition of various chemicals have been tried; but the result on this particular ore is still far from satisfactory. It was thought that the presence of .04 per cent. cyanide and .03 per cent. alkali in the pulp solution was the cause of the poor extraction. This was remedied by killing the cyanide and alkali with acid; but the results were no better. The fact that the ore must be ground to pass a 200-mesh screen in order to make a good saving by cyanide, probably interferes with the flotation treatment, as the very fine slime is carried up with the froth. The most likely explanation, however, is that the cyanide treatment changes the surface of the mineral particles to such an extent that these particles do not readily float.

In the past the cyaniding of Cobalt ores even with its higher cost has been more economical than water concentration. A number of companies with concentrators already built added cyanide installations for the treatment of the slime. Now with the high cost of cyanide and other chemicals, and with the advent of flotation, there is not much to choose between the two methods of treatment. It looks as if a 1-oz. tailing would soon be an accomplished fact.

Treatment of the Flotation Concentrate.

The main objection to flotation in Cobalt is the cost of marketing the concentrate. At the present time there is only one smelting concern in Canada or the United States known to the writer which will buy this product. Such a situation is disquieting, to say the least. The cost of marketing 100 oz. concentrate with silver at 75c per oz. is 34 per cent. of the gross value. The marketing costs on 200, 300 and 400 oz. concentrates are 22 per cent., 16 per cent., 13 per cent. Every effort is being made at present to perfect a process for the economical treatment of flotation concentrate on the ground, and thereby save the high transportation cost.

Mr. Hugh Rose, in an article on the Santa Gertrudis practice states that the flotation concentrate from that silver ore can be treated raw by cyanide with a resulting high extraction. The same treatment on Cobalt concentrate gives very poor results and it becomes necessary to roast with salt before attempting to leach. If a good chloridization can be had, there should be little difficulty in extracting the silver by cyanide or by hyposulphite of soda.

In roasting this concentrate with salt, high volatilization losses occur in some instances. The dust loss on this very fine material is also an item. The Holt-Dern furnace has been suggested for this work, and one will shortly be built at the Buffalo. This furnace is used on silver ores at Tintic, Utah. Its construction resembles that of a lime kiln, and it has no moving parts. The ore is mixed with 5 per cent. sulphur in the form of pyrite, or with coal, and is charged wet into the furnace. A fire underneath starts the operation and air blown through the charge keeps it going with the fuel in the mixture. The top of the charge being wet prevents volatilization and dust losses.

The Buffalo Process of Treating the Flotation Product.

Mr. T. R. Jones at the Buffalo has just completed a plant for the treatment of this flotation product. The concentrate is pumped to a thickener that feeds an Oliver filter, where it is dewatered. The necessary salt is added in solution to the cake before it is scraped

from the drum of the filter. The concentrate is then dried in an oil fired revolving cylinder, and, after crushing, is fed to a hearth furnace to be replaced later by the Holt-Dern.

The calcine is pulverized in a Hardinge ball mill, mixed with an acid solution to dissolve the oxidized copper, and then drawn on the leaves of a Moore filter. Subsequently the leaves carrying the pulp are immersed in a caustic soda solution to neutralize the remaining acid and are then transferred to the tank containing cyanide. Most of the silver is extracted in the short treatment on the filter leaves. The residue is then pumped to the cyanide tanks, where it receives further treatment and then goes to flotation.

A New Process for Treating High Grade Ore and Concentrate.

During the past year, a new plant has been built by the Cobalt Reduction Co. for the treatment, by a new process, of high grade ore, and concentrate. This method was worked out by Mr. M. F. Fairlie, who has demonstrated that after a preliminary treatment with bleaching powder, $Ca(OCL)_2$, this refractory combination of minerals can be successfully cyanided. The low-grade ore is concentrated in the usual way on tables, the slime going direct to a cyanide annex. The table concentrate is reconcentrated on tables and brought up to 2,000 oz., while the tailing from this treatment is sent to the cyanide plant with the slime. The rich concentrate, together with the high grade ore, is then ground wet for 24 hours in a tube mill equipped with iron linings and balls. To this charge is added, toward the end of the operation, 2 per cent. bleaching powder. The effect of the bleaching powder is to oxidize the refractory silver minerals and make them amenable to treatment by cyanide.

The charge from the tube mill goes to a Dorr classifier, where the coarse material, including the metallics from the ore, is removed. The pulp after being well washed, is dewatered by an Oliver filter; the treatment by a strong cyanide solution follows. The final residue, after filtration on another Oliver filter, can be readily marketed for its cobalt and silver content.

The silver-bearing solution is precipitated by sodium sulphide, the resulting precipitate being desulphurized in a small tube-mill by the aid of metallic aluminum and a caustic soda solution. The silver is then melted down to fine bullion in a hearth furnace. (This method of precipitation was first installed in Cobalt at the Nipissing and has been described elsewhere)* The oversize raked out by the classifier is given a partial roast on the hearth of the furnace to eliminate part of the arsenic and is then melted down to bullion. The small amount of speiss and slag is returned to the tube mill with the next charge. By this simple but ingenious process the corporation which was formerly one of the largest shippers of ore and concentrate in the district is enabled to market practically its entire production in the form of fine silver bars.

GEOLOGICAL SURVEY PUBLICATIONS.

Three reports just issued by the Geological Survey are: Memoir 89, Wood Mountain-Willowbunch Coal Area, Saskatchewan by Bruce Rose; Memoir 92, part of the district of Lake St. John, Quebec, by John A. Dresser; Memoir 95, Onaping Map-Area, by W. H. Collins.

The area reported on by Mr. Collins included the West Shiningtree gold deposits.

CONCENTRATING COBALT SILVER ORES BY FLOTATION.

The following notes on flotation of silver ores are from a paper to be presented at the annual meeting of the Canadian Mining Institute, March 6, by J. M. Callow and E. B. Thornhill:

Practically all the flotation plants at Cobalt are using an oil mixture consisting of pine oil, coal tar creosote and coal tar. A mixture of 15 per cent. pine oil, 75 per cent. coal tar creosote and 10 per cent. coal tar is very efficient. A 10 per cent. pine oil and 90 per cent. high sulphur fuel oil mixture is being used to float cyanide plant tailings with fairly good results.

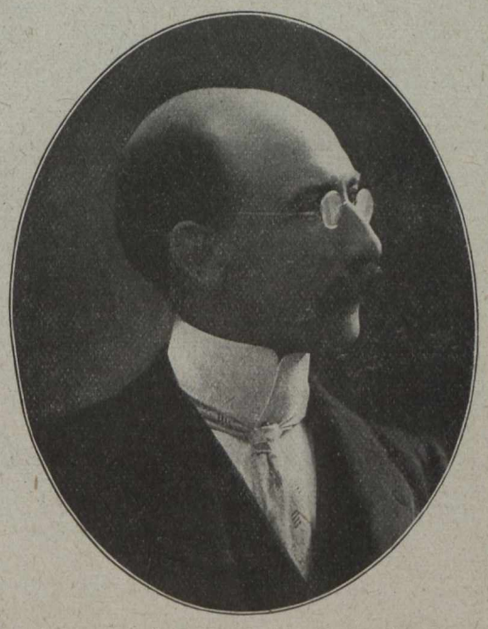
Recoveries by flotation vary over a rather wide range at the different plants, depending on the product going to flotation, the grade of concentrate required and the experience of the operator. The last factor is probably the most important at the present time, as some time is required to produce an efficient operator.

Due to the present excessive marketing charges it is economy to sacrifice recovery to some extent in order to produce a high-grade concentrate.

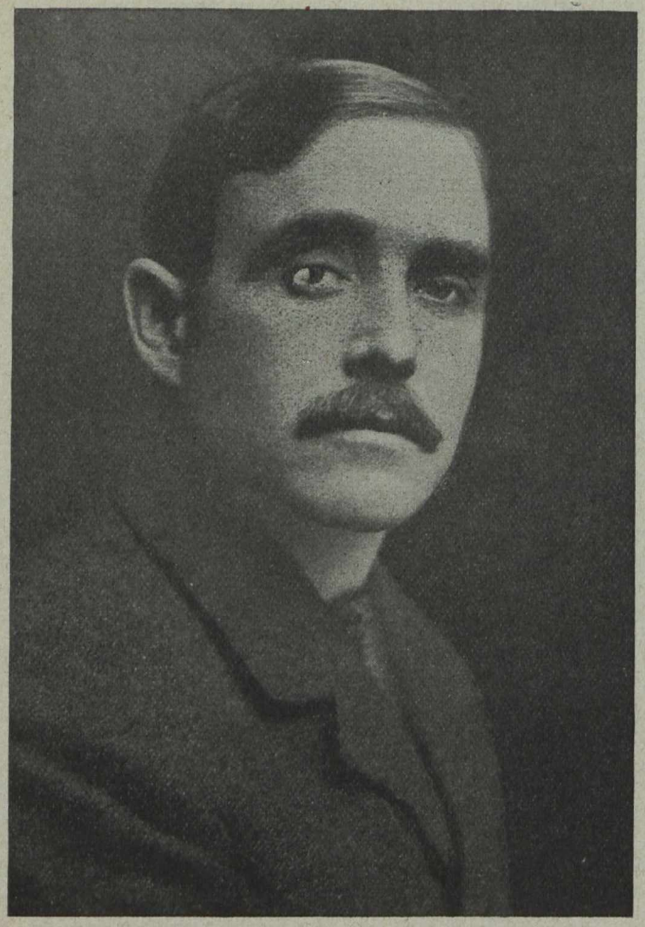
This marketing charge, representing 20 per cent. of the gross value of the product, has led to considerable research work by the metallurgists of the district to devise a satisfactory method for the local treatment of such concentrates.

A chloridizing roast followed by leaching either with cyanide or an acid brine solution has given the best results to date. In fact, the Buffalo mines is now treating five to six tons flotation concentrate daily by a chloridizing roast followed by an acid leach to extract the base metals and then by cyanide leach to recover the silver chloride. A 95 to 98 per cent. extraction of the silver values has been obtained with this method.

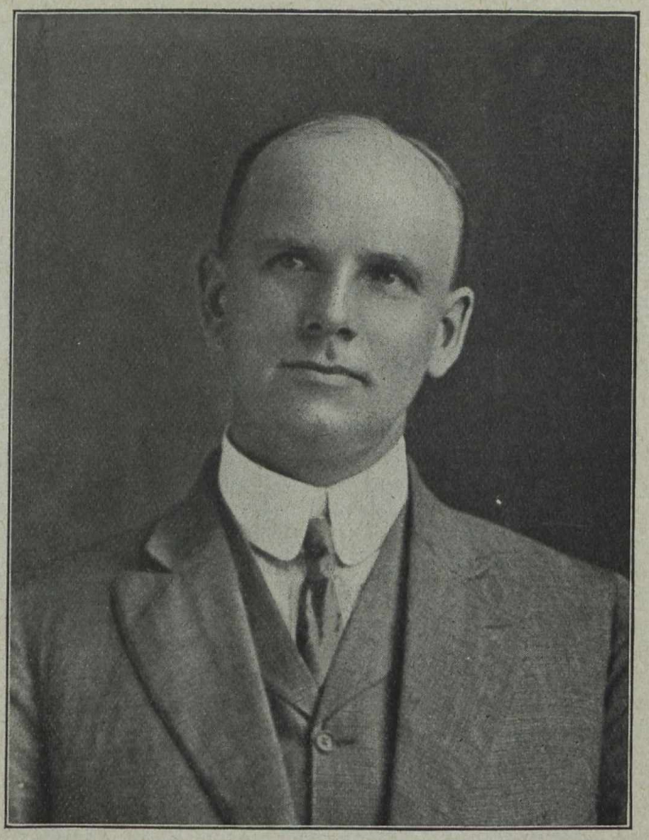
Some research work has been done to determine the amenability to recovery by flotation of the particular silver minerals that occur in this district. These tests were carried out by mixing finely ground picked specimens of the particular mineral with a practically barren gangue and the mixture floated.



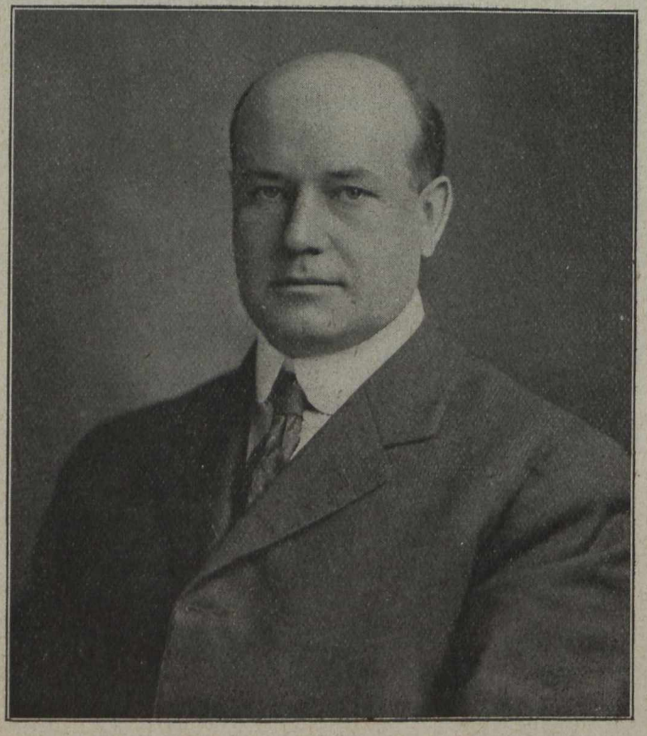
A. A. Cole, Cobalt, re-elected president Canadian Mining Institute.



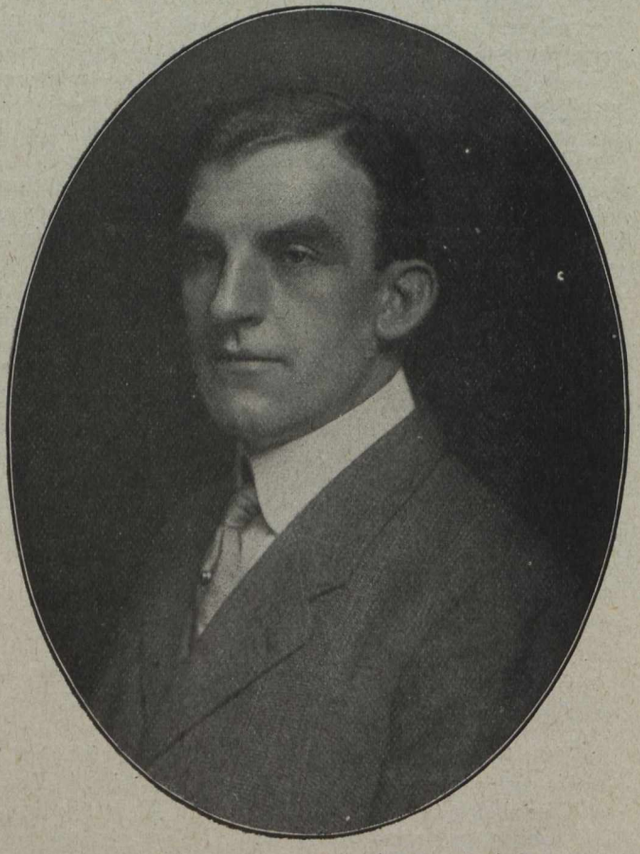
R. B. Watson, general manager Nipissing Mining Co.



A. R. Globe, assistant manager Hollinger Consolidated Gold Mines.



G. C. Bateman, manager La Rose Consolidated Mines.



C. A. O'Connell, manager Tough-Oakes Gold Mines.

THE KIRKLAND LAKE DISTRICT.

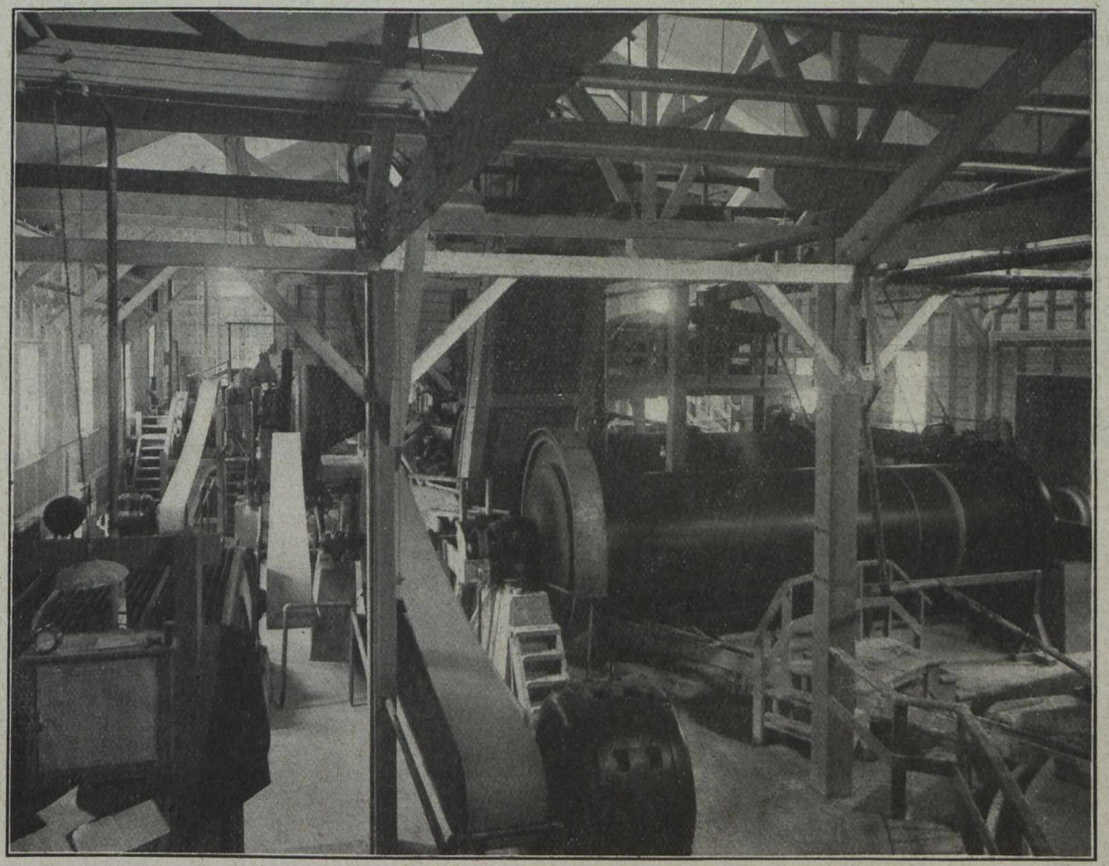
The first discovery of ore made in the Kirkland Lake District was on the Wright-Hargreaves property in 1910, and shortly afterwards some drilling was done there with a McKernan-Terry shot drill Owing to the extreme hardness of the feldspar porphyry the work was abandoned after two shallow holes were put down.

Work on the Tough-Oakes group was started in the summer of 1912 and following this the Teck-Hughes, Lake Shore and other properties were opened up.

The engineers who examined the various properties after the first ore was uncovered were doubtful of their prospective value, owing to the fact that for the most part the veins were narrow and the enclosing rocks showed low gold content on both sides of the outcrop.

The majority of the veins have an East-West Strike, and dip South at tan angle of from 54 to 74 deg. The width at outcrops varies from 3 inches to 24 inches. Outcrops show considerable free gold in places. A number of tellurides have been found in the ores of the district, and of these altaite, or telluride of lead, is the predominating one. This occurs both in the vein quartz and also in the enclosing wall rocks and is usually associated with the very rich ore. Calaverite (Au-Te) and other gold-silver tellurides have also been found in the veins, but in lesser quantities than altaite.

There have been several periods of oredeposition, and in places the vein quartz is much brecciated and recemented with a later quartz filling. Frequently calcite is found on the hanging wall side of the veins and



Tough-Oakes Mill, Kirkland Lake, showing ball and pebble mills.

In many ways the veins in the Kirkland Lake District show a marked similarity to those of Cobalt, inasmuch as they present a narrow width of high grade ore at outcrop, and this with the gold content of the enclosing wall rocks admit of stoping widths of from 48 to 72 inches.

The Report of the Bureau of Mines issued in 1914 set at rest any doubt as to the value of the deposits. This work was done by A. G. Burrows, assisted by P. E. Hopkins, and was accompanied by a Geological Map which is a model of accuracy.

The work on the Tough-Oakes property proved that the bulk of the ore was in the feldspar porphyry, and the indications were that considerable depth of payable ore would be obtained. This property is the senior mine in the district. To the end of 1916 about 70,000 tons of ore has been milled.

some of this contains much coarse gold. The wall rocks show the result of much folding and the fractures have been filled with narrow quartz stringers containing gold and the sulphides of copper and iron. In all of the veins there is present molybdenite in the form of thin films, some of which are slickensided as a result of the folding. Some of the vein quartz shows a thin film of gold on the slickensides, and presents a very attractive appearance.

The bulk of the ore in the district is found in the feldspar porphyry, and to date only a small amount into Kirkland Lake is urgent and as the amount of freight received at Swastika is increasing every month, the congestion at that point is at times very great.

In order to assure an ample supply of electric power for the district the Northern Ontario Light and Power Co., of Cobalt, have built a very substantial, three

phase, 44,000 volt, line from their sub-station at Cobalt to Kirkland Lake. At the terminal they have erected a large reinforced concrete sub-station where the power will be stepped down to 2,200 volts, and delivered to has been mined from the veins where they are in the Temiskaming series of the conglomerate and greywacke. Although most of the veins are narrow they all show continuity, and there is every reason to believe that they will persist to a considerable depth.

Since the summer of 1916 there has been a great increase in the number of properties being developed, and it is very probable that before the end of another year there will be six or eight proven mines in the Kirkland Lake Section.

The need for a branch of the T. & N. O. Railway the various mines within a two mile radius. The Tough-Oakes company have been receiving their power for the past three years from the Farah Hydro Electric Plant at Charlton 26 miles South to Kirkland Lake. The supply has not been adequate for some time and when the power from Cobalt is available a much larger amount of development work can be carried on at all the mines in the District.

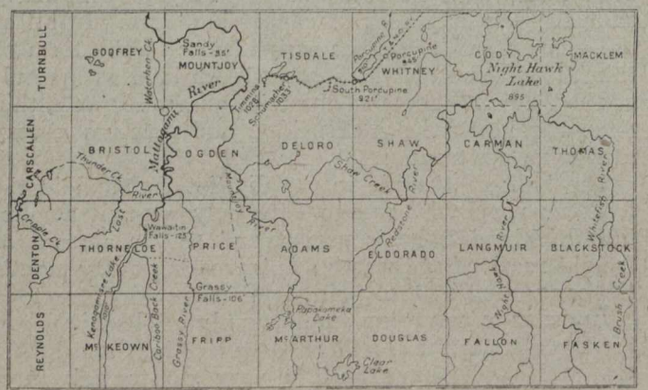
The results of the development carried on during the past four years have demonstrated that the future of the Kirkland Lake District is assured, and the present year should be one of great progress.

MILLERTON AND ACME.

The Millerton and Acme properties were merged with the Hollinger in 1916. Commenting on the work done on these properties during 1916 Manager Robbins says:

"A limited amount of work has been done upon the Millerton at three points. No. 8 shaft near the south boundary of the north claim was deepened and in the course of the work a vein 4 feet wide, assaying about $15 per ton, was passed through. Shortage of labor caused work in this shaft to be suspended. On the 200 ft. level vein No. 13 was followed into Millerton ground, yielding from $12 to $15 per ton. On the same level a crosscut was driven east from No. 7 shaft to tap vein 226, which was found to run from $25 to $30 per ton where encountered.

"The Acme has come up to all expectations and is demonstrating the assumption that its potential value is much greater than the value indicated by developed ore, for work at shafts 9 and 11 has proved that a number of the veins extend beyond the limits previously ascribed to them, while several new ore bodies have been encountered."



Sketch map showing Tisdale and neighboring townships.

ONTARIO'S RICHEST GOLD DEPOSIT.

During the past few years Ontario has, thanks to the Porcupine and Kirkland Lake districts, become an important producer of gold. In the Hollinger and Dome mines the province has two of the largest gold producers in America.

Less well known outside of Northern Ontario is the wonderful Croesus mine in Munro Township, twelve miles from Matheson on the T. & N. O. Railway. Here some of the richest ore ever mined is being taken out.

On the front cover of this issue of The Canadian Mining Journal we reproduce in colors a specimen of rich ore from the Croesus. This specimen is shown natural size. The drill mark in the upper right corner shows how the drill holes are in places almost lined with gold. The specimen is, by weight, over one-third gold.

On the opposite page we reproduce photographs of five pieces of Croesus ore. These are shown considerably reduced in size. The specimen shown on the cover in natural size and color is shown here again and may be recognized by the drill hole. Comparison of these photographs with the colored reproduction will give some idea of the size and gold content of the pieces of ore.

These five pieces of ore have been purchased by the Ontario Bureau of Mines and have been carefully weighed. They together weigh 38,689 grams and contain 16,431 grams gold and silver. This is equivalent to 528.28 oz. gold and silver, of which 480.7 oz. is gold and 47.5 oz. is silver. The value of the gold and silver in the five pieces, which together weigh about 85 lb., is therefore about $9,966.

It is not to be imagined that all of the Croesus ore is like these specimens, for the deposits are very pockety. There is, however, a considerable quantity of such rich ore in the vein.

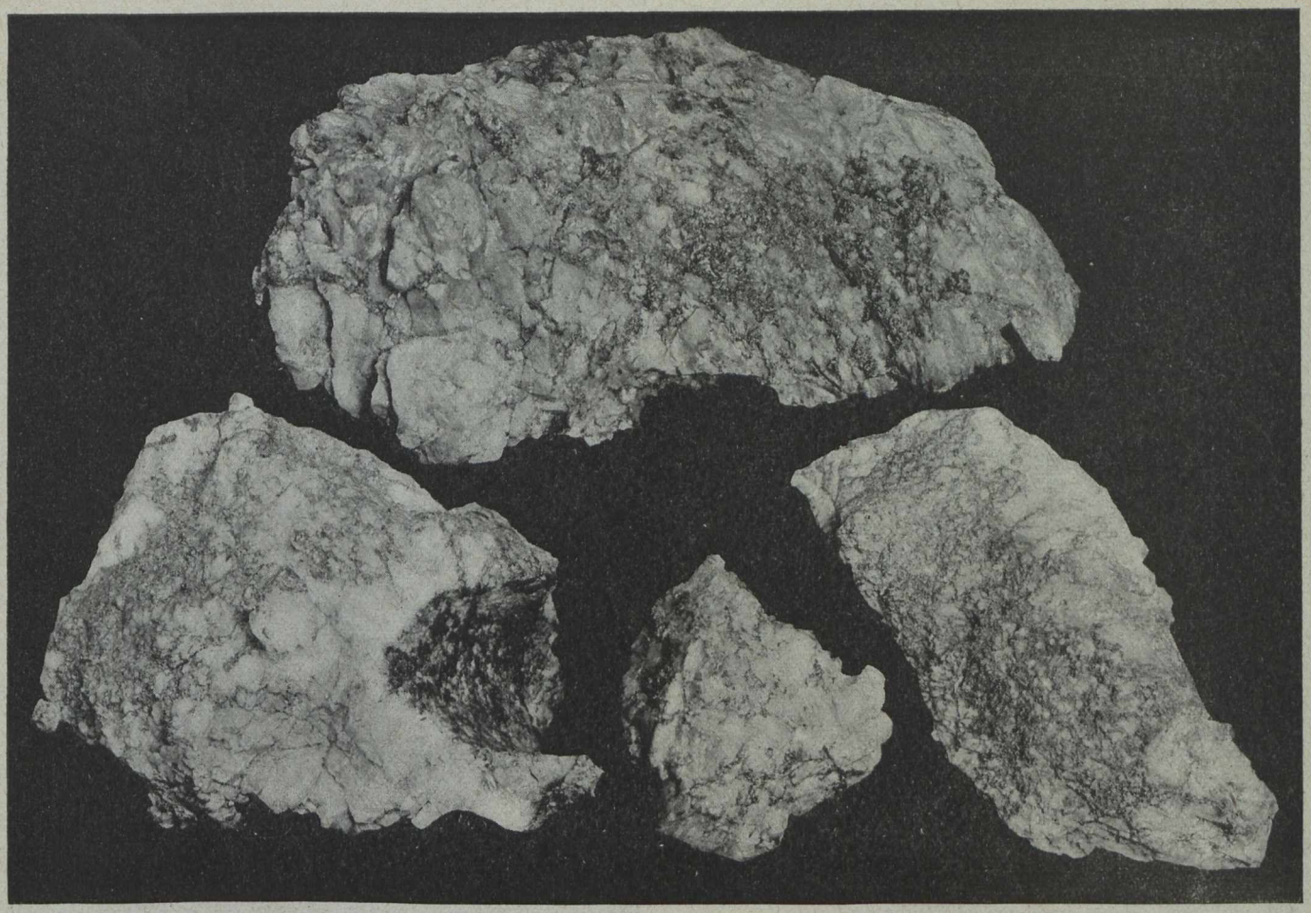
The vein has an average width of 3 ft., and there are values in the wall rock for one foot on each side of the vein. In places serpentine bands cross the vein.

The vein strikes north and south and dips east at an angle of 26 deg. A shaft was put down on the vein to the 300-ft. level and from there to the 400-ft. at an angle of 40 deg. Levels are being extended at 100, 150, 200 and 300-ft. On July 29, 1916, the plant was totally destroyed in the disastrous forest fire. It has since been rebuilt and mining has been resumed.

The property now known as the Croesus was for some time known as the Dobie-Leyson claim. It was considered a good prospect; but little work was done on it until the Dominion Reduction Company acquired the property and began development work in 1915. The results were phenomenal. A shaft was sunk on the vein and from this shaft above the 100-ft. level $120,000 in gold was taken out in sinking operations. In a few months about $1,000,000 worth of ore was partially developed with a small prospecting outfit.

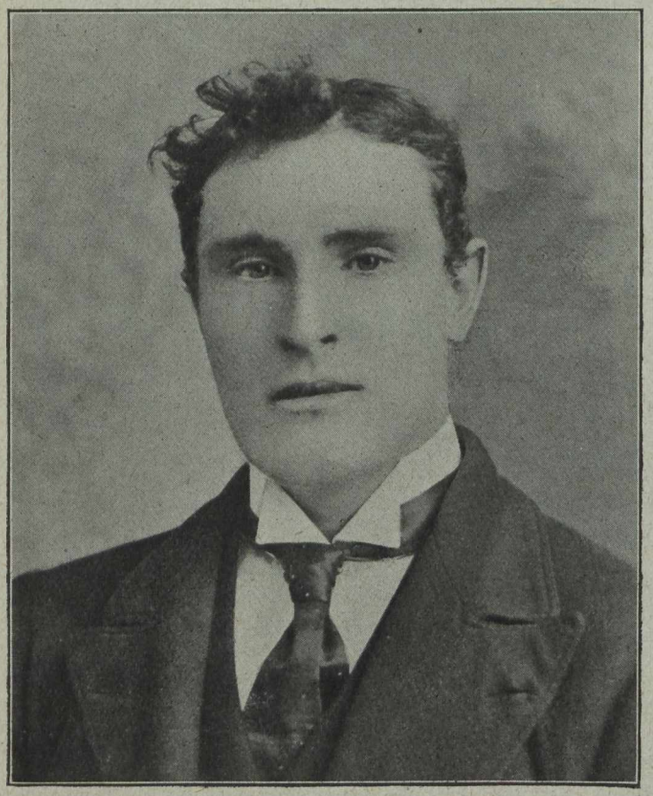
The high-grade ore mined is reduced to bullion in an oil-burning furnace. The quartz remaining after the high-grade is picked out runs quite high. Mill tests on the decantation process show a 99 per cent. extraction.

Croesus Gold Mines, Ltd., is operated as a close corporation by the Dominion Reduction Company. The property consists of three claims, 120 acres. Mr. Julius M. Cohen is manager.

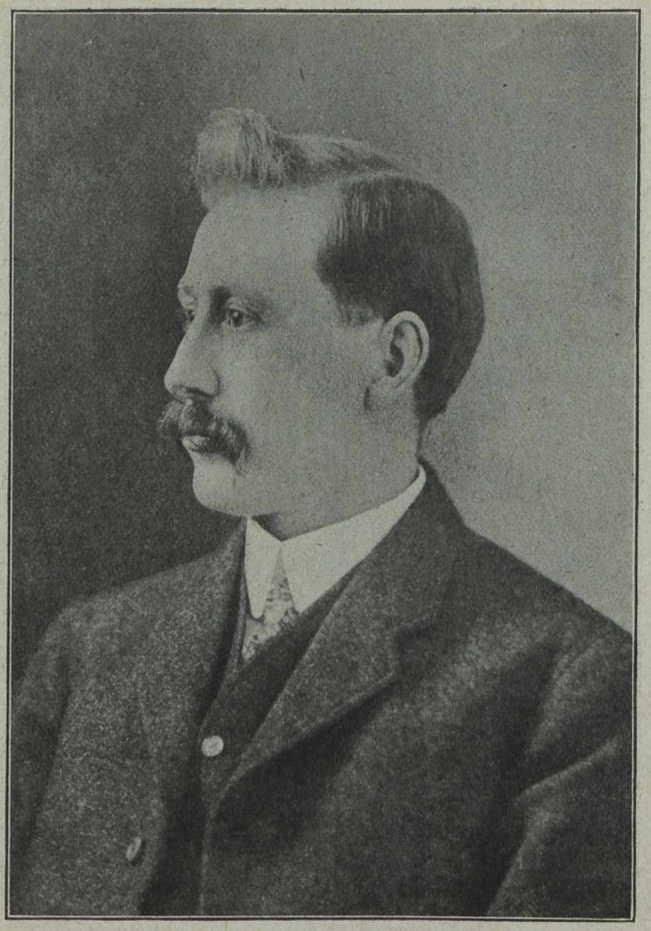


These 5 pieces of ore, shown about one-fifth natural size, contain 528.28 oz gold, or over 40 per cent. See opposite page and front cover.

Gold ore from Croesus Mine, Northern Ontario.
These 5 pieces of ore weigh together 85 lb. and contain $9,966 in gold and silver.



J. W. Morrison, manager Lake Shore Mines, Ltd.



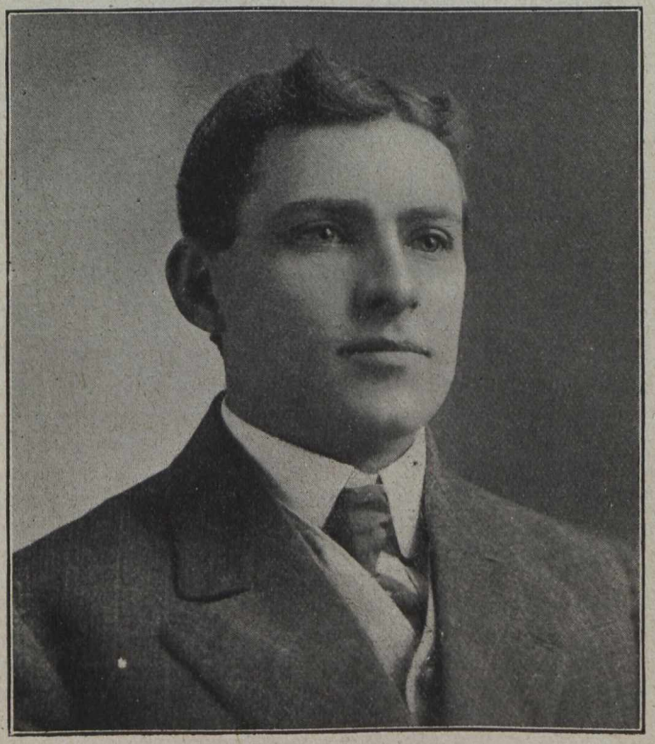
Jos. C. Houston, general superintendent Dome Mines.

M. W. Summerhayes, manager Porcupine Crown Mines, Ltd.

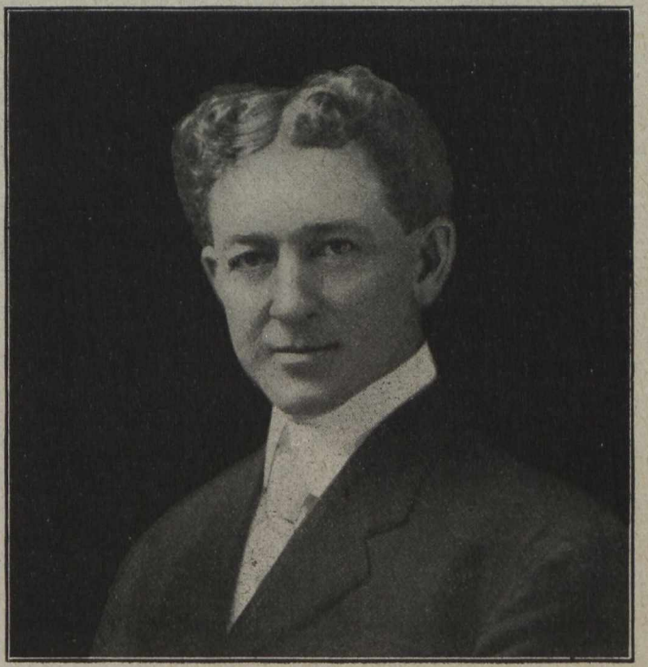
W. E. Segsworth, managing director Seneca-Superior Silver Mines, Ltd.

Tom R. Jones, manager Buffalo Mines.

Julius M. Cohen, manager Croesus Gold Mines.



H. A. Kee, manager Kerr Lake Mining Co., Ltd.



J. A. McVichie, manager Chambers-Ferland Mining Co.

INVESTMENT IN MINES

By J. B. Tyrrell.

It is quite probable that most of the people who buy shares in the stocks of mining companies do not care whether the mines are good or bad. Their money is put on the cards with certain mining names and they occasionally win, and often lose, with the rise and fall of the markets. The extraordinary feature of this game is that the more money the dealer collects in his pile, which of course is taken from them, and the richer he gets, the more confidence they have in him and the harder they play.

If it had been customary for the land to be tilled by agricultural companies incorporated under the Joint Stock Companies Act the names of such companies might have been substituted for those of mining companies, and any disrepute which might have been attached to the one name might have been transferred to the other. So that for any disrepute that the mining industry has, the Joint Stock Company's Act and not the mines are largely responsible.

I have nothing to say to such gamblers. They should be handed over to their clergymen for curative moral and religious treatment.

But there are men in the community who are interested in the development of the mining resources of the country, and who are prepared to follow their interest with some of their money. To such men a few remarks may be of interest.

First, let them disabuse their minds of the idea that mining is any sort of a game, to be played either over the table or out of doors. It is not an amusement or recreation or dishonest mode of making a living; but it is a serious calling and must be contemplated seriously if it is to be successful. The work may be pleasant or enjoyable as any good successful work should be, whether that work is mental or physical; but it is none the less strenuous on that account.

Everyone will of course recognize that the actual supervision and operation of mines is serious and strenuous work, but many think that the investment of money in these same mines is gaming. This may be true or untrue, just as one may see fit to make it.

If the purchaser is willing to take the trouble to be an investor, and not a gambler, in mining stocks he must exercise the ordinary precautions that he would take if he were to put his money into any other business enterprise. He must remember that a mine, in whatever stage of its development, is a natural feature which embraces a definite portion of the earth's crust, and that it can be examined and valued by those who are accustomed to perform such work, just as a house or garden or farm can be valued, and that the men who invest on the advice of such valuators are reasonably certain to make good profits on their investments.

Most men who buy stock in mining companies buy on the advice of men interested in selling stock to them. The sellers may be quite honest, and their opinions may be backed up by those of others who are also honest, but nevertheless it is the duty of an intelligent business man to inspect what he buys, or to get some competent person in whom he can place confidence to inspect it for him, whether the object is a mine, a timber limit, a farm, a horse, or whatever it may be. If he does not have such inspection made he deserves to lose his money. Some people may argue that opportunities for good investments in mining properties are seldom offered, and when offered must be seized quickly or they will be snatched up by others. Take your time, and if a man tries to hurry you into a quick purchase without sufficient time for careful examination, no matter what pretext he may offer for the shortness of time at his disposal, refuse to do business with him; you will save money in the long run.

It may also be thought that it is almost impossible to make favorable investments in good mining properties or in stocks of good mining companies on account of the keen competition for such investments. But competition to be effective must be intelligent, and most of the so-called competition is neither the one nor the other. Uninformed buying is no competition to the careful business man; but on the contrary if often gives him an opportunity to secure bargains which he would not be able to get if other buyers were not wasting their money on trash. The purchaser of a mine or of mining stock, who purchases without knowledge or competent and independent advice is not a formidable competitor to the man who knows thoroughly what he is purchasing. In spite of the wails and protests of those who have lost money by buying pieces of paper which they were gullable enough to believe would soon represent wealth to be derived from new mines, I have no hesitation in saying that at the present time investments in mines, if made intelligently and on competent and independent advice, will yield larger and more certain returns than investment in any other class of securities on the market.

There may be some timid mining engineers who will say that they do not invest any money that they may possess in mining securities. Such engineers must be avoided as financial advisers. If they have not sufficient confidence in their knowledge and ability to separate good mines from bad ones, and to stake their own money on that knowledge, you may take it for granted that they are not capable of judging of the value of mines in which others should invest. But there are engineers who make a study of the value of mines, and who are not afraid to put their money into them. The advice of such men will usually lead to successful investments. It may have nothing to do with the vagaries of the stock market, and it is rarely that a purchaser will buy on such advice stock which is selling at $2.00 to-day and which will be selling at $4.00 to-morrow, but he will buy stock in mines which have intelligent, honest directors, are well managed, have large ore reserves, and are certain to pay good dividends for years to come.

If the capitalist has money to spare, and wishes to take long chances in the hope of larger returns, he may be directed to buy stock or interests in mining properties in their early stages of development which have good prospects of becoming dividend payers, and he will be directed to avoid the many properties, no matter how glaringly advertised, which have no such prospects. In the case of such speculative purchases no advising engineer of any reputation or standing will guarantee success, but he will increase the chances of success manyfold.

Such speculative purchases are the ones usually

thought of when men talk about "putting their money into mines," and the successes that have fallen to the lots of the fortunate speculators have laid the foundations for many an attractive story. If a man wishes to speculate, let him do so, but let him be sensible and reduce the chances against himself as much as possible before he pays over his money. He should not accept a seller's statement that a hole in the ground, whether large or small, is of any value as a mine until he has taken the trouble to examine it for himself or has had it examined by some competent and independent valuator.

I have attempted briefly to draw attention to an ordinary business principle in common use among people everywhere throughout the country. If it is kept as constantly in view when mines, or interests in mines, are being purchased, as it is in other commercial transactions, we will soon hear less of the losses incurred in the purchase of worthless mining stock.

DIVIDENDS PAID BY COBALT SILVER MINING COMPANIES.

To December 31, 1916.

Beaver	$ 650,000
Buffalo	2,787,000
Caribou	225,000
Casey Cobalt	203,249
City of Cobalt	139,321
Cobalt Central	192,845
Cobalt Comet	229,700
Cobalt Lake	465,000
Cobalt Townsite	966,726
Coniagas	8,440,000
Crown Reserve	6,102,399
Foster	45,774
Hudson Bay	1,940,250
Kerr Lake	6,570,000
La Rose	6,887,708
Mining Corporation	1,348,750
McKinley	4,809,044
Nipissing	15,340,000
Penn. Canadian	67,485
Peterson Lake	420,318
Right of Way	573,036
Seneca Superior	1,579,817
Silver Queen	315,000
Temiskaming	1,684,156
Trethewey	1,111,999
Wettlaufer	637,466
Private Corporations	3,825,000

HAS PRODUCED $15,466,444 GOLD.

Hollinger, Acme and the consolidated company, Hollinger Consolidated, produced to Dec. 31, 1916, $15,466,444 and paid in dividends $7,456,000. The deposits were discovered in 1909 and production began in 1911. The Hollinger output in 1911 was $46,082.

$1,200,000 FOR SUPPLIES.

Hollinger Gold Mines, Limited, is a big consumer as well as a producer. During 1916 Hollinger used in operations alone $800,000 worth of supplies, $400,000 was used in construction work during the same period.

THE HOLLINGER IN 1916.

In spite of increased cost of supplies, delays in shipments of machinery and shortage of labor, the Hollinger mine produced in 1916 $5,073,401, as compared with $4,205,901 in 1915.

The increase is not as great as was expected a year ago, and present production is not what it would have been under normal conditions. When the adverse circumstances are taken into account the production of $5,073,401 at a profit of nearly $2,866,984 is a creditable one. Unfortunately, however, development work has of necessity been somewhat neglected, and it is said that labor agitators are taking advantage of the shortage of labor to spread unrest among the men.

Regarding the shortage of labor and the increasing cost of materials and supplies the President, N. A. Timmins, states in a recent report to shareholders that gold, having a fixed valuation, can be produced at a much less cost after the war than at present. There is, in his opinion, no reason why the Hollinger company should enter into undue competition with other industries or with the enlistment of men for the army to secure an adequate supply of labor.

"One year ago," says the President, "we believed that we would not only be able to keep up our output, but to increase it materially; and we expected that by the time the new addition to the mill would be completed the scarcity of labor would be relieved. That we did succeed in increasing our output is a matter of record, and if we could feel absolutely sure that conditions in the matters especially of labor and supplies would not become worse we would be inclined to continue our present policy.

"In view of the situation we have decided that under prevailing conditions it is in the best interests of the shareholders to conserve the company's assets and properties rather than to continue to disburse the amount now being distributed every four weeks. Whether this will be done by maintaining the present dividend rate of 1 per cent., with less frequent distributions, or by reducing the rate by one-half, will be announced at the annual meeting. The directors regard any change in the dividend as merely temporary, and shareholders may rest assured that the dividends will be increased as soon as conditions warrant it. We expect to operate for many years to come, and consider our action in regard to the dividend not as a setback, but merely a delay in our program of expansion. Meanwhile it is the intention to operate the mine and the mill to the fullest capacity possible consistent with present conditions ,and we will continue to make as large profits as possible."

"During 1916 dividends amounting to $3,126,000 were distributed among shareholders, thus causing a deficit from operations of $119,590, to which is added $150,000 written off for plant depreciation.

"The deficit is largely technical," ays the President, "and so small in comparison with our total operations that it has no real significance and will be readily made up once normal economic conditions are restored."

Ore Reserves.

Managing Director P. A. Robbins estimates the Hollinger ore reserves at 3,938,000 tons of ore of an average value of $8.68 per ton. The estimated gross value of the ore reserves on December 31, 1916, was $34,185,000, as against $33,837,000 on December 31, 1915. Mr. Robbins states that "ore reserves have been estimated upon the same basis as previously, although they are

somewhat more conservative in that certain doubtful valuations have been eliminated. In spite of greatly curtailed development we still show approximately the same reserves as we did in last year's report, and during the interval there has been removed from the mine 604,062 tons, containing $5,342,234.77, an average of $8.84 per ton.

"In estimating the reserves we use the actual measurements of the ore in place, but when the ore is mined it is not possible to prevent a certain amount of waste rock from being broken and becoming intermingled with the ore. This dilution with waste has the effect of lowering the value per ton of the mixture, although it increases the number of tons. Our experience, after five years of operations, has been that there is a dilution of approximately 10 per cent., and hence the present estimate of $3,938,540 tons at $8.68 per ton will, when milled, probably yield approximately 4,300,000 tons, averaging about $7.75 per ton.

"It gives me pleasure to report that all of our underground developments have been highly favorable, and once normal conditions of labor are restored there can be no doubt but that developments will continue to show increases in total values of ore beyond those contained in the present estimates."

In his general remarks Mr. Robbins mentions the fact that during the year 1916 there was expended upon capital account a total of $725,000 in opening up the mine and increasing the plant to permit of mining and milling 3,500 tons of ore daily. In 1916 the company produced the sum of $5,073,000 at a profit of nearly $3,000,000, and, while the Managing Director states that it falls short of his expectations, it is, nevertheless, a new record in Canadian gold mining operations. In regard to the hitches which have occurred in the amalgamation program Mr. Robbins states: "The amalgamation was planned at the end of 1915, and it was anticipated that by the first of April, 1916, it would be an accomplished fact. Unfortunately for our plans, the resolution proposing the Dominion war profits tax was not understood, and the first interpretation led to a belief that we should be placed in an awkward financial predicament if the proposed amalgamation were gone ahead with. Consequently the matter was delayed until the meaning of the act was better understood, and as a result the actual amalgamation of the properties was not consummated until June.

"Long delays in the delivery of machinery and parts held up the completion of the addition to the mill, so that, instead of April, it was September before we were able to treat the tonnage required by our plans. The knowledge that there has been a shortage of labor has naturally resulted in diminishing efforts upon the part of many workers, and while various expedients have been tried in an endeavor to overcome this tendency, the results have not been a marked success.

"Labor agitators and organizers have succeeded in spreading considerable unrest among the men, but it is to be hoped that their efforts to precipitate a strike will be unsuccessful. Under present conditions there would be nothing for us to do but curtail our operations.

"The shortage of labor has somewhat affected the grade of ore produced, for instead of developing and mining the better grades of ore, it has been advisable to mine such ore as could be most readily extracted."

Total costs including all mining, milling, etc., amount to $2.428.601, or at the rate of $4.033 per ton, as compared with $3.982 in 1915.

In the matter of costs the report says: A continual advance in the cost of supplies, and the growing shortage and the lowering quality of labor has increased the costs of operation, until they are approximately 50 cents per ton above normal, which means a reduction in profits of from $900 to $1,000 per day. Scarcity of labor has also prevented the aggressive development of higher grade ore bodies, and has made it necessary to mine and mill the ore most easily available.

Additions to plant and equipment during 1916 totaled $599,417. Total development done was 20,280 feet.

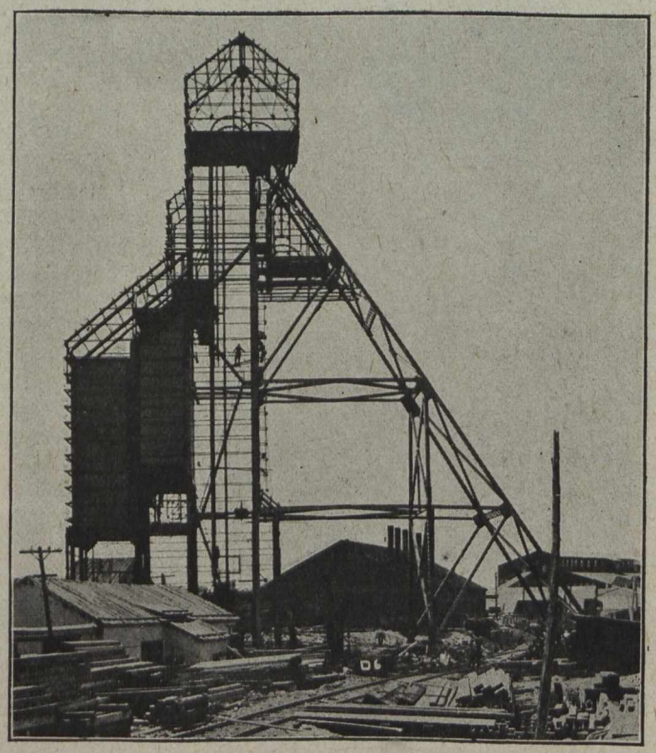
BRITISH COLUMBIA MINERAL PRODUCTION IN 1916.

A preliminary report, issued by the British Columbia Bureau of Mines, shows an estimated mineral production during 1916 of a value of $42,970,555, an incerase of 45.9 per cent. over 1915, and of 32.5 per cent. over the best previous year, 1912.

The output of copper for the year 1916 is estimated to have been about 67,757,075 lbs., which is about 19 per cent. greater than the previous year. The value of the product was $18,429,924, an increase over last year of $8,594,424, or 87 per cent., and amounts to about 56.3 per cent. of the value of the metallic minerals produced this year.

The combined rises in the prices of lead and silver very greatly helped the silver-lead mines of the Slocan. The provincial output of lead this past year is estimated to be about 52,242,183 lbs., worth $3,186,773, and that of silver was 3,366,205 ozs., worth $2,099,838.

Preliminary figures indicate that the output of zinc in 1916 was more than two and a half times what it was in 1915, the previous record year. Increased production has been nearly general in all the zinc-producing districts.



New head frame, Dome Mine.

GOLD AND SILVER MINING IN NORTHERN ONTARIO—(RETROSPECTIVE AND PROSPECTIVE.)

By Homer L. Gibson.

Looking backward very little more than half a score of years, one can recall the time when precious metal mining in Ontario was regarded in the light of an extremely doubtful venture in which no practical or sensible person should engage. Then, any one daring to publicly express a belief that mining would ever contribute in more than a nominal degree to the prosperity of the province, was regarded in the light of a dreamer, to put it mildly.

One can also recall that at that time there were some grounds for such a feeling, as the earlier efforts to develop profitable mines resulted in disappointments, almost without exception. The history of the Rainy River and Lake of the Woods districts is not a particularly pleasant one to recall. In the light of later developments, however, it is not altogether certain whether the failure of those districts to make good the somewhat extravagant promises which were made concerning them, was due to lack of ore or lack of knowledge. That they did fail, though, is certain.

Silver Mining at Cobalt.

In any event the real beginning of the evolution of precious metal mining in Ontario from the stage of doubtful venture to that of stable industry, dated with the discovery of silver at Cobalt.

Cobalt was, and is, unique in the mining world, and by that very fact attracted the attention of mining men the world over. The wonderful richness of its veins fairly dazzled their beholders, and to men of practical knowledge furnished the very reason why it could never take its place among the really great metal-producing districts of the world. That it has done so, however, cannot now be gainsaid, as witness its substantial dividend record of nearly $70,000,000, and its total production figures of nearly $150,000,000 in a little more than ten years.

Cobalt's past history can properly be divided into four stages, with a fifth just dawning. Each of these stages has witnessed changes in mining practice, each more scientific than the preceding one, and each made necessary by changes in conditions brought about gradually by the progress of underground development.

The first of these periods constituted what we may call the "high grade" days of the camp, during which the sole effort of the operators was concentrated on extraction and shipment of the wonderfully rich ores which occurred at or close to the surface. This was the period of $10,000 cars, and of course was the boom period of the district. Then, no particular attention was paid to low grade wall rock values, which were consigned to the dumps with hardly a thought that they would in time furnish the mainstay of the camp's production.

The second period witnessed the introduction of concentration of the lower grade ores, aimed primarily at reduction of shipping charges. The noticeable difference between this period and the former one was in the decreasing tonnages of shipments to smelters, but an easy maintenance of earlier records as regards number of silver ounces handled.

In the third period, cyanidation of ores and the refining of a considerable part of the product to bullion form was inaugurated, bringing about further reductions in the tonnages of raw ores shipped.

The fourth and final period as regards Cobalt's past was that of oil-flotation. Properly speaking, this period cannot be considered as of the past, as it is of comparatively recent introduction and is of decided vogue at the moment. Its success has been fully demonstrated and it is gradually being made a part of the practice at all the plants in the camp.

By this method, ores formerly considered of entirely too low grade for profitable handling are being treated, and in several instances the old tailings dumps that had accumulated in past years of operation, are being re-handled at a decided profit. This profit has, of course, been materially enhanced by the high average price for silver metal that has prevailed for the past year or more. It can be safely said that this innovation bids fair to maintain the profitable life of the camp for many years.

The fifth period lies entirely in the future and has just been made probable by the definite location of values below the diabase sill which at one time must have covered the greater part of the district.

At the risk of appearing to be a wild theorist, the writer would suggest that many similar areas in the western part of Coleman Township and through the Elk Lake and Gowganda districts, offer decidedly attractive speculative possibilities to those with sufficient of that necessary combination of capital and courage, to sink through the diabase and explore the keewatin which probably underlies.

This theory does not seem any more unreasonable now than did that of F. L. Culver regarding Beaver and Temiskaming five or six years ago, particularly as the section referred to has numerous veins of consistent size and regularity, carrying the characteristic Cobalt minerals, but of low silver content.

To demonstrate the truth or falsity of such a theory is of course a matter of years, requiring the expenditure of very large sums of money, purely and simply as a venture. This only emphasizes the passing of the poor man's Cobalt and the actual beginning of a time in which the new chances will have to be taken by those who know Cobalt best, and by such knowledge are made willing to gamble large sums in the hope of the handsome reward that follows the location of high grade values. Such an idea may seem somewhat ridiculous just now, but it indeed presents an attractive picture.

Porcupine Gold Mines.

Entirely aside from its own importance, to Cobalt can be laid the reason for the discovery of Northern Ontario's gold districts, of which at present Porcupine and Kirkland Lake are the shining lights. Their discovery is certainly the result of the prospector's search for other Cobalts and seems entirely incidental to the real reason underlying their efforts.

Fortunate in respect of having attracted the attention of real mining money and brains in its earliest days, Porcupine has been beset with many difficulties in its comparatively short life. First there was the handicap of lack of railway transportation, which for the first year and a half made the cost of development work almost prohibitive. When this was overcome by the construction in 1911 of the Porcupine branch of

the Temiskaming and Northern Ontario Railway, other camp, in that no change of geological formation or of vein occurrence takes place to depths of 2,000 feet or more. This is not a great depth as such are measured in some other mining districts, but it is conceded by geological authorities that it is reasonable to expect both veins and values to continue to the lowest possible depths for profitable mining.

The most encouraging feature of the whole situation is that both veins and values have been found to be more consistent in their occurrence below 500 feet depth than they are above. Many of the veins have been found to be severely faulted above the 500-ft. level and this has made necessary heavy expenditures in searching for "lost" veins above that level. The work that has now been done, however, has demonstrated the nature of those faults, so that they do not now represent the same difficulties they did in earlier stages of development.

Porcupine has sometimes been called the "Canadian Rand." Such a definition or comparison may at this time seem somewhat far-fetched, but when it is considered that the South African Rand comprises many square miles of territory, and when the same broad definition is given to the Porcupine, such a comparison seems fairly apt. The production at the present time in no wise compares, but the possibilities certainly do, and it does not seem unreasonable to imagine the gold production of our Northern Rand comparing very favorably with that of the great South African field in say another twenty-five years.

Kirkland Lake.

Kirkland Lake has also been the scene of some remarkably consistent development within the last eighteen months. On every property on the belt on which a reasonable amount of money has been expended, most encouraging results have followed, until now the district has two producing mines in the Tough-Oakes and Teck-Hughes, four about ready for milling equipment in the McKane, Lake Shore, Wright-Hargraves and La Belle, and several other prospects of certain promise on which development is now being carried out.

Other Gold Deposits.

Other districts, all of which give promise of becoming an important part of what has been above termed the Canadian Rand, are, the Township of Munroe, which already has a producer in the Croesus; Boston Creek with at least three attractive prospects in the Boston Creek, the R. A. P., and the Miller Independence; Tashota and the Nepigon country, where the St. Anthony and the Wells properties are being given intelligent trials; West Shining Tree, where several properties are undergoing preliminary development, and last, and possibly most interesting of all at the present time, the new discoveries at Fox Rapids in the Fort Matachewan territory, tributary to Elk Lake.

Future Possibilities.

Certainly enough has been proven in Northern Ontario to demonstrate without fear of contradiction the truth of a statement recently made by Mr. Arthur A. Cole, president of the Canadian Mining Institute, that in this section "greater mining possibilities exist than in any other part of the known world" and that "it does not require any very vivid imagination in looking to the future, to picture the devlopment of new mining districts converting the northern wilderness into thriving hives of industry."

A more general realization of the importance of this wonderful North country is certain to be forced upon us, posibly before we expect. It would seem extremely likely that after the great war is over, an impetus will be given to development that will make the progress of the last few years seem slow indeed.

Many of the men now wearing the khaki will probably have acquired a liking for the freedom of outdoor life that can only be satisfied by that offered in the North. To the men who are so fully deserving of opportunities, none can compare with those offered by our own Northern Ontario. What more fitting than that they should share them?

CORROSION OF COBALT ALLOYS.

The results of an investigation by H. T. Kalmus and K. B. Blake, of Cobalt alloys with non-corrosive properties has just been published by the Mines Branch, Ottawa.

Among the conclusions reached are:

The alloys formed by the addition of small percentages of copper, nickel, and cobalt (from 0.25 per cent. to 3.0 per cent) to American ingot iron, are more resistant to atmospheric corrosion than the pure American ingot iron, from which the alloys were prepared.

Considering the data for alloys formed by adding various amounts of cobalt (from 0.25 per cent. to 3.0 per cent) to American ingot iron, with very little, if any, carbon content, it is apparent that the corrosion is not a simple function of the percentage of cobalt content. In general, the corrosion of the alloys formed by the addition of 3 per cent. of cobalt to American ingot iron, is about 75 per cent. as great as that of the alloys formed by the addition of 0.5 per cent. cobalt.

Alloys formed by the addition of 0.25 per cent. to 3.0 per cent. cobalt to American ingot iron, with very little if any, carbon content, are corroded in the atmosphere to an extent varying between 50 per cent. and 75 per cent of that of the pure American ingot iron, from which the alloys were prepared.

FELDSPAR IN CANADA.

The Mines Branch, Ottawa, has just published a report by Hugh S. de Schmid on "Feldspar in Canada."

Mr. de Schmid says in part: "At the present time deposits situated more than a few miles from a railway cannot be worked profitably. Even where favorably located close to a rail point, the cost of freight to the New Jersey or Ohio potteries is sufficient to render development of all but the adjacent Ontario deposits a doubtful undertaking."

"As regards the possibility of extracting the potash content of feldspar, the most that can be said at this time, is that several processes have been evolved which are reported to have given satisfactory results. It still remains questionable, however, whether any of the methods proposed can successfully be employed on a commercial scale at a time of normal prices for potash salts."

Some of the best feldspar mined in America is that shipped from Frontenac Co., Ontario. The chief producer is Feldspars Limited.

PERSONAL AND GENERAL

Mr. F. P. Burrall is now managing the Boyle properties in the Yukon.

Mr. Philip N. Moore of St. Louis, Mo., has been elected president of the A.I.M.E. Dr. W. G. Miller of Toronto has been again elected a director.

Mr. C. D. Kaeding, general manager of the Dome Mines, is in Nevada.

Mr. Arthur Rigby has joined the staff of Feldspars Limited, and is now with manager Ralph Scott at the mine at Hartington, Ont.

Mr. Geo. Rogers has returned to Toronto from West Shining Tree district, where he recently acquired gold properties.

Mr. J. B. Tyrrell has returned to Toronto from Manitoba after examining a gold property in the Rice Lake district.

Lieut. J. G. McMillan, who was mine inspector at Cobalt when he joined the army last year, has been awarded the Military Cross for conspicuous bravery.

Mr. M. W. Hotchkin has been appointed consulting engineer for the Miller Independence mining company, Boston Creek.

Mr. J. P. Bickell of Toronto, has been elected president of McIntyre Porcupine Mines Limited.

Mr. S. R. Wickett has been elected president of Trethewey Silver Mines, Limited, succeeding the late A. M. Hay.

Mr. Geo. Mackenzie, Chief of the Division of Ore Dressing and Metallurgy, Mines Branch, Ottawa, addressed the Toronto Branch of the Canadian Mining Institute at a luncheon meeting of the branch on Saturday, Feb. 17. In the evening he addressed the Royal Canadian Institute.

Mr. J. H. Black, general manager of the Northern Canada Power Co., has been appointed managing director of the Excelsior Life Assurance Co.

Among those who attended the New York meeting of the American Institute of Mining Engineers last week were the following members from Toronto: Dr. W. G. Miller, J. B. Tyrrell, E. P. Mathewson, Fred Brule, Geo. Guess and R. E. Hore.

Dr. A. W. G. Wilson, of the Mines Branch, Ottawa, H. Mortimer-Lamb of Montreal, Charles Spearman of Mt. St. Patrick, Ont.; J. C. Nichols of Copper Cliff and F. P. Burrall of Dawson City attended the New York meeting of the American Institute of Mining Engineers last week.

Col. W. Stevenson, of Seattle, Washington, formerly of Alaska, and Mr. H. Hanson, of San Franisco, California, representing the recent purchasers of the Tyee Copper Co's smeltery at Ladysmith, Vancouver island, B. C., early in February visited the works, at which Mr. W. J. Watson, general manager, is making important alterations and additions to the plant and ore reduction facilities generally.

Mr. Raleigh P. Trimble, of Portland, Oregon, recently returned from that city to Omineca mining division of British Columbia, where for some years he has been engaged in developing mining properties.

At the postponed annual meeting of the Western Coal Operators' Association, held at Calgary, Alberta, on February 9, Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was elected president; Mr. O. E. S. Whiteside of Coleman, Alberta, general manager for the International Coal and Coke Co., Ltd., vice-president, and Mr. W. F. McNeill, of Calgary, secretary-treasurer (re-elected). The association includes all the larger coal-mine operators in Alberta and the neighboring Crowsnest district of British Columbia.

Lieut. J. W. Bryant, of Company 258, Royal Engineers, B. E. F., formerly mine superintendent for the Tyee Copper Co., in British Columbia, is now at Orama, Egypt.

Major. J. R. Roaf, for years on the engineering staff of the Crow's Nest Pass Coal Co., and at the time of the outbreak of the present War, manager of the Pacific Coast Coal Mines Co's colliery at South Wellington, Vancouver Island, B.C., recently registered at office in London, England, of the Agent-General for British Columbia.

Mr. John F. Miller, before leaving Trail, B.C., for Australia last month, was entertained at a valedictory banquet by the officials and Trail staff of the Consolidated Mining and Smelting Co.; who presented him with a fine Old English solid silver tea service and tray. Numbers of old friends and fellow-employees at the company's electrolytic lead refinery and smelting works also made him a presentation, consisting of an illuminated address and a gold watch.

Mr. J. R. Lockard, of Cumberland, Vancouver island, B.C., has resigned as general manager for the Canadian Collieries (Dunsmuir) Limited, operating the Comox and Extension collieries, both on Vancouver island.

McINTYRE.

According to the official figures, McIntyre milled 14,317 tons of ore and produced $145,297 in January. The average grade of ore was $10.60 per ton. The average monthly production during October, November and December was $118,764, while the average grade of ore milled was $10.60; average tonnage treated was 13,123 tons.

McIntyre during 1916 milled 132,879 tons ore. The production was $1,033,699, and the operating profit was $564,264.

COSTS AT THE HOLLINGER.

Manager P. A. Robbins says in his report for 1916: "In comparing our working costs of 1916 with those of 1915 shareholders will no doubt be struck by the fact that there is not much difference. Total costs in 1916 were $4.03 per ton, as against $3.98 in 1915. Excluding taxes and depreciation the costs were $3.54 per ton in 1906, as against $3.41 per ton in 1915, a rise of 13 cents per ton. The explanation of the smallness of the difference lies in the fact that the advantages due to consolidating the different properties have led to economies which have offset to a large extent the additional expense due to increased costs of supplies and inefficient labor. When normal conditions are again restored we shall no doubt show a reduction in working costs of from 40c to 50c per ton below present figures." Mr. Robbins shows that the purchase of ten tube mills and one hundred stamps, which in 1914 would have represented an outlay of $59,115, in 1916 actually cost $93,045, an increase of $33,390. The "landed" cost of these items does not represent the entire expenditure of the company, for the import duties increased from $11,699 to $21,861, the increase being $10,161.

"Thus it is evident that we are paying a very heavy war tax indirectly," writes the Managing Director, "for in operations alone we used approximately $800,000 worth of supplies and over $400,000 more in construction work."

SPECIAL CORRESPONDENCE

COBALT.

Buffalo.

The new Callow Oil Flotation plant at the Buffalo mine is now treating 400 tons of ore daily. 300 tons of this is coming from the huge sand pile which was considered as waste up to the time of installing the oil flotation. One hundred tons is ore being taken from the underground workings of the mine, which are said to be looking better now than for some time past. The recovery from the present process is the best ever obtained at the plant and the loss is said to be less than one ounce per ton. A Holt-Dern furnace will be installed, which will permit of material changes in the refining resulting in a considerable decrease in costs of production in this department. The Buffalo is taking advantage of every step made by science to get for its shareholders all the benefits of the wonderful property which they possess.

Lorrain.

The shaft at the Lorrain Consolidated is now down a depth of 263 feet and a cross-cut has been run about eighty feet east. It was thought that the Keewatin was only 250 feet deep on the property, however, when the shaft reached this depth and drifting was commenced the Keewatin was found to be a good deal deeper to the east of the shaft. The management therefore decidedto crosscut in the opposite direction to explore the ground at this depth and are now working in the diabase formation at the 263 foot level. To explore their property to the east of the shaft, it will be necessary to sink to deeper levels. The company are using the plant of the Haileybury Frontier Mining Company.

Crown Reserve.

The Crown Reserve Mining Company discovered a new vein containing four inches of good grade silver and about two feet of mill rock at the 700-foot level. A surprising feature of this discovery is that it was made in the Keewatin formation and fully six hundred feet from the diabase contact. This discovery is considered to be very important, and will probably mean much to the future of the Crown Reserve, which, according to the annual report of the mine manager, was pretty well worked out.

McKinley.

The new ball mill to replace the fifty stamps at present in use is being installed at the McKinley-Darragh. This change in the treatment of the ore from this mine is expected to show a considerable saving in milling costs and also to lead to a better recovery. The McKinley-Darragh installed the oil flotation process last July, putting in a hundred ton plant which has been running smoothly since that time. A year ago it was generally supposed that the McKinley-Darragh was about worked out as it was generally understood that the Keewatin came in on this property at the 250 foot level. Developments, however have shown that the conglomerate takes a sharp dip on the property and was found to continue to the 400-ft. level and this working is still in the silver bearing formation, and the company have met with very gratifying results at this depth. A raise from the 400-foot to the 250-foot level has been completed and the timbering of the shaft has commenced. When this is completed the ore from the lowest working of the mine will be hoisted direct. The McKinley-Darragh should have many years' ore reserves ahead of her and with the improved system of treating these reserves a big future is still in store for this Cobalt property.

O'Brien.

The O'Brien Mine at Cobalt is said to have four years' ore reserves in sight at the present time and to be producing at the rate of one million ounces per annum. It is very likely that further ore bodies will be encountered during the period allowed for working out that which is already known to exist on the property. The O'Brien Mine is privately owned by Mr. M. J. O'Brien of Renfrew, and is one of the oldest in the Cobalt district. That there is still four years' ore supply ahead of the company after almost thirteen years of life, demonstrates the great future that may possibly be in store for other mines in the district.

Nipissing.

The Nipissing Mining Company's production during the month of January was below the average for the balance of the year, owing to the fact that there was a shut-down to allow for the annual "clean-up" and a number of changes and alterations and repairs to the equipment. The ore mined during the month was estimated at $137.988, and the shipments of Nipissing and customs ore had a value of $301,692. The high grade mill treated 66 tons and shipped 398.343 ounces of fine bullion, and the low grade mill treated 4.068 tons of ore. The following is an estimate of the production for the month of January:—

Washing Plant	$83.986
Low Grade Mill	90.002
Total	$173,988

Kirkland Lake.

The new transmission line to furnish power to the Kirkland Lake district is now completed and the trial tests were made this week. Power will be turned on permanently early next week. The plant has a capacity of 5,000 horse power, which will be sufficient for the needs of the district for some time to come. The line passes through the much talked of Boston Creek district and no doubt a good many of the properties developing in this section will avail themselves of the benefits of electric power. Recent developments in the Kirkland Lake camp indicate that the Northern Ontario Light and Power Co., have not entered the district blindly as there are at least four proven mines in the camp and a number of promising prospects which have been developing at a disadvantage awaiting the turning on of the much needed electric energy. Now that this power is available much more rapid developments are looked for from this section of the north country.

The estimated cost of the power plant to the Northern Ontario Light and Power Co., is said to be in

the neighborhood of $300,000. Some delay was caused by the slowness in delivery of parts, but considering the distance covered is sixty miles and the difficulties met with in construction work in this country, the company have made good time in the installation of the plant. Much praise is due this enterprising concern for their pioneer work in the north country.

Beaver.

Developments on the two veins discovered at the 1,600 foot level of the Beaver mine recently are proving highly satisfactory. The two veins are running parallel and carry 1,500 and 2,000 ounce ore. There is seven feet between the two veins and this is of a very high grade milling ore. It is said that the company are preparing the shipment of a car-load of ore from the new discovery.

Gowganda.

It is understood that the Miller Lake O'Brien mine will soon enter the class of weekly shippers. This mine is located at Gowganda, and has been operating for a number of years with varying results. Last August a three foot vein of high grade silver was encountered at the 250 foot level. Further development work has been accomplished since that time and the shaft is now down to the 350 foot level and there is said to be no material change in the formation of the vein. Some of the ore runs as high as ten thousand ounces to the ton. Owing to the success attained on this property there are a number of prospects in the district which will be actively worked during the coming spring and summer. Owing to the fact that the Miller Lake-O'Brien is a closed corporation the activities of the company have not been heard much of. Lack of transportation facilities has discouraged development work in this district, and it is hoped some steps will be taken in the near future to improve this condition, and give the Gowganda Camp the opportunity to make good that recent developments warrant.

A popular method of traveling in Porcupine in winter. Driver is Mr. H. Darling, manager Dome Lake Mine.

Dome Lake.

The annual report of the Dome Lake Mining Company proved a very disappointing one for the shareholders. According to the report of Mr. Harry W. Darling, the ore reserves and results of development were greatly exaggerated in the previous reports on the property, and he was very pessimistic as to the future. The mill was said to have a capacity of 200 tons per day and it was stated by the present manager that the cyanide equipment would only handle from 80 to 100 tons. A six foot by 22-inch Hardinge Mill was installed and many other additions and alterations made to the plant which cost $22,133.22. The next returns from bullion shipped was $18,267.09. The milling costs were $14,345.43. Underground development work cost the company $72,101.67. Ore breaking charges amounted to $25,429.93. The management of the mine is now under the direction of Mr. Harry W. Darling, who will issue a report in the near future as to the outlook of the property.

South Bay.

The South Bay Mines company has commenced the erection of a power plant at Hangingstone Falls, about five miles from Gowganda. The plant will provide the district with 1,500 horse power. A considerable quantity of the energy generated will be used in the development of the company's own properties at this point. The intention is to install the plant in three units of 500 horse power each. The main scheme consists of placing a dam at Hangingstone Falls and diverting water from the east branch of the Montreal river through a tunnel to the Hangingstone Creek, a distance of 6,500 feet. Contracts have been let with a Haileybury firm for the construction of a dam before the spring freshet to develop 500 horse power for immediate use in completing the work. The project is said to involve the expenditure of approximately $300,000. Philadelphia and Buffalo interests are supplying the capital for the venture.

TORONTO MARKETS.

Cobalt oxide, black, $1.05 per lb.

Cobalt oxide, grey, $1.15 per lb.

Cobalt metal, $1.25 to $1.50 per lb.

Cobalt anodes, $1.50 to $1.75 per lb.

Nickel metal, 45 to 50 cents per lb.

White arsenic, 5½ to 6 cents per lb.

Feb. 19, 1917—(Quotations from Canada Metal Co., Toronto)—

Spelter, 13½ cents per lb.

Lead 12¾ cents per lb.

Tin, 60 cents per lb.

Antimony, 35 cents per lb.

Copper, casting, 36½ cents per lb.

Electrolytic, 38 cents per lb.

Ingot brass, yellow, 23 cents; red, 25½ cents per lb.

Feb. 22—(Quotations from Elias Rogers Co., Toronto)—

Coal, anthracite, $9.50 per ton.

Coal, bituminous, nominal, $10 to $14 per ton.

SILVER PRICES.

		New York. cents.	London. pence.
February	6	77	37 7/16
"	7	77⅛	37½
"	8	77¼	37 9/16
"	9	77⅜	37⅝
"	14	78⅝	38¼
"	15	78⅝	38¼
"	16	78⅝	38¼

MARKETS

NEW YORK MARKETS.

Connellsville coke—
Furnace, spot, $11 to $12.
Contract (nominal), $6 to $8.50.
Foundry, spot, $12 to $13.
Contract (nominal), $8 to $8.50.
Straits Tin, spot f.o.b. nominal, 50.00 cents.
Copper—
Prime Lake, nominal, 34.00 to 35.00 cents.
Electrolytic nominal, 35.00 to 36.50 cents.
Casting, nominal, 32.50 to 33.50 cents.
Lead, Trust price, 8.50 cents.
Lead, outside, 10.00 to 10.25 cents.
Spelter, prompt western shipment, nominal, 10.42½ to 10.67½ cents.
Antimony—Chinese and Japanese, 29.00 to 30.00 cents.
Aluminum—nominal—
No. 1 Virgin, 98-99 per cent., 57.00 to 59.00 cents.
Pure, 98-99 per cent. remelt., 51.00 to 53.00 cents.
No. 12 alloy remelt, 37.00 to 39.00 cents.
Powdered aluminum, 85.00 to 90.00 cents.
Metallic magnesium—99 per cent. plus, $3.00 to $3.50.
Nickel—shot and ingot, 45.00 cents.
Electrolytic, 50.00 cents.
Cadmium, nominal, $1.45 to $1.50.
Quicksilver, $140.00.
Platinum—
Pure, $105.00.
10 per cent. Iridium, $110.00.
Cobalt (metallic), $1.50.
Tungsten ore per unit, $17.00 to $17.50.
Silver (official), 78⅝ cents.

Metal Products—Following quotations represent mill prices and are strictly nominal except in the case of lead sheets and sheet zinc:

Sheet Copper—
Hot rolled, 42.00 cents.
Cold rolled, 43.00 cents.
Copper bottoms, 50.00 cents.
Copper in rods (round), 41.00 cents.
Square and rectangular, 42.00 cents.
Copper wire, nominal, 41.00 to 42.00 cents.
Copper wire, April, May, 39.00 to 40.00 cents.
High brass—
Sheets, 39.00 to 40.00 cents.
Wire and light rods, 40.00 cents.
Heavy rods, 38.00 to 39.00 cents.
Low Brass—sheet wire and rods, 42.00 cents.
Tubing—
Brazed bronze, 51.00 to 52.00 cents.
Brazed brass, 48.00 to 49.00 cents.
Seamless copper, 45.00 to 46.00 cents.
Seamless brass, 43.00 to 45.00 cents.
Seamless bronze, 52.00 cents.
Full lead sheets, 9.75 to 10.25 cents.
Full lead sheets, 10.00 to 10.50 cents.
Sheet zinc, f.o.b. smelter, 21.00 cents.

STOCK QUOTATIONS.

(By courtesy of J. P. Bickell & Co., Toronto.)

As of close February 22, 1917

New York Curb.

	Bid.	Asked.
Boston and Montana	1.65	1.75
Canada Copper	1.75	1.87
Dome Extension	.30	.31
Hargreaves	.20	.21
International Petroleum	12.25	12.50
Kerr Lake	4.75	5.00
La Rose Con.	.50	.56¼
McIntyre	1.81	1.93
N. America Pulp & Paper	7.37	7.62
Nipissing	8.00	8.25
Superstition	.42	.45
Temiskaming	.59	.61
Thompson-Krist	.20 bid	
Tommy Burns	.23	.30
Vipond	No market	
Victoria Oil	1.06	1.18

Porcupine Stocks.

	Bid.	Asked.
Apex	.10¾	.11
Davidson	.84½	.85
Dome Extension	.28½	.29
Dome Lake	.29	.30
Dome Mines	19.50	20.50
Gold Reef	.02½	.03½
Hollinger Con.	5.25	5.30
Inspiration	.12	.13
Jupiter	.30	.32
Lally Gold Mines	.02	....
McIntyre	1.85	1.86
Moneta	....	.12½
Newray	1.16	....
Porcupine Crown	.65	.66½
Porcupine Imperial	.03⅝	.03⅞
Porcupine Tisdale	.02⅝	.03
Vipond	.47	.47½
Preston E. D.	.05⅞	.06
Schumacher	....	.69
Teck-Hughes	.70	.74
West Dome	.29½	.30
Boston Creek Mines	1.25	1.26
Kentucky Silver	.21	.25
Vacuum Gas & Oil	.35	.38

Cobalt Stocks.

	Bid.	Asked.
Adanac	.28	.30
Bailey	....	.07
Beaver Con.	.47¼	.48
Chambers-Ferland	.15	.15½
Coniagas	....	4.20
Crown Reserve	.36	.37
Foster	.03	....
Gifford	.04¼	.04¾
Great Northern	.13¾	.14
Hargreaves	.20½	.20¾
Hudson Bay	....	48.00
La Rose	.50	.57
Lorrain Con.	.30	.50
McKinley-Dar.-Sav.	.52	.54½
Nipissing	7.80	8.30
Ophir	.09	.10
Peterson Lake	.11	.11½
Right of Way	.04½	....
Rochester Mines	....	.04
Silver Leaf	.02⅜	.02½
Shamrock Cons.	.20½	.21
Temiskaming	.59½	.60
Wettlaufer	.09½	.11
York, Ont.	.02¼	.02¾

The Canadian Miners' Buying Directory.

Air Hoists—
Canadian Ingersoll-Rand Co., Ltd.

Amalgamators—
Fraser & Chalmers of Canada, Limited.
Northern Canada Supply Co.

Antimony
Canada Metal Co., Ltd.

Assayers and Chemists—
Milton L. Hersey Co., Ltd.
Campbell & Deyell, Cobalt
Ledoux & Co., 99 John St., New York
Thos. Heys & Son.
C. L. Constant Co.

Assayers' and Chemists Supplies—
C. L. Berger & Sons, 37 William St., Boston, Mass.
Lymans, Ltd., Montreal, Que
Stanley, W. F. & Co., Ltd

Babbitt Metals
Canada Metal Co., Ltd.
Can. Fairbanks-Morse Co.

Ball Mills—
Fraser & Chalmers of Canada, Limited.
Hull Iron & Steel Foundries, Ltd.

Belting—Leather, Rubber and Cotton—
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.
Jones & Glassco

Blasting Batteries and Supplies—
Can. Ingersoll-Rand Co., Ltd.
Curtis & Harvey (Canada) Ltd.
Northern Canada Supply Co.
Canadian Explosives, Limited

Blowers—
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited.
Northern Canada Supply Co.

Boilers—
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited.
Northern Canada Supply Co.
Can. Ingersoll-Rand Co., Ltd

Boxes, Cable Junction—
Standard Underground Cable Co. of Can., Ltd.

Buckets—
Can. Fairbanks-Morse Co.
Hendrick Mfg. Co
M. Beatty & Sons Ltd.
Northern Canada Supply Co.

Cable — Aerial and Underground—
Fraser & Chalmers of Canada, Ltd.
Northern Canada Supply Co.
Standard Underground Cable Co. of Can., Ltd.

Cableways—
Fraser & Chalmers of Canada, Limited.
M. Beatty & Sons, Ltd.

Cages—
Fraser & Chalmers of Canada, Limited.
Jeffrey Mfg. Co.
Northern Canada Supply Co.

Cables—Wire—
Standard Underground Cable Co. of Canada, Ltd.

Car Dumps—
Sullivan Machinery Co.

Cars—
Can. Fairbanks-Morse Co.
W. Fraser.
Jeffrey Mfg. Co.
Northern Canada Supply Co.

Cement Machinery—
Northern Canada Supply Co.
Hull Iron & Steel Foundries, Ltd.

Chains—
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Jones & Glassco
Northern Canada Supply Co.
B. Greening Wire Co., Ltd.

Chemists
Canadian Laboratories.
Campbell & Deyell.
Thos Heys & Sons.
Milton Hersey Co.
Ledoux & Co.

Coal—
Dominion Coal Co.
Nova Scotia Steel & Coal Co.

Coal Cutters—
Jeffrey Mfg. Co.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

Coal Dock Bridges—
Roberts & Schaefer Co.

Coal Mining Explosives—
Curtis & Harvey (Can.), Ltd.
Canadian Explosives, Limited

Coal Mining Machinery—
Can. Ingersoll-Rand Co., Ltd.
Fraser & Chalmers of Canada, Limited.
Jeffrey Mfg. Co.
Roberts & Schaefer Co.
Sullivan Machinery Co.

Coal Pick Machines—
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.

Coal Washeries—
Jeffrey Mfg. Co.
Roberts & Schaefer Co.

Coaling Stations—
Roberts & Schaefer Co.

Compressors—Air—
Can. Fairbanks-Morse Co.
Darling Bros., Ltd.
Escher Wyss & Co.
W. Fraser.
Smart-Turner Machine Co.
Fraser & Chalmers of Canada, Limited.
Sullivan Machinery Co.
Can. Ingersoll-Rand Co., Ltd.
Northern Canada Supply Co.

Concentrators and Jigs—
Fraser & Chalmers of Canada, Limited.

Concrete Mixers—
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.
Wettlaufer Bros.

Condensers—
Fraser & Chalmers of Canada, Limited.
Smart-Turner Machine Co.
Northern Canada Supply Co.

Converters—
Fraser & Chalmers of Canada, Limited.
Jeffrey Mfg. Co.
Northern Canada Supply Co.

Conveyor—Trough—Belt—
Can. Fairbanks-Morse Co.
Jeffrey Mfg. Co.
Hendrick Mfg. Co.

Cranes—
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
M. Beatty & Sons, Ltd.

Crane Ropes—
Allan, Whyte & Co.
B. Greening Wire Co., Ltd.

Grinding Plates—
Hull Iron & Steel Foundries, Ltd.

Crushers—
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited.
Lymans, Ltd
Jeffrey Mfg. Co.
Mussens, Limited.
Hull Iron & Steel Foundries, Ltd.
Wettlaufer Bros.

Cyanide Plants—
Fraser & Chalmers of Canada, Limited.
Roessler & Hasslacher.

Derricks—
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
S. Flory Mfg. Co.
M. Beatty & Sons, Ltd.

Diamond Drill Contractors—
Diamond Drill Contracting Co.
Smith and Travers.
Sullivan Machinery Co.

Dredger Pins—
Armstrong, Whitworth of Can., Ltd.

Dredging Machinery—
M. Beatty & Sons.

Dredging Ropes—
Allan, Whyte & Co.
Fraser & Chalmers of Canada, Limited.

Drills, Air and Hammer—
Can. Ingersoll-Rand Co., Ltd
Jeffrey Mfg Co.
Sullivan Machinery Co.
Northern Canada Supply Co.

Drills—Core—
Can. Ingersoll-Rand Co., Ltd
Standard Diamond Drill Co.
Sullivan Machinery Co.

Drills—Diamond—
Sullivan Machinery Co.
Northern Canada Supply Co.

Drill Steel—Mining—
Armstrong, Whitworth of Can., Ltd.

Drill Steel Sharpeners—
Can. Ingersoll-Rand Co., Ltd
Northern Canada Supply Co.
Sullivan Maclinery Co.

Drills—Electric—
Can. Ingersoll-Rand Co., Ltd.
Sullivan Machinery Co.

Drills—High Speed and Carbon—
Armstrong, Whitworth of Can., Ltd.
Can. Fairbanks-Morse Co.

Dynamite—
Curtis & Harvey (Canada). Ltd.
Canadian Explosives.
Northern Canada Supply Co.

Ejectors—
Can. Fairbanks-Morse Co.
Darling Bros., Ltd.
Can. Ingersoll-Rand Co., Ltd
Northern Canada Supply Co.

Elevators—
Darling Bros., Ltd.
Jeffrey Mfg. Co.
M. Beatty & Sons.
Sullivan Machinery Co.
Northern Canada Supply Co
Wettlaufer Bros.

Engineering Instruments—
C. L. Berger & Sons.

Engineers and Contractors—
Fraser & Chalmers of Canada, Limited.
Roberts & Schaefer Co.

Engines—Automatic—
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.

Engines—Gas and Gasoline
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited.
Alex. Fleck.
Sullivan Machinery Co.
Smart-Turner Machine Co.

Engines—Haulage—
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited.
Can. Ingersoll-Rand Co., Ltd

Engines—Marine—
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.

Engines—Steam—
Fraser & Chalmers of Canada, Limited.
Smart-Turner Machine Co.
M. Beatty & Sons.

Fans—Ventilating—
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited.
Jeffrey Mfg. Co.

Feeders—Ore—
Fraser & Chalmers of Canada, Limited.

Flights—
Hendrick Mfg. Co.

Forges—
Can. Fairbanks-Morse Co.
Northern Canada Supply Co., Ltd.

Forging—
M. Beatty & Sons.
Smart-Turner Machine Co.

Furnaces—Assay—
Lymans, Ltd.

Fuse—
Curtis & Harvey (Canada). Ltd.
Canadian Explosives.
Northern Canada Supply Co.

Gears—
Can. Fairbanks-Morse Co.
Smart-Turner Machine Co.
Northern Canada Supply Co.
Hull Iron & Steel Foundries, Ltd.

Hammer Rock Drills—
Mussens, Limited.

Hangers—Cable—
Standard Underground Cable Co. of Canada, Ltd.

Hand Hoists—
Darling Bros., Ltd.
Fraser & Chalmers of Canada, Limited

High Speed Steel—
Armstrong, Whitworth of Can., Ltd.

High Speed Steel Twist Drills—
Northern Canada Supply Co.
Armstrong, Whitworth of Can., Ltd.

Hoists—Air, Electric and Steam—
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd
Jones & Glassco.
M. Beatty & Sons
Fraser & Chalmers of Canada, Limited
Northern Canada Supply Co.
Wettlaufer Bros.

Hoisting Engines—
Can. Fairbanks-Morse Co.
Mussens, Limited.
Sullivan Machinery Co.
Fraser & Chalmers of Canada, Limited
Can. Ingersoll-Rand Co.
M. Beatty & Sons.

Hose—
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

Ingot Copper—
Canada Metal Co., Ltd.

Insulating Compounds—
Standard Underground Cable Co. of Can., Ltd.

Jacks—
Can. Fairbanks-Morse Co.
Can. Ingersoll-Rand Co., Ltd
Northern Canada Supply Co.

Kiln Linings—
Hull Iron & Steel Foundries, Ltd.

Kominuters—
Hull Iron & Steel Foundries, Ltd.

Lamps—Safety—
Canadian Explosives.

Link Belt—
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.
Jones & Glassco.

Locomotives—
W. Fraser.

Machinists and Founders—
Hull Iron & Steel Foundries, Ltd.

Metal Merchants—
Henry Bath & Son.
Geo. G. Blackwell, Sons & Co.
Consolidated Mining and Smelting Co. of Canada.
Canada Metal Co.
C. L. Constant Co.

Monel Metal—
International Nickel Co.

Nickel—
International Nickel Co.

Ore Sacks—
Northern Canada Supply Co

Ore Testing Works
Ledoux & Co.
Can. Laboratories.
Milton Hersey Co., Ltd.
Campbell & Deyell.

Ores and Metals—Buyers and Sellers of—
C. L. Constant Co.
Geo. G. Blackwell.
Consolidated Mining and Smelting Co. of Canada.
Orford Copper Co.
Canada Metal Co.

Perforated Metals—
B. Greening Wire Co., Ltd.
Fraser & Chalmers of Canada, Limited
Northern Canada Supply Co.
Hendrick Mfg. Co.

Pig Tin—
Canada Metal Co., Ltd

Pig Lead—
Canada Metal Co., Ltd.

Pipes—
Can. Fairbanks-Morse Co.
Canada Metal Co., Ltd.
Consolidated M. & S. Co.
Pacific Coast Pipe Co., Ltd.
Northern Canada Supply Co.
Smart-Turner Machine Co.

Pipe Fittings—
Can. Fairbanks-Morse Co.
Northern Canada Supply Co.

Piston Rock Drills—
Mussens, Limited.

Pneumatic Tools—
Can. Ingersoll-Rand Co., Ltd
Jones & Glassco.

Prospecting Mills and Machinery—
Standard Diamond Drill Co.
Fraser & Chalmers of Canada, Limited

Canadian Miners' Buying Directory.—(Continued from page 14.)

Pulleys, Shafting and Hangings—
Can. Fairbanks-Morse Co.
Fraser & Chalmers of Canada, Limited
Jeffrey Mfg. Co.
Northern Canada Supply Co.

Pumps—Boiler Feed—
Can. Fairbanks-Morse Co.
Darling Bros., Ltd.
Smart-Turner Machine Co.
Northern Canada Supply Co.
Canadian Ingersoll-Rand Co. Ltd.
Fraser & Chalmers of Canada, Limited
Wettlaufer Bros.

Pumps—Centrifugal—
Can. Fairbanks-Morse Co.
Darling Bros., Ltd.
Escher Wyss & Co.
Mussens, Limited.
Smart-Turner Machine Co.
M. Beatty & Sons.
Can. Ingersoll-Rand Co., Ltd
Fraser & Chalmers of Canada, Limited

Pumps—Electric—
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1 Rand Class C. straight line, 16″ x 24″, capacity 640 cu. ft.
1 Rand Class C. straight line 14″ x 22″, capacity 410 cu. ft.
1 Rand Class C. straight line 12″ x 18″, capacity 329 cu. ft.

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1 60″ x 14′ for 125 lbs. air pressure.
1 42″ x 10′ for 100 lbs. air pressure.
1 42″ x 7′ for 100 lbs. air pressure.
1 36″ x 12′ for 100 lbs. air pressure.

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4 300-h.p. Sterling Water Tube.
2 125-h.p. Return Tubular.
1 100-h.p. Return Tubular.
2 60-h.p. Return Tubular.
1 150-h.p. Marine Fire Box Type.
1 35-h.p. Locomotive Type.
1 25-h.p. Locomotive Type (New).
1 15-h.p. Locomotive Type (New).
2 12-h.p. Locomotive Type (New).
1 10-h.p. Locomotive Type (New).
1 20-h.p. Vertical Type.
2 12-h.p. Vertical Type.

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4 14-cu. ft. Side and End Dump.
4 14-cu. ft. Mine Cars.
90 1-cu. yd. Petlor Cars.
60 4-cu. yd. Western Dumps.

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1 Kennedy No. 3 Gyratory (New).
1 Gates No. 2 Gyratory (Nearly New).
3 McCully No. 4 Gyratory.
1 Chempion No. 5 Jaw.
1 Blake 7 x 10 Jaw.

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2 Rand No. 63¼ Piston Drills.
6 Rand No. 44 Piston Drills.
1 Burrell No. 847 Piston Drill.
2 Ingersoll Eclipse Piston Drills.
1 Air Boring Drill Class 1d.

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12 Tripods for above drills.
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6 Shaft Bars, with arm and clamp.

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10,800 lbs., made up 1⅛″ and 1¼″, solid lengths 2′ to 12′.
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2 400-h.p., same as above type, direct connected to generators built by Swedish General Electric, complete with switchboard.
1 150-h.p. Bessemer Gas Engine.
1 75-h.p. Bessemer Gas Engine.

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1 6 x 8 Double Cylinder Single Friction Drum (Lidgerwood).
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1 10 x 16 Double Cylinder, reversible link motion, geared direct to drum 48″ x 66″ long, no friction or brake.
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1 Duplex 6 x 4 x 6.
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1 Duplex 5 x 3 x 5 Pot Valve.
1 Cameron No. 5.
6 Single 10 x 6 x 12, suction 4″, discharge 3″.

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Aggregate Value of $516,270,253

The substantial progress of the Mining Industry of this Province is strikingly exhibited in the following figures, which show the value of production for successive five-year periods: For all years to 1894, inclusive, $88,904,199; for five years, 1894-1899, $46,906,258; for five years, 1899-1904, $90,391,394; for five years 1904-1909, $121,618,733; for five years, 1909-1914, $139,002,161, for the year 1915, $29,447,508.

Production During last ten years, $267,607,077

Lode-mining has only been in progress for about twenty years, and not 20 per cent. of the Province has been even prospected; 300,000 square miles of unexplored mineral bearing land are open for prospecting.

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The holder of the certificate may stake mining claims to the extent of 200 acres.

WORKING CONDITIONS. During the first six months following the staking of the claim, work on it must be performed to the extent of at least twenty-five days of eight hours.

SIX MONTHS AFTER STAKING. At the expiration of six months from date of the staking, the prospector, to retain his rights, must take out a mining license.

MINING LICENSE. The mining license may cover 40 to 200 acres in unsurveyed territory. The price of this license is Fifty Cents an acre per year, and a fee of $10.00 on issue. It is valid for one year and is renewable on the same terms, on producing an affidavit that during the year work has been performed to the extent of at least twenty-five days labour on each forty acres.

MINING CONCESSION. Notwithstanding the above, a mining concession may be acquired at any time at the rate of $5 an acre for SUPERIOR METALS, and $3 an acre for INFERIOR MINERALS.

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The Copper Smelting Industry of Canada. Report on, by A. W. G. Wilson, Ph.D.

Building and Ornamental Stones of Canada (Quebec). Vol. III. Report on, by W. A. Parks, Ph.D.

The Bituminous Sands of Northern Alberta. Report on, by S. C. Ells, M.E.

Peat, Lignite and Coal: their value as fuels for the production of gas and power in the by-product, recovery producer. Report on, by B. F. Haanel, B.Sc.

Annual Report of the Mineral Production of Canada During the Calendar Year 1914 by John McLeish, B.A.

The Petroleum and Natural Gas Resources of Canada: Vols. I. and II., by F. G. Clapp, M.A., and others.

The Salt Industry of Canada. Report on, by L. H. Cole, B.Sc.

Electro-plating with Cobalt. Report on, by H. T. Kalmus, Ph.D.

Electro-thermic Smelting of Iron Ores in Sweden. Report on, by A. Stansfield, D.Sc.

Non-metallic Minerals Used in Canadian Manufacturing Industries. Report on, by H. Frechette, M.Sc.

The Mines Branch maintains the following laboratories in which investigations are made with a view to assisting in the development of the general mining industries of Canada:—

Fuel Testing Laboratory.—Testing value of Canadian fuels for steam raising and production of power gas; analyses, and other chemical and physical examinations of solid, liquid and gaseous fuels are also made.

Ore-Dressing Laboratory.—Testing of Canadian ores and minerals, to ascertain most economical methods of treatment.

Chemical Laboratory.—Analysing and assaying of all mineral substances and their manufactured products. Copies of schedules of fees, which are slightly in excess of those charged by private practitioners, may be had on application.

Ceramic Laboratory—Equipment is such that complete physical tests on clays and shale of the Dominion can be made, to determine their value from an economic standpoint.

Structural Materials Laboratory.—Experimental work on sands, cements and limes is also undertaken.

Applications for reports and particulars relative to having investigations made in the several laboratories should be addressed to **The Director, Mines Branch, Department of Mines, Ottawa.**

GEOLOGICAL SURVEY

Recent Publications

Memoir 57. Corundum, its Occurrence, Distribution, Exploitation and Uses, by A. E. Barlow.

Memoir 64. Preliminary Report on the Clay and Shale Deposits of the Province of Quebec, by J. Keele.

Memoir 69. Coal Fields of British Columbia, by D. B. Dowling.

Memoir 74. A List of Canadian Mineral Occurrences, by Robert A. A. Johnston.

Memoir 76. Geology of the Cranbrook Map-area, British Columbia, by S. J. Schofield.

Memoir 77. Geology and Ore Deposits of Rossland, British Columbia, by C. W. Drysdale.

Memoir 81. The Oil and Gas Fields of Ontario and Quebe, by W. Malcolm.

Memoir 82. Rainy River District of Ontario. Surficial Geology and Soils, by W. A. Johnston.

Memoir 84. An Exploration of the Tazin and Taltson Rivers, Northwest Territory, by Charles Camsell.

Memoir 85. Road Material Surveys in 1914, by L. Reinecke.

Memoir 87. Geology of a Portion of the Flathead Coal Area, British Columbia, by J. D. Mackenzie.

Memoir 88. Geology of Graham Island, British Columbia, by J. D. Mackenzie.

Memoir 89. Wood Mountain-Willowbunch Coal Area, Saskatchewan, by Bruce Rose.
Ontario. Topography.

Map 59A. Wheaton, Yukon Territory.

Map 66A. Brechin Sheet, Ontario and Victoria Counties,

Map 150A. Ponhook Lake Sheet, Nova Scotia.

Map 153A. Asquith and Churchill Townships, Sudbury District, Ontario.

Map 158A. Nanaimo Sheet, Vancouver Island, British Columbia.

Map 175A. Ymir, Kootenay, British Columbia.

Map 181A. Wood Mountain-Willowbunch Coal Areas, Saskatchewan.

Applicants for publications not listed above should mention the precise area concerning which information is desired.

Maps published within recent years may be had, printed on linen, at the nominal cost of ten cents each.

The Geological Survey will, under certain limitations, give information and advice upon subjects relating to general and economic geology. Mineral and rock specimens, when accompanied by definite statements of localities, will be examined and their nature reported upon.

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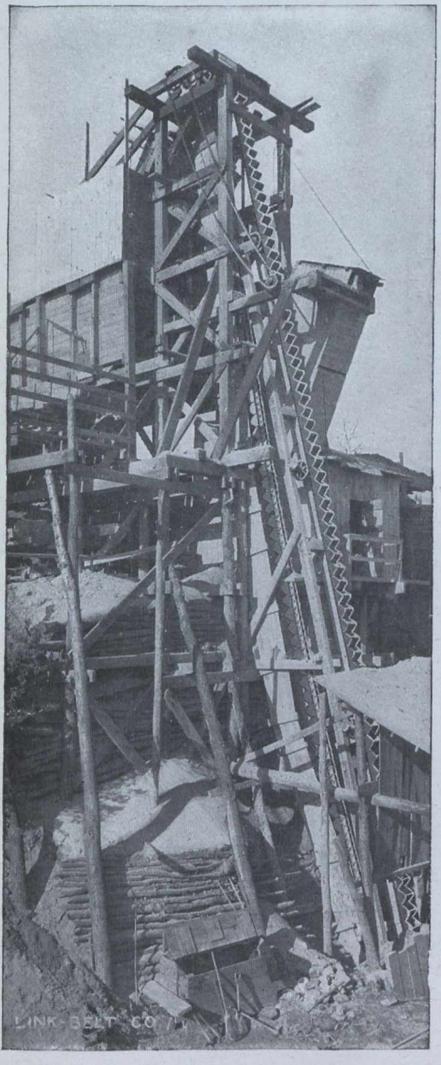

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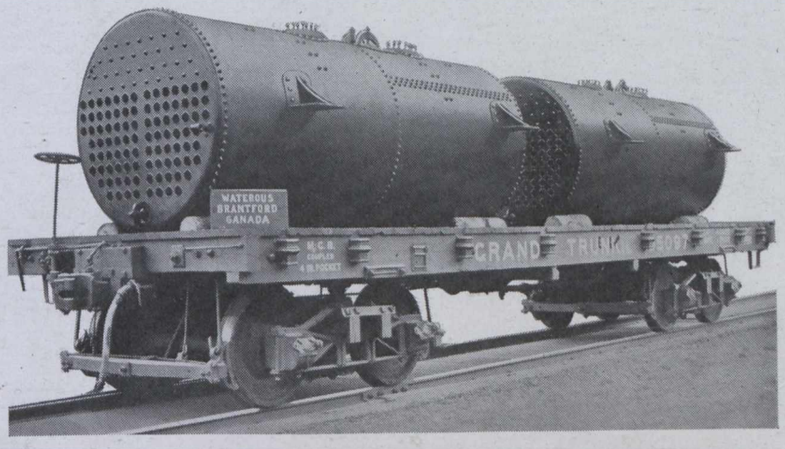

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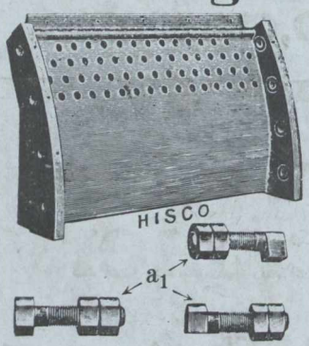

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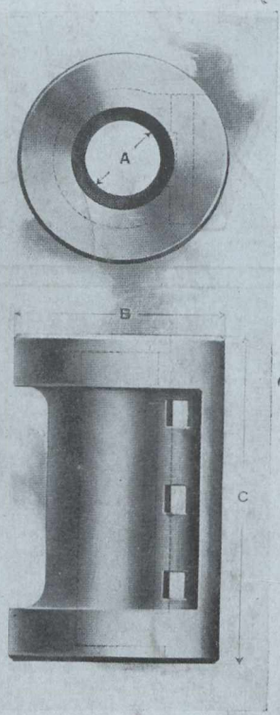

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