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REGINALD E. HORE

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RAILWAYS AND MINING

In the introductory paragraphs of his report to the Temiskaming and Northern Ontario Railway, Mr. A. A. Cole calls attention to the interdependence of railways and mining and to the great part that both have played in the opening up of new districts.

The financial success of the operation of the Ontario Government Railway is directly attributable to the development of the mineral resources at Cobalt, Porcupine and other points in Northern Ontario. On the other hand, the discovery of these mineral deposits and their successful exploitation is directly attributable to the construction of the railway.

The mines along the railway have furnished a good market for supplies of all kinds. Southern Ontario manufacturers and merchants have profited to no small extent by the development of Northern Ontario mines. Gradually also farms have been cleared in the north country. The pioneer farmers were successful primarily because of the railway service and the market furnished by the mines. The railway still depends largely for its business on the mining industry. Other industries are growing, and as new mineral deposits are opened up, a further stimulus will be given to the development of other resources.

In our April 1 issue we published an article by Mr. E. Jacobs on the same subject, with special reference to British Columbia. In this issue will be found extracts from Mr. Cole's report, showing that what is true of British Columbia and Ontario is true of many other districts. Railway construction and mining are largely responsible for the successful development and permanent settlement of places without number.

CONSERVATION OF COAL IN CANADA

The Commission of Conservation has now ready for distribution a very interesting and useful report on Conservation of Coal, written by Mr. W. J. Dick, M.Sc., mining engineer of the Commission. Mr. Dick urges that more care be taken to prevent waste and offers many suggestions which are worthy of careful consideration. Changes in the form of coal mine leases, utilization of slack and low grade coals, manufacture of coal briquettes and comparison of beehive and by-product ovens are among the subjects dealt with.

The subject has been very carefully studied by Mr. Dick and the book contains a fund of information on Canadian coals and mines.

WESTERN FEDERATION STRIKE DECLARED OFF

The strike of copper miners in Michigan, called on July 22, 1913, to take effect on July 23, has been called off. For several months it has been quite evident that the mines could be operated without using members of the Western Federation. Some of the mines had already more men at work than when the strike was called.

It is no credit to the officers of the Federation that they did not acknowledge their defeat sooner. The prolongation of the strike has been mere waste of the resources of the Federation as well as of the mining companies.

On July 23rd and 24th, finding that many of the mine workers paid no attention to the calling of the strike by the district union, bands of strikers violently drove men from their work and threatened them against returning. Men attempting to go to work and deputy sheriffs, who had been sworn in to guard the various properties, were assaulted. Sixteen men employed by one company were seriously injured. The sheriff found himself unable to cope with the situation and appealed to the Governor of the State for the aid of troops in restoring peace. Governor Ferris sent the National Guard, and a semblance of order was restored. Houghton county and some of the companies engaged men from the Waddell-Mahon Corporation to take charge of a force of about 1,700 deputy sheriffs, who were sworn in to protect life and property.

After the arrival of the troops there was little disorder for a few weeks. Then work was resumed in some of the mines and the strikers resumed their violent tactics in an endeavor to prevent the men from going to work. Gradually, however, the number at work increased in spite of the violence and threats of the strikers. It soon became evident that a majority of the miners were not in sympathy with the strike and that it was destined to failure. Few of the members of the Federation, however, deserted their union, doubtless because of the misleading statements published by their leaders. By instilling false hopes in the minds of the strikers and by paying them a few dollars a week, the leaders succeeded in annoying the companies for several months.

Gradually the men began to realize that while the agitators were profiting, they were themselves gaining nothing by hampering the mining companies and the industry which gives them employment. Their places were being filled by less experienced but more willing workmen. So far as the companies were concerned the strike was over months ago.

Finally, on Easter Sunday, a vote was taken and resulted, as expected, in the defeat of those who wished to continue the strike. The men who return to work will be accepted on the same conditions as before the strike, except that they must first sever their connection with the Western Federation. Before the

strike the companies did not discriminate against this organization. Now they do. On the day before the vote was taken there were many strikers at the mine offices asking to be taken back. On Easter Monday there was another rush for places.

Many of the strikers will be given a chance to work again in the Michigan mines. The companies will welcome them back, believing that many of them have acted merely as instruments doing the bidding of socialistic demagogues. The Federation has gained nothing by its alliance with red socialism. The companies have improved their position as a result of the strike, in that they now have a larger number of men than they can find work for. Not for several years has there been such a demand for work at the Michigan copper mines as there is to-day. It should now be possible to greatly increase the efficiency, to increase the production and to retrieve, in part at least, the losses of the period when the Western Federation wasted in Michigan \$1,000,000 of labor union funds in an endeavor to cripple an industry which gives steady employment to over 14,000 men and pays in wages over \$1,000,000 per month.

The mine managers have stated that none of the new men taken on since the strike began will be dismissed to make places for the strikers who are now clamoring for re-employment. The old employes will, however, be given the preference over new applicants for work. Already many have been taken back. Some will never be re-employed under any conditions. Others will be given work as soon as possible.

In this issue we publish an interesting article on Radium and Its Ores, by R. A. A. Johnston, of the Canadian Geological Survey. The offer by the Ontario Government of a reward to the discoverer of radium ore should stimulate the search for this valuable substance.

Minute diamonds have been found by Mr. R. A. A. Johnston in chromium ore discovered by Mr. D. O'Connor, the well-known Northern Ontario prospector. Mr. O'Connor sent samples of the ore from his claims in Reaume township to the Ontario Bureau of Mines, and it was found to contain chromium and a little platinum. Owing to the similarity of the ore to that of the Tulameen district, B.C., in which Mr. Johnston had found diamonds, Dr. Miller submitted specimens to Mr. Johnston for examination. The discovery of the diamonds resulted. The diamonds are very small and of little value; but the discovery is of interest.

The ore sent in by Mr. O'Connor is chiefly valuable for its chromium content. Concerning the size of the deposit we have as yet no accurate information.

Mr. O'Connor has made many important discoveries in Northern Ontario. His latest promises to result in attracting attention to the possibilities of the country traversed by the National Transcontinental Railway.

THE 'TWENTY-SECOND ANNUAL MEETING OF THE MINING SOCIETY OF NOVA SCOTIA

The annual meeting of the Mining Society of Nova Scotia held in Sydney occupied the dates 15th and 16th April, and proved successful beyond the expectations of the most sanguine. The Council in making the arrangements for the meeting thought it wise to limit its duration to two days, but the event proved that a three-days' meeting would have been desirable.

The morning session of Tuesday was taken up by business proceedings, those tiresome but apparently inevitable details that waste valuable time, which most persons would rather see devoted to the reading and discussion of papers.

Electric Motors for Mine Service.

In the afternoon a paper was read by Mr. C. H. Wright, of Halifax, on "The design of electric motors for service in mine operations." This paper was avowedly written to evoke discussion, and it was followed by one of the most animated and technically valuable discussions that the meetings of the Society have ever witnessed. The discussion embraced opinions on the relative merits of alternating and direct current for mining service, and the general opinion was that the choice depended largely upon the size of a colliery plant and the distance over which it was necessary to transmit current. Some interesting opinions were expressed on the subject of variable speed motors for ventilation fans, and here, so far as could be gathered, the concensus of opinion was that variations in the quantity of air required for ventilation could be best obtained by an arrangement of doors in the fan-drift, and that there was not much advantage in the complications of a variable speed-motor.

The number of speakers in the discussion and the interest evoked was evidence of how important a part electricity now plays in coal mining plants in Nova Scotia. Mr. Wright is the representative of the Canadian General Electric Company in Nova Scotia, and had to defend manufacturers of electrical machinery in general against the charge that the manufacturers expected too much from colliery engineers in the matter of specification and design of plants to meet certain conditions. The engineers present urged upon manufacturers the necessity of spending a little money in experiment and research to meet existing conditions, rather than to expect purchasers to do this all by themselves. Mr. Wright ably defended the manufacturer, but the contention of the engineer is not without foundation.

Coal Resources.

Mr. McLeish, the statistician of the Department of Mines, showed a number of statistical graphs illustrating the mineral statistics of Canada. Mr. McLeish also exhibited interesting charts compiled from the monograph on the "Coal Resources of the World," issued in connection with the International Geological Congress of recent date. The outstanding impression obtained from these charts is the predominance of the North American continent in bituminous coal resources, and the fact that the bulk of the anthracite coals of the world is in and around the ancient Empire of China. Mr. McLeish is au fait with all figures relating to minerals in Canada and he was required to make his usual explana-

tions with regard to the method of valuation used by the Department in arriving at the amount of wealth represented by the annual mineral yield of the Dominion. Nova Scotians in the audience were a little astonished at the enormous coal resources of Alberta when compared with those of the Maritime Provinces, and also with the rapid increase in production in that Province. The only consolation to Nova Scotians is that their Province contains the quality, although Alberta apparently has the quantity.

Microscopical Study of Coal.

In the evening a paper was read by Mr. A. J. Tonge, the mining engineer of the Dominion Coal Company, on "Coal, as seen under the microscope." The paper was introductory to a number of microphoto slides, obtained from the paleo-botanical laboratory of Mr. James Lomax, of Wigan, Lancashire, showing magnified sections of representative British coals, colored by hand to represent without exaggeration the actual appearance under the microscope. Mr. Tonge related some of the recent advances made in the microscopical study of coal, and the unique position occupied in this connection by Mr. Lomax, whose work has recently attracted widespread interest in mining circles. The slides were one of the outstanding features of the meeting, and were a revelation to all present of the tremendous possibilities of a science that is but in its infancy. In several of the slides layers of what are supposed to be leaf tissues were distinctly observable, and it has been suggested that these layers represented the successive seasons of the carboniferous forest, and that if it were possible to make a complete section of a coal seam, some idea of the number of seasons that were occupied in the making of the coal seam might be obtained, and an approximation arrived at as to the length of time represented. On some of the spore-cases which were visible in the slides it was explained that certain characteristic and ornamental pittings were to be seen, and it was hoped that by study under high magnification it might be possible to identify some of these "pittings" and perhaps aid in the correlation of seams by their identification and classification. Some of the vistas which are opening up to the scientific imagination through the microscopical study of coal sections lead to conclusions that savour of unbridled theorizing, but these same conclusions may seem commonplace to the next generation.

A few slides of Cape Breton coals were projected on to the screen without much magnification, and among these slides was one which showed a complete spore-case with the spores intact, a specimen stated by Mr. Lomax to be extremely rare, as it is only by chance that such a specimen should occur in the small piece of coal which is selected for the making of a section.

Mr. Tonge's paper was not followed by discussion, really because the hour was late, and other papers were to follow, but also because the feeling of the meeting was one of wonder at the beauty and novelty of the slides, and most of those present felt they required time to assimilate an entirely new idea and point of view.

Accidents in Mines.

Following Mr. Tonge's paper, was one on "Accidents in Mines," by Hon. Robert Drummond, the editor of

the Maritime Mining Record. Mr. Drummond deplored the recent tendency to increase shown by fatalities in Nova Scotian collieries, to reduce which he advocated more stringent enforcement of the existing mining laws. Mr. Drummond's paper was not discussed at length, as it was felt that the strictures it contained were only too deserved so far as the increase in accidents is concerned.

First-Aid Work.

After hearing Mr. Drummond's paper, the meeting removed to the Sydney Casino and witnessed several cinematograph reels lent by the U. S. Bureau of Mines, showing first-aid work, and other matters connected with the "Safety First" movement. The film showing the effects of a coal-dust explosion in the experimental gallery was most convincing, but the other film which showed men wearing oxygen helmets descending a mine slope immediately after an explosion, the slope meanwhile belching great volumes of thick black smoke, was not only unconvincing, but in the opinion of practical men, undesirable, as teaching the public to expect too much of breathing apparatus, and inculcating the belief that men wearing oxygen helmets can go anywhere and do anything. The possibilities of oxygen breathing apparatus in smoke and fumes was well demonstrated by the film showing men wearing apparatus passing into the smoking experimental gallery, but while not wishing to disparage the work of the U. S. Bureau of Mines, who were so kind as to lend these films to the Mining Society without charge, it was the general opinion of the mine managers who saw them that the film above referred to was a little theatrical and misleading.

After the Bureau of Mines films, a number of films were shown illustrating the application of the cinematograph to scientific investigation of motion, these examples being chosen in connection with a paper prepared for the meeting by Mr. Alex. Theurkauf, chief draftsman of the Dominion Steel Company, on "Cinematics as an aid to Science."

This finished the proceedings of the first day, and the meeting adjourned at eleven p.m.

Mine Accidents and Their Causes.

On Wednesday morning the reading of papers connected with questions of mine safety were continued. A paper was read, prepared by Mr. John Casey, the manager of Dominion No. 4 colliery, on "Mine Accidents and Their Causes." Mr. Casey referred to the large number of accidents arising from falls of coal, of roof and sides, to the necessity for systematic timbering, and to the widespread propensity of the miner to "take a chance" and to neglect spragging and timbering, oftentimes leading to his death. Mr. Casey, like Mr. Drummond, advocated more stringent enforcement of the existing regulations, but was afraid that no legislation would cure wilful, or unthinking personal negligence.

Safety First.

Mr. C. J. Coll followed with a paper on "Safety First," in which he traced the historical development of the movement, and pleaded for its extension into the mines of Nova Scotia. It has been the proud boast of Nova Scotia that safety has always been a first consideration in its coal mines, and up till now the Province has not felt the need of bringing about the state of auto-suggestion which the phrase "Safety first" is creating among mine workers in the United States to-day. The obsession of individualism characteristic of the last industrial generation in the States, combined with the tremendous influx of an ignorant and docile labor sup-

ply from poverty-stricken districts of Europe did give rise to a cynical disregard of human life and ordinary ethics that has rendered necessary some such appeal to the psychology of the individual worker and his master as the slogan "Safety first," but the Nova Scotian is diffident about the matter, because he thinks he always did value human life. Possibly, however, the large number of foreign laborers now in Nova Scotia may render it necessary to take mental stock of our position and see if we also are not in danger of drifting into indifference. The general burden of the papers read before the Nova Scotia Mining Society at this meeting would lead one to believe, however, that the Province is fully awake to its responsibilities in this connection.

The Working of Coal Seams.

Mr. Herd, the assistant mining engineer of the Dominion Coal Company, read a paper on "The working of two coal seams which closely approached each other, by the long-wall method." This paper was of a very practical nature and described an actual case which had come under the writer's notice of the working of two coal seams, by the long-wall method, where the coal seams closely approached each other. The paper was an excellent illustration that hard and fast rules regarding the working of the upper seam first, or the lower seam first, could not be laid down, but were influenced by many local factors. Two other papers were prepared on mining by the long-wall method, but the time would not allow of their being read. One paper was by Mr. J. F. K. Brown, president of the Mining Engineering and Supply Company, of Sydney, who described the possibilities of the long-wall method of mining with the employment of face conveyors and coal-cutters, illustrated with actual statistics from the author's own experience. The other long-wall paper was prepared by Mr. John Johnson, of Sydney Mines, to describe the "Working of the Jubilee Pit of the Nova Scotia Steel & Coal Co. by the Long-wall Method." Mr. Johnson was ill and could not attend, and his paper was taken as read owing to lack of time.

Topographical Surveys.

In the afternoon session of Wednesday, Mr. Boyd, of the Dominion Department of Mines, showed a series of slides illustrating the methods used and the difficulties encountered in making topographical surveys of Canada. It is gratifying to know that such exact methods and the results are insisted upon in this important work, and the audience were particularly impressed with the photographs showing the difficulties of surveying mountainous country. Particular interest was attached to the detailed large scale maps which the Department is preparing for the use of engineers in portions of the Dominion where mining operations are extensive. The use of contours was strikingly illustrated by pictures of Turtle Mountain compared with a cardboard model made on the field from contours and sections taken off the published map. A map of the Dominion was shown marked with the districts already surveyed in less or greater detail by the Survey, and although the work done is but small in comparison with the vast area of the Dominion, it has been carried out in the most important districts, and from the information given by Mr. Boyd has been done with a thoroughness that very few persons properly appreciate.

Transportation.

Mr. C. M. Odell, the resident engineer of the Dominion Coal Company, read a paper entitled "Transporta-

tion," which transported his audience, and for which he himself should be transported. Mr. Odell's paper was unique, like himself, and bids fair to become a classic in this vicinity. The paper contended that nations rose and fell as their means of transportation were good or bad, and although its reading evoked continuous laughter, the basic importance of transportation could not have been more forcibly propounded.

The Department of Mines.

Mr. Odell's *jeu d'esprit* was followed by a talk from the Deputy Minister of Mines, Mr. Brock, who explained the work and constitution of the Mines Department at Ottawa, and showed a number of slides illustrative of the work of the Geological Survey in the field and office, of the Victoria Museum at Ottawa, and of some of the remarkable fossil remains found in the Northwest.

"De Re Metallica."

Your correspondent called the attention of the meeting to Hoover's translation of the "De Re Metallica" of Georgius Agricola, and showed lantern slides of some of the curious woodcuts that the translation contains. Dr. Adams, of McGill University, referred to the benefit that Mr. Hoover and his wife had conferred upon the mining world by this translation, and mentioned that the copies of this unique reproduction had cost to produce about \$15.00 each, but had been sold for \$5.00.

Distillation of Coal.

The concluding paper of the meeting was read by Mr. F. J. Lucas, superintendent of the Coke Ovens of the Dominion Iron & Steel Co., and treated of "The Distillation of Coal." Mr. Lucas' paper was largely a plea for the more complete extraction and utilization of the by-products of coal, and enlarged upon the really small percentage of coal consumed in the raising of power that represented the ultimate efficiency realized. A lengthy discussion followed this paper, and there was complete unanimity in the opinion that present methods of using coal are wasteful in the extreme.

The proceedings closed with the annual banquet on Wednesday evening.

C. M. I. Officers Propose Affiliation With N. S. M. S.

A deputation from the Canadian Mining Institute attended as the guests of the Nova Scotia Mining Society, consisting of the president, Mr. Lindsey, Dean Adams, of McGill University, and Mr. Mortimer Lamb, the secretary. The delegation came for the purpose of laying before the Mining Society proposals for affiliation with the C. M. I. The Council were empowered to deal with these proposals and report to the members. There seems a good probability of a conclusion being reached in this matter which will be satisfactory to both societies. The presence of the C. M. I. delegation, together with that of Messrs. Brock, Boyd, and McLeish, of the Mines Department, added greatly to the success of the meeting, and was a source of gratification to those who had arranged the preliminaries.

Features of the Meeting.

A striking feature of the meeting was the extensive use made of lantern slides, which, thanks to the president, Mr. Sexton, were successfully handled.

The number and excellence of the papers read, the really worth-while discussion that followed them, the large attendance of local men actively engaged in the technical direction of mines, and the presence of prominent mining men from outside the Province, together

with the excellent leadership of President Sexton—who, by the way, comes out of the twenty-second meeting of the Society with an enhanced reputation for courtesy, wit and ability—all combined to make the meeting in Sydney more successful than the most sanguine had dared to hope. Great things are expected when the annual meeting comes round again.

REWARD FOR DISCOVERY OF RADIUM IN ONTARIO.

The Ontario Government has presented a bill which provides for the payment out of the Consolidated Revenue Fund of a reward not exceeding \$25,000 to the first person proving to the satisfaction of the Lieutenant-Governor in Council that he has discovered radium in the Province of Ontario.

The bill further provides that the Lieutenant-Governor in Council may:

(a) Reserve all radium in the Crown lands of Ontario not staked out, located or sold at the date of the passing hereof, notwithstanding anything contained in the Mining Act of Ontario, the Public Lands Act, or any other Act or regulation; and any such reservation shall be taken to include the right to enter upon such lands whether or not the same may hereafter be staked out, located or sold, and to dig for, work and remove all radium thereon, and to do all acts necessary or incidental thereto; and may rescind such reservation in whole or in part at pleasure;

(b) Make rules and regulations for the exploration of such lands, the working of any deposits of radium found thereon, the treatment of the same, and the production of radium therefrom, and the conservation, sale or use of the radium so produced, and make any such other rules and regulations for conserving and obtaining radium from such lands as may seem proper;

(c) Purchase and acquire on behalf of the Province any radium-bearing lands not the property of the Crown, or any specified interest therein, or the right to work the same for radium, on such terms as he may deem proper, subject to the approval and ratification of the Assembly, and make such rules and regulations for the working of the same, the production of radium therefrom, and the conservation, sale or use of the radium so produced as he may deem proper;

(d) Under the direction of the Minister of Lands, Forests and Mines expend moneys appropriated for any or all such purposes by the Legislature.

THE IRON INDUSTRY.

At the annual meeting of the Canadian Mining Institute in Montreal, March 4, 5 and 6, it was proposed "That the Canadian Mining Institute, in annual meeting assembled, begs to direct the attention of the Federal Government to the fact that the iron industry of Canada is handicapped by the reason that there has not as yet been found in the country the same extensive deposits of high grade ore as are freely mined in the neighboring Republic, and in Newfoundland and Cuba, which necessitates the importation of 94 per cent. of all the iron ore smelted in Canada. Whereas it is the conviction of the Canadian Mining Institute that such deposits ought, by increased endeavor, to be found. Therefore, we most respectfully request that the Dominion Government will, through its proper channels provide every necessary means for the accomplishment of this most desired end, the realization of which would add more than anything else to the economic wealth of the Dominion." The resolution was adopted.

THE MINING INDUSTRY IN RELATION TO THE TEMISKAMING AND NORTHERN ONTARIO RAILWAY

By Arthur A. Cole.

(From the annual report of the Temiskaming & Northern Ontario Railway Commission.)

The fertility of the soils in the clay belt of Northern Ontario is becoming better known every year, but it is not necessary to go back many years to find complete ignorance on this subject among many otherwise well informed people. To these the building of Ontario's Government railway, north from the Canadian Pacific Railway for over 100 miles, to reach the agricultural lands of the clay belt seemed the veriest waste of money.

The possibility of other industries helping out agriculture in building up business for the railway was considered by the promoters of the colonization idea, but with little thought of the importance these industries were soon to assume. The railway was thus started and the wisdom of the decision was soon shown in the large increases in the values of the timber limits being sold by the Ontario Government.

When the railway reached the present site of Cobalt, a new chapter in the history of this enterprise was started by the introduction of the mining industry. The business of the railway due to this industry rapidly assumed prime importance and this position it is likely to hold for many years to come.

The importance of mining was further increased by the discoveries later of the silver districts of Elk Lake, Gowganda, and South Lorrain, and the gold districts of Porcupine and Kirkland Lake.

The following statement of freight revenue on the Temiskaming and Northern Ontario Railway for the years 1911, 1912 and 1913, shows the relative positions of the agricultural, lumbering and mining industries eight, nine, and ten years after the discovery of Cobalt.

Sources of Freight Revenue, T. & N. O. Ry.

	—1911—			—1912—			—1913—		
	Revenue.	Pct.	Tonnage.	Revenue.	Pct.	Tonnage.	Revenue.	Pct.	Tonnage.
Agriculture	\$69,925.75	6.5	56,325	94,858.31	10	82,092	\$111,928.69	12	
Lumbering	152,400.97	14	95,753	150,623.20	17	143,660	197,333.23	21	
Mining	510,729.74	48.5	247,830	400,821.50	44	328,366	444,499.55	48	
Miscellaneous	326,445.81	31	163,342	260,591.59	29	129,978	173,551.65	19	
Totals	\$1,059,502.27	100	563,250	\$906,894.60	100	684,096	\$927,363.12	100	

(Under the heading of miscellaneous is placed the income from freight for construction and also the through freight for the National Transcontinental Railway.)

In the above statement all business due to the prosecution of each industry is segregated without any consideration of class of commodity comprising the freight handled. Thus at a station whose business is entirely due to the lumbering industry in the vicinity, the whole of the business of that section is credited to the lumbering

industry though the freight handled will comprise machinery, foodstuffs, etc., as well as lumber.

In the report for the fiscal year 1913, the Department of Railways and Canals of Canada publishes the following table based on the class of commodity handled by the railways of Canada:

Commodities Carried by the Railways of Canada.

	1907.	1908.	1909.	1910.	1911.	1912.	1913.
	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.	Pct.
Products of agriculture	16.85	14.91	17.91	17.31	17.17	19.34	16.31
Products of animals	4.37	3.92	4.21	3.71	4.00	3.53	3.01
Products of mines	32.68	35.92	35.81	35.11	35.87	35.18	38.16
Products of forests	18.11	20.49	17.35	17.54	16.57	15.82	15.75
Manufactures	14.11	16.56	11.82	13.44	17.00	18.16	18.68
Merchandise	4.08	3.18	3.58	3.39	3.06	3.03	4.14
Miscellaneous	9.79	11.02	9.32	9.50	6.33	4.94	3.95

An interesting comparison may here be made with figures compiled for the United States Interstate Commerce Commission from whose reports the following table is taken. It shows the freight traffic movement by

class of commodity, originating on line of reporting roads in the United States for the fiscal years 1900 and 1906:

Commodities Carried by Railways of the United States.

Class of Commodity.	—1900—		—1906—	
	Tonnage reported as originating on line.	Pct. of aggregate.	Tonnage reported as originating on line.	Pct. of aggregate.
Products of agriculture	53,468,496	10.35	70,201,720	8.56
Products of animals	14,844,837	2.87	19,002,825	2.32
Products of mines	271,602,072	52.59	435,450,476	53.09
Products of forests	59,956,421	11.61	92,187,351	11.24
Manufactures	69,257,145	13.41	121,457,738	14.81
Merchandise	21,974,201	4.26	33,319,615	4.06
Miscellaneous	25,329,045	4.91	48,543,902	5.92
	516,432,217	100.00	820,164,627	100.00

ANNUAL REPORT OF NIPISSING MINES CO., 1913

President's Report.

President E. P. Earle says in part:

The production of silver was 4,552,173 oz., valued at \$2,756,612.48, and was approximately the same as in 1912. The gross receipts were \$2,804,093.46, and the net receipts \$1,645,107.87. The expense of production was 24.09 cents per oz. This is 6.70 cents per oz. more than in 1912. The increased expense was due to the fact that nearly one-half the silver was produced from milling ore, and because of the lower average grade of the ore. The average price received for silver was 60.26 cents per ounce. \$1,800,000 was distributed to stockholders during the year. The known ore reserves contain 9,510,000 oz. of silver, about one-half of which is in high grade ore. The surplus is \$1,259,060.96. These figures show that the reserves and surplus are at almost the high record point. The mines are in excellent condition, and the high and low grade mills are being operated economically and efficiently. Stockholders are fortunate in having the same able mine and mill management as heretofore.

General Manager's Report.

Mr. R. B. Watson, general manager, in his report to Mr. David Fasken, president of the operating company, says in part:

Shipments in 1913 were as follows—

	Dry Tons.	Fine Oz. Silver.	Net Value.
Silver bullion	224,7970	6,530,871.31	\$3,894,123.35
Cobalt residue	1,569,2195	57,380.74	62,484.44
By-products and claims paid	166,3500	50,327.29	29,824.05
Bullion from ore milled by Nova Scotia Co. . . . .	.3245	9,467.08	5,059.12
Total shipments	1,960,6910	6,648,046.42	\$3,991,490.96
Less Custom ore purchased	632,0660	1,803,877.01	1,070,784.69

Shipments of Nipissing product 1,328,6250 4,844,169.41 \$2,920,706.27

The production of individual veins in 1913 was as follows:

	Silver Oz. in High Grade Ore.	Silver Oz. in Mill Rock.	Total Silver Oz.
Vein 8	1,091	1,091	1,091
Shaft 63 and Little Silver	293,435	192,963	486,398
Shaft 73:—			
Veins 64, 73, 80, and 100	2,147,515	1,767,828	3,915,343
Vein 96	20,051	20,051	20,051
Vein 122	104,677	4,367	109,044
Vein 128	6,003	6,003	6,003
H 2, 5 and 35	14,243	14,243	14,243
Total	2,566,964	1,985,209	4,552,173

The reduction works for high grade ore treated 1,200 tons of Nipissing ore, averaging 2,501 oz. per ton and 632 tons of custom ores averaging 2,854 oz. per ton. The precipitate from the low grade mill was also sent to the high grade plant for melting and refining. Total shipments of bullion during the year amounted to 6,530,871 fine oz. The residue from the high grade mill carries 20 to 40 oz. of silver, 8 to 10 per cent. cobalt, 4 to 6 per cent. nickel and 30 to 40 per cent. arsenic. This is sold to the manufacturers of cobalt products and during the year shipments of 1,659 tons were made, which netted the company \$62,484. The only new construction during the year consists of a baghouse for the fumes from the furnaces and retorts. A great deal of research work has been carried on with the object of improving the method for treating high grade ore and concentrate produced in the Cobalt district. By applying the principles successfully used in the reduction of low grade ore, it is hoped that a me-

thod will be worked out whereby the higher grade ore can be treated to advantage by cyanide only.

The record of the low grade mill for 1913 is as follows:

	Tons.	Assay Oz.	Silver Oz.
Ore treated	77,133	27.182	2,096,611
By-products treated	107		54,383
Total milled	77,240		2,150,994
Bullion recovered from above			1,985,209

From the start of the mill, November 11, 1913, the actual recovery has been 91.85 per cent. All ore going to the mill is weighed on a registering beam scale and the content of the ore is based on this weight and on an automatic sample of the 200 mesh pulp as it enters the cyanide plant. Two features made possible the above extraction on these complex ores, which have heretofore resisted successful treatment by cyanide alone. One is the desulphurizing process originated at Nipissing, whereby the fine pulp is subjected to contact with metallic aluminum in a caustic soda solution. This treatment breaks up most of the refractory silver combinations and reduces the silver to the metallic state, so that it goes into solution easily in the subsequent treatment by cyanide. The other feature is the use of aluminum dust for precipitation instead of zinc dust. The resulting precipitate runs over 90 per cent. silver and is melted down into commercial bars 996 fine or better.

The consumption of supplies at the low grade mill was as follows:

	Lb.	Lb. Per Ton.	Cost Per Lb.	Total Cost Per Ton Ore.
Cyanide	400,722	5.190	\$1.1500	\$7.785
Caustic soda	246,880	3.200	.0214	.0684
Lime	512,595	6.640	.0040	.0266
Aluminum dust	43,911	.568	.3373	.1917
Aluminum plates	20,731	.268	.2438	.0654
Aluminum ingots	74,483	.964	.2207	.2128
Flint pebbles	505,170	6.540	.0098	.0646
Ore pebbles	239,500	3.100	.....	.....
Coal for heating	2,329,250	30.160	.0029	.0881
Power, K. W. H.	3,983,000	51.570	.0115	.5933
Total				\$2,0894

Forty stamps ran 316.82 days or 86.80 per cent. of possible running time. Tons crushed 77,240; crushed per stamp per day 6.09 tons.

The treatment costs, including transportation, picking plant, low grade mill and construction, based on 77,240 tons milled, were as follows:

	Total Cost.	Cost Per Ton.
Crushing at mine	\$12,573.51	\$1.163
Aerial tramway	7,730.43	.100
Surface tramways	9,070.80	.117
Picking plant	16,782.42	.217
Crushing	6,267.72	.081
Battery	20,597.76	.267
Tube mills and classifiers	42,262.52	.547
Slime collecting	34,579.65	.448
Intermediate filtering	9,843.18	.127
Treatment	78,874.29	1.021
Filtering and discharging	14,327.73	.186
Clarifying and precipitation	23,279.55	.301
Refining	9,830.52	.127
Heating	8,745.58	.113
Water supply	2,361.43	.031
Construction	22,071.71	.286
Total	\$319,198.80	\$4.132

Surface Prospecting.—Prospecting by cleaning off the surface of the rock with a hydraulic jet was continued in 1913; work began on May 3rd and stopped December 6th; the area cleared was 54.69 acres, the average depth of over-burden being 3.9 ft. Operations are carried on with the aid of a searchlight at night; 125 different set-ups were made, 21,376 ft. of 16 in. pipe was taken up and 25,716 ft. laid down. The average pressure of water at the nozzle was 117 lb. While

no veins of great importance were found, the work exposed numerous stringers and some promising fissures which will be explored further. The ground draining into Cobalt Lake has been about finished and the pump will be moved to Peterson Lake for the coming season's work. A diamond drill was put to work in the diabase area of R. L. 408. Six holes aggregating 2,239 ft. were drilled without favorable results.

Development.—The footage of underground development and exploration in 1913 was about the same as in the previous year, amounting to 13,664 ft., compared with 13,020 ft. in 1912. Nearly three times as much stoping, however, was done in 1913 as in the previous year, the cubic yards stoped being 44,017, compared with 15,764. The broken ore in the stopes ready for hoisting on December 31st was 65,393 tons. During 1913 over 86 per cent. of the silver came from the town side of the property, that is, from shafts Nos. 73, 80 and 64; the production from the territory on the east side of the lake was comparatively unimportant.

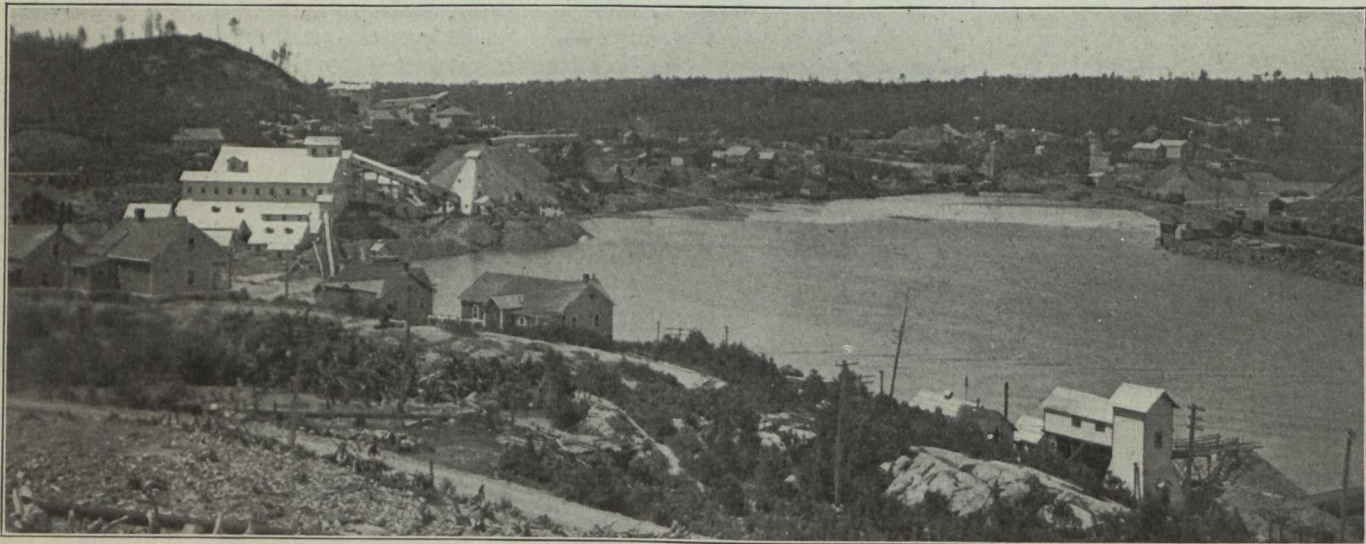
Vein 8 was opened up on the 100 ft. level, a raise was put through to surface and some crosscutting done. The results were not favorable. The vein will yield some mill ore but very little high grade.

Shaft 63.—From this shaft 1,756 ft. of exploration

hydraulic prospecting were developed and are ready for stoping.

Vein 122.—Some additional exploration work was done from this vein in the area to north and north-east. The results were not encouraging and work is now restricted to taking out what little ore remains unbroken. The broken ore in the stopes is now going to the mill; the low grade ore is exceptionally good.

Shaft 73.—More than half of the total underground work on the property was done at shaft 73 and the results of development here have been very gratifying. The fourth level was opened up at a depth of 324 ft. below the collar of the main shaft; at this level the main vein is mostly in the Keewatin and is low grade. There is a wedge of good ore on the main vein between the third and fourth levels down to the contact. The most notable development of the year was not on the main vein, but on the various cross veins of which there are a dozen. These branch off from the main vein on the south side and will doubtless continue to the contact. Several of them have been recently found on the fourth level, where they occur in the conglomerate, so that we are assured of a good production from these branches between the third and fourth levels. Several veins, which promise well, have been encoun-



A View Across the South End of Cobalt Lake from the Nipissing Property

was done under Little Silver Hill and at the south end of Cobalt Lake. No veins of importance were found, but the shoot of ore on the Little Silver vein opened up satisfactorily and produced some high grade and considerable low grade ore. Nothing of importance was produced by the old veins, 63, 108 and 148, but there remain some good pillars of ore around the shaft.

Vein 86.—Sinking continued in this shaft and a new level was driven at a depth of 176 ft. The vein on this level is poor, but another vein which promises better has recently been cut about 45 ft. to the east. On the 60 ft. level there is a small vein of fair ore for 140 ft. This shaft will produce quite a tonnage of mill rock.

Shaft 150.—A large amount of prospecting was done in the conglomerate area east of Cart lake. From the 209 ft. and 309 ft. levels of shaft 150, crosscuts were run in various directions and several veins were drifted on, but none of this work yielded any ore.

Vein 92.—The open cut on this vein was pumped out and from the bottom some small veins found by the

tered in the east crosscut on the fourth level, but whether they are new veins or extensions of the side veins has not yet been proved. The ore reserves, at shaft 73, consist of 2,435,000 oz. in high grade ore and 1,209,000 oz. in mill rock. The broken ore in the stopes amounts to 33,000 tons.

Shaft 80.—Work on No. 80 and No. 100 veins consisted mostly of stoping; the ore bodies exceeded expectations and there is now a large reserve of broken ore in the stopes. These veins have been fully developed and there is little chance of getting more ore than is now in sight. The developed ore in these two veins amounts to 2,218,000 oz.

Shaft 64.—It was not necessary to stope any ore from vein 64, so the only yield from that part of the property in 1913 came from a new vein found in a crosscut connecting the third levels of 73 and 64. This vein promises to be an important discovery; the ore shoot already shows a length of 200 ft., with good ore in the east face. Sinking was continued in the main shaft,

GOLD AND SILVER MINING IN NORTHERN ONTARIO

During the past ten years Ontario has made tremendous strides in gold and silver mining. Previous to the discovery of Cobalt silver deposits only one mine, the Silver Islet, had made a large production of silver. Previous to the discovery of the Porcupine gold deposits very few mines had been profitably worked for gold in Ontario.

It is true that there were many gold and silver mines in the Province years before the Cobalt and Porcupine districts were opened up, and it is not unlikely that some of them will prove worthy of reopening. Most of them, however, produced but little and very few were at all profitable. Many were mines in name only. To-day Ontario has many splendid gold and silver mines.

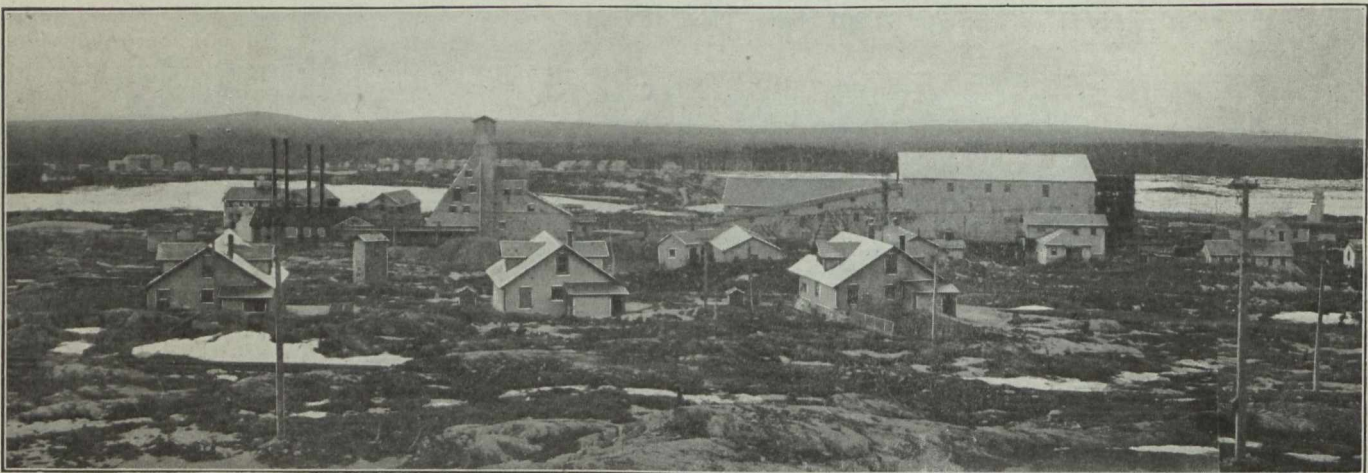
Silver Mining at Cobalt.

The Cobalt silver mines have for the past few years been producing about 30,000,000 oz. of silver annually. It is not expected that the yield of high grade ore will

fall at the Kerr Lake property by draining the lake. During the coming summer the removal of the mud now lying on the bottom of the lake will be undertaken by the Crown Reserve and Kerr Lake Mining Companies.

Gold Mining at Porcupine.

Gold mining in Ontario has become of great importance since the opening up of large deposits at Porcupine. Five mines, Dome, Hollinger, Acme, McIntyre and Porcupine Crown, are now making regular outputs. The Acme is as yet not a large producer; but will be when equipped for mining. Its present production is from the treatment of ore mined during development work. The Hollinger is producing more ore than last year, and the mill to treat Hollinger and Acme ore is being considerably enlarged. The Porcupine Crown has blocked out ore valued at \$2,000,000 in its upper levels. The development work has shown that there are important faults on the Porcupine



Hollinger Mine and Mill. Town of Timmins in the Distance

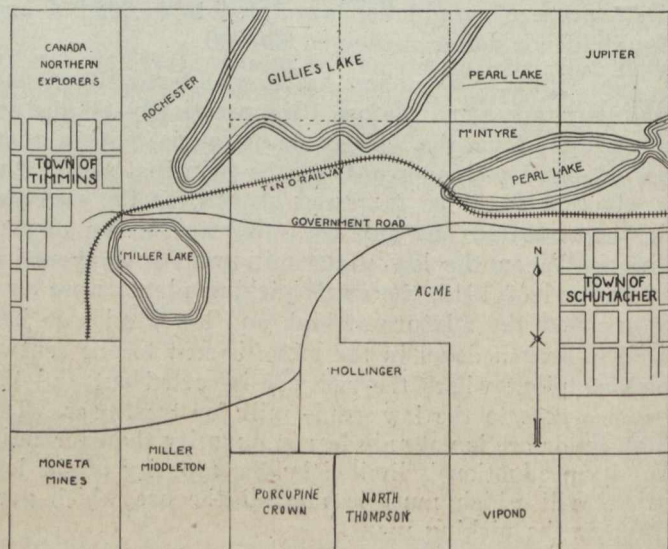
be as great in the future; but there is every reason to expect a larger production than in the past of lower grade ore and a considerable production as well of high grade ore. The cost per oz. has increased, but there is now more ore being mined than ever before. To date the producing companies have made a profit from operations of about \$60,000,000.

A large number of concentrating mills and several cyanide plants are in constant operation at Cobalt. Notable recent additions are the low grade ore plant of the Nipissing Mining Co., and an 80 stamp mill built last fall by the Northern Customs Co.

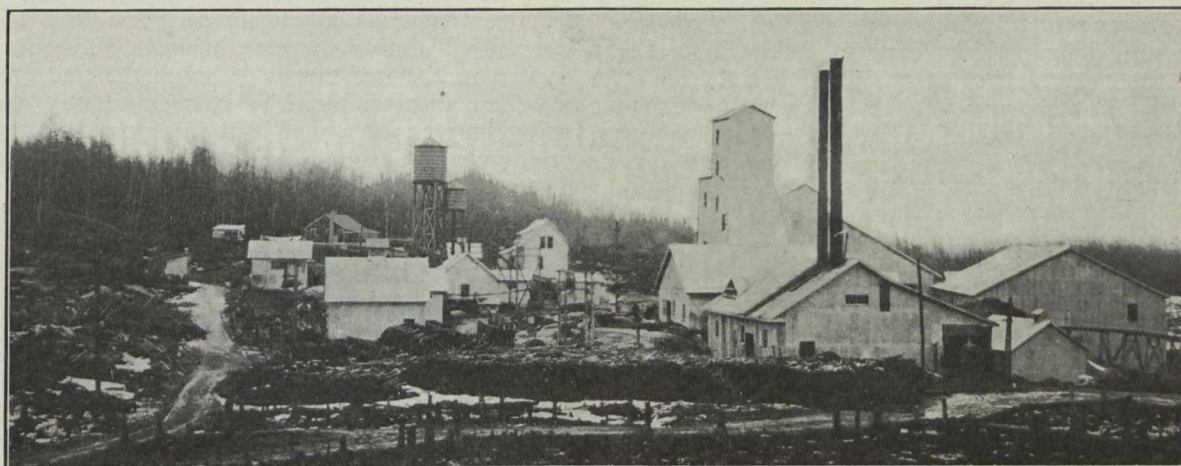
The treatment of the silver ores has resulted in the development at Cobalt of a very important metallurgical centre. Many skilled metallurgists have taken part in the development of the industry. Their remarkable success has resulted in making it possible to greatly decrease the cost of treatment.

At Cobalt the most important recent discovery is that made by the Peterson Lake Co. A promising shoot of ore was opened up a few months ago, and according to reports is holding well as development proceeds. The Seneca-Superior mine had an exceptionally profitable year and will be for some time a large producer of high grade ore. A good find was made last

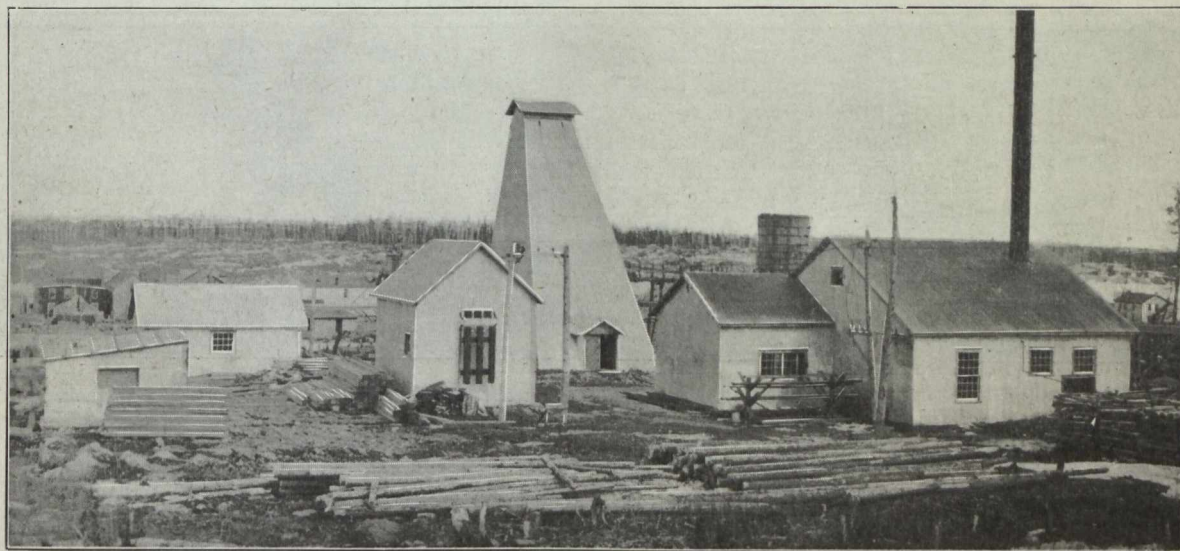
Crown property, and it has proven difficult to pick up the vein at the lower levels. Steady production can be maintained from the ore already blocked out, while



Hollinger and Neighboring Properties



Porcupine Crown Mine, Timmins, Ont.



Schumacher Mine



Shaft House and Stock Pile, Acme Mine

the work of exploration is carried on. The McIntyre has had a varied career, but is also an important producer.

At the Hollinger and the western part of the Acme the veins are comparatively easy to follow, now that a few of the peculiarities of the structure have been determined. Further south on the Porcupine Crown faults are giving considerable trouble. Further east on the McIntyre and Schumacher the ore bodies are very irregular in shape as well as having the usual variations in values. The development work is showing irregularities which might have been expected from the nature of the surface exposures.

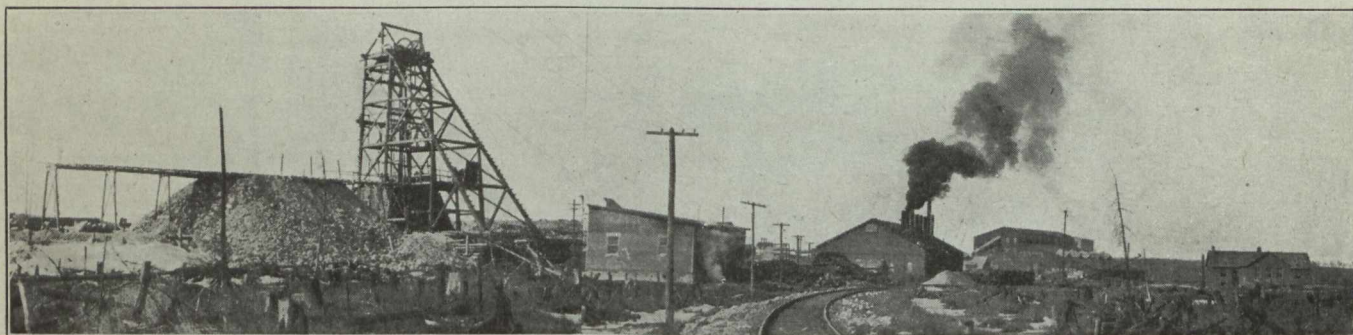
Taken together the Hollinger, Acme, McIntyre and Porcupine Crown will certainly produce a large quantity of gold. The Hollinger and Acme properties are located on what appears to be by far the best part of the mineralized zone. The other two properties have valuable but smaller and less continuous ore bodies.

In addition to these four mines there are neighboring properties which may also become producers.

The Dome mine is situated in another part of the Porcupine district, and the deposit being worked is quite different to that at the Hollinger and adjoining properties. At the Hollinger the ore occurs in well

amalgamation is not so important as formerly. When separate treatment of sand and slime was the general practice the question was quite important, but the problem was never satisfactorily solved. With the prevalence of all-sliming the case is quite different. The ore travels in a closed circuit through the fine grinder and classifier until reduced to slime, and any coarse gold which may happen to be in the pulp is thus "worn out" and gives no trouble in the extraction department. Therefore, in all-sliming mills it is considered good practice to simplify the process by cutting out amalgamation even when the ore contains coarse gold.

However, there are cases in which it is best to treat a part of the ore as sand, and then if it contains coarse gold the question of amalgamation comes up. To crush in water, amalgamate, dewater and then treat with solution occasions a loss of cyanide besides complicating the process; while amalgamating in cyanide solution has its drawbacks. In the latter case we have the gold cleaned and brightened by the cyanide solution and in the very best possible condition for amalgamation, but we are confronted by new difficulties. The solution attacks the plates, rapidly eating them away, while the amalgam is hardened by the dissolution of the mercury until it becomes unmanageable and the plates inefficient. The



No. 2 Shaft, Power House and Mill, Dome Mine

defined veins forming a vein system. At the Dome the ore is in very irregular large masses. It averages considerably lower in grade than the Hollinger. Owing to the size of the ore body, however, it can be cheaply mined.

The Dome Mines Co. has had in operation for some time a 40 stamp mill. This has been enlarged by the addition of 40 stamps and a sand leaching plant, which will soon be ready for operation. The ore is being mined largely from open pits. Underground, a very large ore body has been developed.

Gold Mining at Kirkland Lake.

At Kirkland Lake the Tough-Oakes mine, described in the April 15 issue of the Journal, is the most promising. Good results are also being obtained at the Teek-Hughes mine, where exploratory work is being steadily carried on by drifts and crosscuts at the 75 ft. level. It is expected that the Ontario Government will this year put the wagon road from Swastika to Kirkland Lake in good condition. This will be of great assistance in the development of the district.

A SUCCESSFUL METHOD OF AMALGAMATING IN CYANIDE SOLUTION.

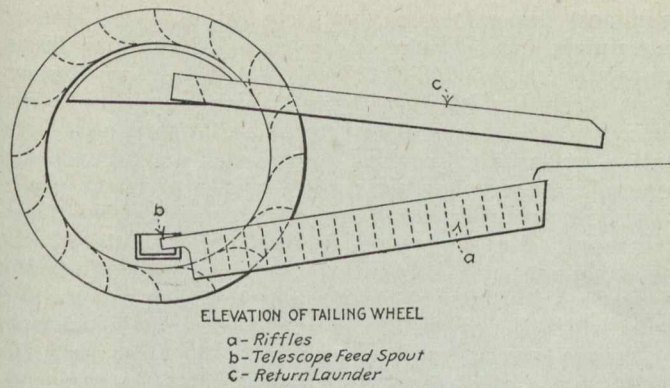
Mr. John Randall, in "Metallurgical and Chemical Engineering" describes a method of amalgamation in cyanide solution. He says that in case coarse gold is encountered in the cyanidation of ore, the question of

difficulties encountered have generally been sufficient to result in the abandonment of amalgamation in cyanide solution after many careful and persistent efforts.

It is the object of this article to bring into notice a phase of the subject which seems to have escaped general attention.

It is well known that if metallic sodium be mixed with mercury and immersed in a watery solution the action of the sodium in going into solution as NaOH at the surface of the mercury will produce practically the same result as that occurring at the cathode of an electrolytic cell. If there is gold or other metals in the solution they will be deposited upon the surface of the mercury and amalgamated. But in plate-amalgamation the mercury and sodium is spread out into such an exceedingly thin film that the sodium is rapidly oxidized and carried off, the good effect of it being noticeable for only a very short time after dressing the plates. This is the main reason why amalgamators generally regard sodium as of little or no value.

However, if ruffles containing mercury be substituted for plates the last named difficulty is overcome, and it is possible to keep the quantity of sodium in the mercury fairly constant. Some time ago the writer was in charge of a mill, treating sand and slime separately, where gold nuggets the size of a pea were sometimes found, although the ore averaged a little below \$10 per ton gold. The ore was a weathered dump and contained some copper as azurite, but no native copper. The



Use of Tailing Wheel to Return Part of Riffle Discharge

crushing was done in solution in a Chilean mill through 16 mesh screens. The mill was provided with plates, but they were taken out and riffles were substituted.

In cleaning up it was found that the greater part of the amalgam was so fine that it could be squeezed through chamois leather, and the bullion from the riffles was found to contain about two pounds of copper for each oz. of gold and silver. It is evident that the copper was deposited from the solution, and that in addition to recovering free gold that passed through the screens, the riffles had been of service in mitigating troubles arising from copper in the zinc boxes.

It was aimed to keep the amount of sodium just below the point where the mercury would amalgamate a freshly brightened iron nail. To accomplish this some mercury containing a large amount of sodium amalgam was kept on hand in a dry, glass stoppered bottle and a determined amount of this put into the riffles every four hours. No mercury was detected in the solution, and as none was floured, a weighing at the end of the run showed no loss except what might be expected in retorting.

In operating riffles it is found that those of the best design will choke when the feed is temporarily diminished below full capacity, and some trouble is experienced in getting them started again. This trouble may

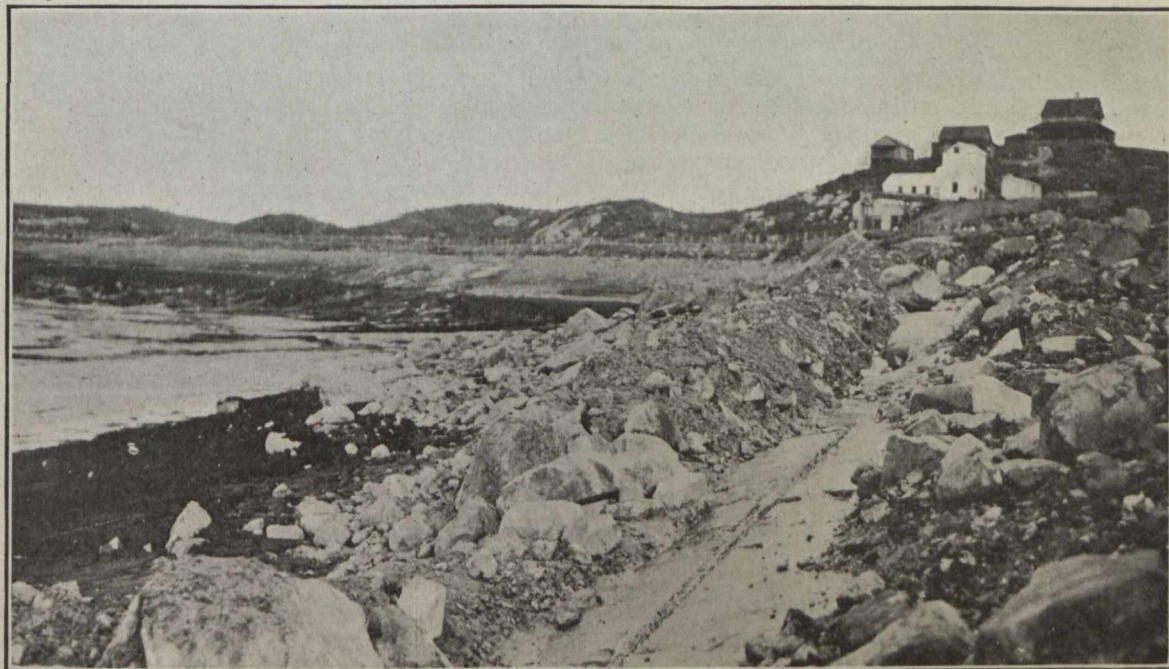
be obviated by placing a small tailing wheel in such a manner that it will return a variable amount of the outflow back to the head of the riffles, as shown in Fig. 1. By this means riffles of comparatively large capacity may be operated on a small amount of pulp. A section of the feed spout may be made to slide in telescope style, or a movable partition may be placed in the spout to cut out a variable amount of pulp.

I think it very doubtful if it would pay anybody to make riffles should they desire to use them with mercury, for this or any other mill purpose. The Pierce riffles, called the Pierce amalgamator, can be depended upon if given the proper amount of feed, and the sodium will protect the metal parts. They look somewhat expensive in first cost, but any riffles that will hold mercury and not pack with sand are open to the same objection. In operating riffles it is quite necessary to have a screen above them to intercept gravel that may occasionally come from a broken mill screen.

THE DRAINING OF KERR LAKE.

Permission having been granted on May 1st, 1913, by the Mining Commissioner of Ontario to the Crown-Reserve Mining Co., Limited, and Kerr Lake Mining Co., Limited, jointly, to pump out the water and mud from the bed of Kerr lake, construction work was immediately begun. The method of procedure follows:

A 100 ton barge was constructed, on which were installed four single stage pumps, each with a capacity of 1,800 gallons of water per minute, arranged in 2 units, each unit being directly connected to a 250 h. p. motor; the pumps having a 12 in. suction and a 10 in. discharge. At the beginning, as long as fresh water was being pumped and the head was not excessive, the pumps were operated in parallel, that is, each pump discharged independently into the main discharge line. Later against the greater head, and when the pumps were working on mud, the pumps were operated in series, that is, there was one suction for each unit, the water going from the first pump into the second pump, and then into the discharge line. The whole installation is very elastic, and adapted to any changes



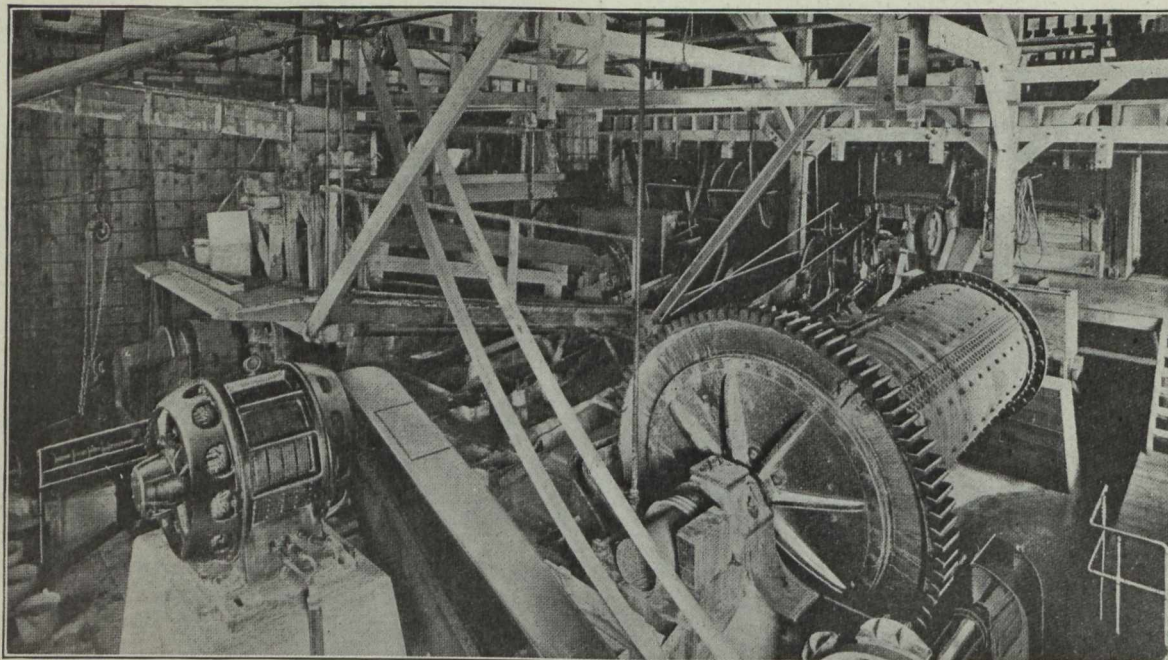
A View of Kerr Lake Basin After Pumping Out the Water. Note the Silver Vein on the Rock Bottom.

made necessary by new conditions. The barge was first anchored near the shore of the lake, and as the water was lowered, it was floated out to the middle of the lake, the connection between the shore and the barge being made by two universal ball and socket joints, and an expansion and contraction joint supported on floats.

A 20 in. pipe line was installed from the shore of Kerr Lake for a distance of 2,500 ft., where it discharged directly into Giroux lake, from whence it empties into the Montreal river.

Pumping was actively begun on August 28th, and four weeks thereafter most of the clear water had been pumped out, leaving the silt and mud still to be handled, and lowering the lake 28 ft. From that time until the freeze-up of November 28th, good progress was made in pumping the mud, although the rate of pumping was much less than that of handling the water. It was found that there was an average depth of 25 ft. of mud

is almost impossible to absolutely estimate ore blocked out unless small blocks can be sampled on four faces; especially at the 100 ft. level of the Crown-Reserve mine, with the lake overlying, which meant only one face exposed, such an estimate at best would have been only a guess. Rather than hazard such an estimate, the general manager has always stated the physical conditions and probabilities of the property so that the directors could for themselves deduce an estimate of the probable value of the property. The method of stating these probabilities was to take a certain block of ground from which the ore had been extracted, and the contents of course known, and to assume by analogy that the block immediately above this would be of the same approximate value, if the face exposed was similar to the ore extracted. This was based on the fact that practically all the development work in the whole Cobalt district, in the conglomerate formation, and especially on



Porcupine Crown Mill

and silt over the whole lake after the clear water had been removed. In all, 325,000,000 gall. of water and mud were pumped out, the lake being lowered a total depth of 38 ft. The operation of pumping the mud will be renewed as early as possible in the spring, and during the next summer all of the mud should be removed. It may be necessary in connection with this work to put in some kind of a sluicing plant to wash all of the mud into the pump in the middle of the lake, but the cost of such a plant will be nominal.

The total cost of plant installation, including a fresh water plant on Giroux lake, capable of handling 1,000 gall. per minute, was:

For distribution of fresh water	\$39,604.76
The total operating cost to date is	12,078.29

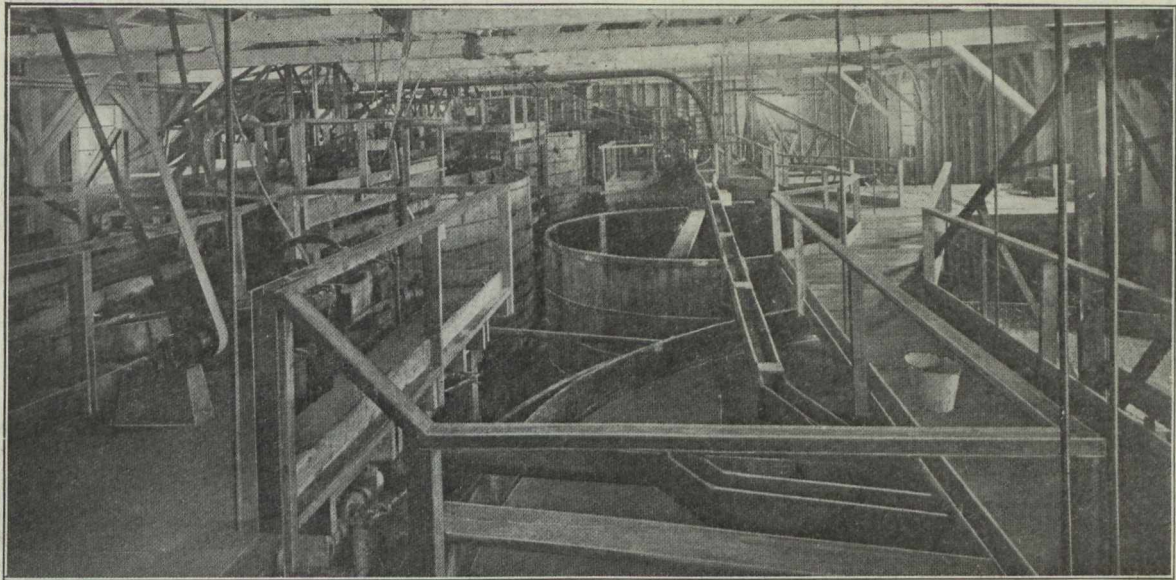
The total expenditure to date is	\$51,683.05
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CROWN RESERVE.

Mr. S. W. Cohen, in the annual report for 1913 says in regard to the Carson vein: "Because of the irregularity of the silver values and of the high grade veins in the Cobalt district, and the great error in sampling, it

the Crown-Reserve property, had demonstrated that the ore bodies remained at least as rich, if not richer, as the surface was approached from below. In fact this was the only method possible at the 100 ft. level of the Crown-Reserve, as no raises could be put up because of the lake overhead, so that the ore could be sampled on only one face, and a result deduced from the samples of ore exposed on one face only would be subject to a much greater error. The results of the methods described have generally checked the estimates of probable ore with remarkable fidelity during the whole history of the mine, and now that it has been possible to put raises up to the bed of the lake, these estimates have been very closely checked by sampling.

"It, of course, needs no demonstration to assume that, while the method described will closely approximate the estimates on a large number of blocks, any individual block might vary greatly from the value as based on the block below. This is what happened on the Carson vein, Only one face could be seen, and while in the last annual report no statement was made as to the probable value of the remaining ore in the Carson vein, it was stated that 25 per cent. of the 100 ft. stope was left, and it was hoped that 25 per cent. of the value of the entire



Porcupine Crown Cyanide Plant

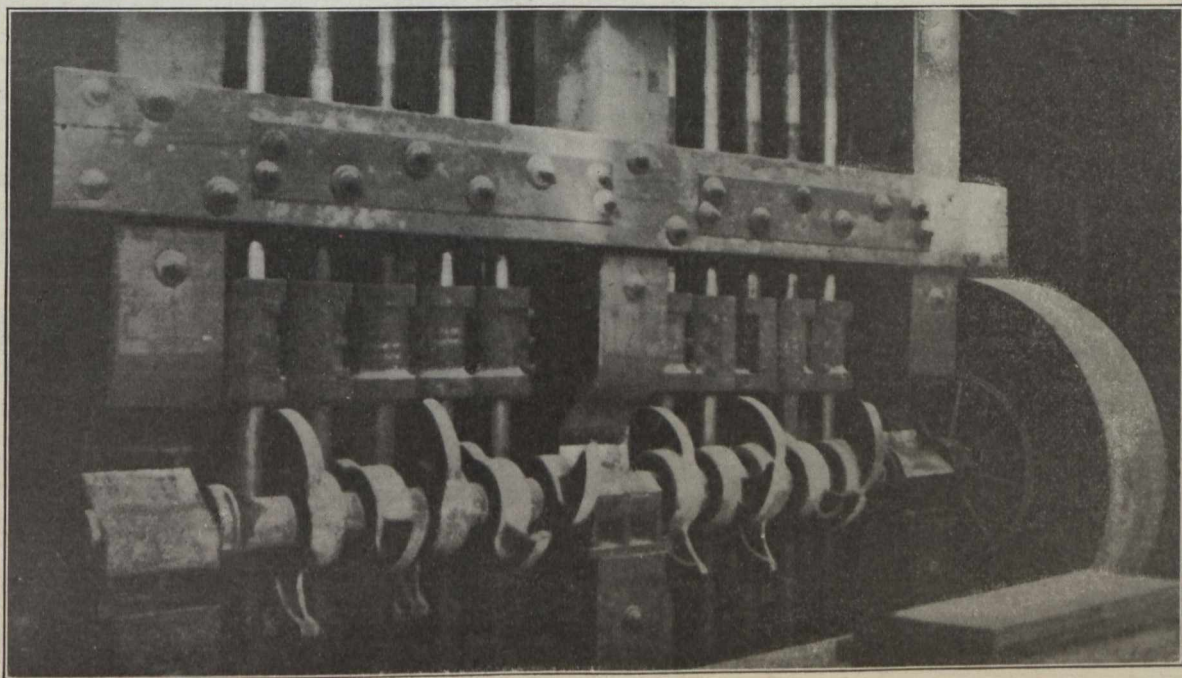
stope, or practically 1½ million oz., would be extracted from this block of ground, especially as this vein had always been very regular in value. Subsequent work on this ore body, as already stated, has proved to be very disappointing, and, as a result, the earnings of the company for the past year were very materially decreased. When the lean ore was first encountered, it was hoped that the conditions were merely local, but continued development work during the past twelve months has produced only 200,000 oz. of silver, and has demonstrated that no material amount of high grade ore can be further expected from this vein.

PORCUPINE-CROWN MILL AND CYANIDE PLANT

A small five stamp mill was started up in February, 1913. This was operated on straight amalgamation and was primarily intended for a test mill, but as the results

were so encouraging, it was run regularly on its full capacity, while experiments were carried out as to the treatment of a larger tonnage.

Up to the time the cyanide plant was installed, this mill showed an average extraction of 85 per cent., the tails being impounded and available for future treatment by cyaniding. The result of experiments on the testing mill showed that the continuous decantation process of cyaniding the ore, as introduced by the Dorr Cyanide Machinery Co., was especially suited to the ore, and that this method would prove the least expensive in installing and operating. As a result, a further 15 stamps, duplex classifier and tube mill, as well as the cyanide tanks, pumps, etc., were installed and cyanide work begun about the middle of November, 1913. Since this time, the mill has been making an extraction of 96 per cent. at an average cost of \$1.50 per ton, treating 100 tons per day. Experiments are being carried out which



10 of the 40 New Stamps, Dome Mill

show that a further recovery of 1 per cent. may be made by small changes. The mill has not been running long enough to give complete detailed figures, but the manager is satisfied that as a result of this method of treatment, the extraction will be as high and the costs less than by any other method. The maximum capacity of the mill is 180 tons per day.

THE DOME MILL.

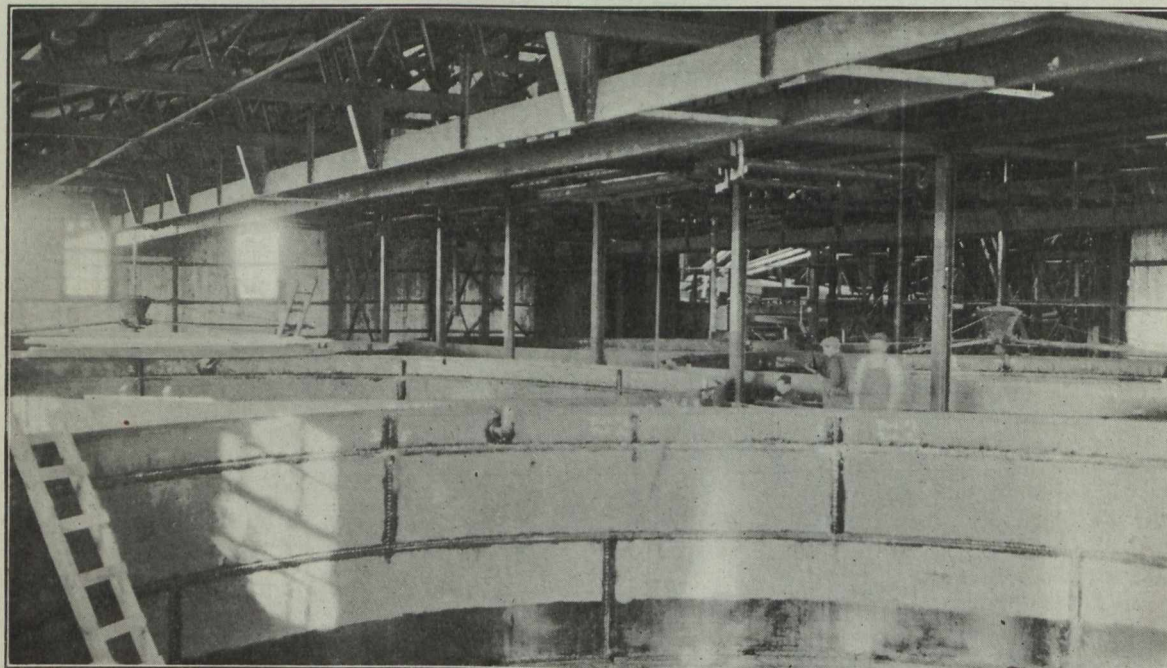
Forty additional stamps have been installed at the Dome mill during the winter, and the sand leaching plant will soon be ready. In the present mill all the ore is slimed in tube mills. When the new plant is in oper-

The heavy coarse particles separated in the classifying cones from the lighter sand will be returned to the tube mills for regrinding. The circuit is therefore a closed one so far as concentrate is concerned.

The new plant is being installed by the Merrill Metallurgical Co., Mr. F. C. Languth is in charge of the work.

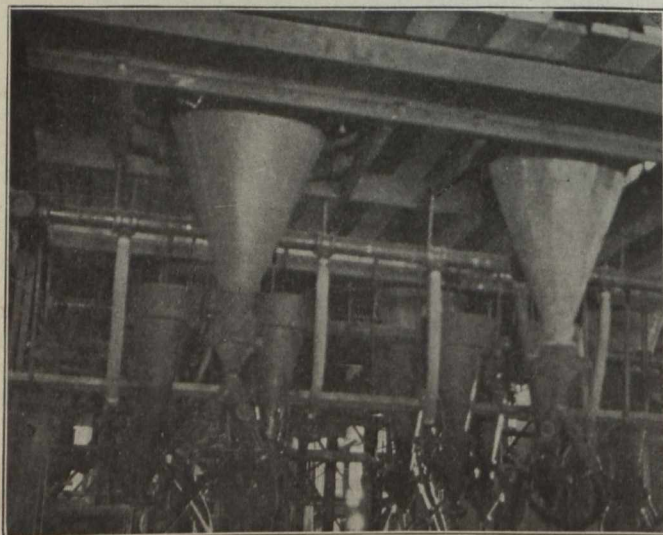
The 40 stamp mill now in operation, which was also installed by the Merrill Co., has been making a very large output under the supervision of Mr. W. F. Battersby, of the Dome Mines, Ltd.

With these forty stamps and the leaching plant in operation the production of the Dome will be very much larger than at present.



View of Leaching Vats, Dome Cyanide Plant

ation the circuit will no longer be a closed one. The sands will be separated and leached in large vats. Cones will be used for settling. The accompanying photographs show one of the new batteries and views of the settling cones and leaching vats.



Classifying Cones, Dome Mill

THE PREPARATION OF METALLIC COBALT BY REDUCTION OF THE OXIDE.

The Mines Branch has issued a bulletin describing in detail methods of preparing metallic cobalt from the oxide.

There are four methods of reducing commercial cobalt oxide, in order to obtain metallic cobalt in reasonably pure form:

1. By reduction with carbon.
2. By reduction with hydrogen gas.
3. By reduction with carbon monoxide gas.
4. By reduction with aluminum.

Each of these methods has been studied at considerable length, and this paper is a report of the results. It should serve as a guide to those who will subsequently be interested in the preparation of metallic cobalt in large quantities. Copies of the bulletin may be obtained on application to the Mines Branch.

The researches were conducted at the School of Mining, Queens University, Kingston, Ontario, for the Mines Branch of the Department of Mines, by H. T. Kalmus, assisted by C. W. Day, C. Harper, W. L. Savell and R. Wilcox.

RADIUM AND ITS ORES

By R. A. A. Johnston.

The discovery of the element radium by Mme. Curie at the end of the last century was the culmination of a long series of experiments and researches prosecuted by many investigators. A few years previous to this discovery Becquerel had observed that a photographic plate wrapped in black paper was markedly affected when brought into proximity with a compound of uranium. Later on Mme. Curie found that the residues left after the extraction of uranium from its ores were much more active in this respect than was uranium itself. Stimulated by this discovery Mme. Curie carried her researches still further and in the course of a long and laborious series of separations of the constituents of these residues found that there were two substances which were capable of affecting a photographic plate in the way mentioned. In the course of these separations one of these substances was found to associate itself with the bismuth; to this substance Mme. Curie gave the name of polonium after her native country Poland; the other associated itself with barium and on account of its strongly radio-active properties was called radium.

Properties of Radium.

It must be remembered here that radium itself has not been liberated as a separate entity and that it is only in its compounds such as the chloride, bromide, nitrate, etc., that it has been studied. These compounds are luminous of themselves and have the power of imparting luminosity to many other substances when brought into proximity with them; they charge electrically vessels containing them; they of themselves give off heat continuously; they have marked effect on photographic plates and in many other ways display remarkable properties.

These active properties of radium are due to a kind of decay by which it, in all probability, gives rise to other elements. This decay is so uniform and of such potentiality that the amount of radium in a substance may be actually estimated from the emanations issuing from it. This is done by means of an instrument called an electrometer.

It is natural to suppose that a substance possessing such unusual properties should at once attract attention with a view to ascertaining its possible practical applications, and nowhere has greater activity been shown than in its possible application as a curative agent for some of the ills to which humanity has fallen heir; and in this connection extensive investigations have been carried on with a view to ascertaining the effect of the emanations from radium upon that greatest of human evils, malignant cancer. The results have undoubtedly been most startling, but the public would be well advised to reserve final judgment upon the merits of radium as a curative agent until the permanency of these results has been proved. In the opinion of the best authorities this may not be ascertained for some years to come. For all this the results of these experiments have been of such a character that various Governments have thought it expedient to take such steps as will tend to conserve any supplies of radium ores coming within their jurisdiction and in some instances have gone so far as to prohibit their export.

As has already been stated the ores of uranium were the first to attract attention as possessing any unusual

radio-active properties and it is from such ores that all of the radium of commerce has been obtained. Radio-activity of greater or less potentiality has been observed in a great variety of materials both liquid and solid, but whether this radio-activity is in all cases due to the presence of radium is not absolutely clear. The waters of some springs are known to show considerable activity and on this account wonderful curative properties have rightly or wrongly been ascribed to them. The petroleums issuing from many oil wells show more or less radio-activity; some of the petroleum from the Interlake Peninsula of the Province of Ontario have been shown to exhibit marked radio-activity; this has been particularly marked in some of the heavy oils found in the deeper wells. Amongst the solid constituents of the earth's crust, crystalline rocks such as the granites have been noted as sources of radio-active emanations and in this case the emanations are probably due to the presence of uranium bearing minerals; generally speaking, however, the amount of uranium in these rocks is so minute that its presence may only be detected by the most critically conducted chemical analysis and the instances in which the presence of uranium is manifested in the form of a distinct mineral are comparatively rare and for the most part are found in the coarse granites known as pegmatites; occurrences of this kind have not yet been found to be profitable sources of uranium or radium. Until quite recently certain metaliferous veins of secondary origin furnished the only source of commercial radium; the silver and copper-bearing veins of Schneeberg in Saxony, Joachimsthal in Bohemia, and Rezbanya in Hungary, which sometimes hold more or less of the mineral pitchblende, are examples of this kind. At a few places in the world uranium-bearing minerals have been found in connection with certain sandstones and conglomerates, rocks of sedimentary origin. These rocks have been formed from the detritus occasioned by the breaking down, by aqueous or other agencies, of vast quantities of crystalline rocks; the constituents of these rocks during transportation by stream agencies have undergone a selective process according to the laws of gravity by which the heavier minerals have been segregated amongst themselves; in this way the uranium bearing constituents of the crystalline rocks have become concentrated; these constituents have subsequently become oxidized and have given rise to a class of minerals different in some respects to those indicated previously; examples of this kind are the commercially important deposits of carnottite found within recent years in Colorado and Idaho in the United States.

A brief description of the principal uranium bearing minerals may not be out of place here.

The mineral uraninite, which includes a number of varieties such as cleveite, broggerite, and pitchblende based on slight differences in composition, is found as a primary constituent of some granite rocks and also as a secondary mineral along with ores of silver, copper, lead, etc. It is a heavy mineral with a specific gravity of about 9 to 9.7 (water-1); the lustre varies from sub-metallic through greasy to dull and the color from grey through green and brown to velvet black. It contains from 75 to 88 per cent. of oxides of uranium.

Gummite occurs in the form of rounded or flattened

pieces frequently with uraninite in dikes of pegmatite. It has a greasy lustre, and in color varies from reddish yellow to reddish brown. It occurs as an alteration of uraninite and includes a number of sub-varieties.

Then there are a number of other minerals more or less closely allied with these in point of composition and modes of occurrences, but which need not be touched upon here as so far they have not attained to any commercial importance.

Then we come to that class of uranium-radium minerals which are found in sedimentary deposits, and these for the time being at least bid fair to attain to the greatest importance commercially. Their mode of formation has already been touched upon. The principal mineral of this class is carnotite a compound containing vanadium, uranium, and potassium often with more or less adventitious materials. Carnotite is of a bright yellow color and appears both as a very fine powder and as a crystalline efflorescence.

Occurrence in Canada.

In Canada the number of localities in which uranium bearing minerals are known to occur is comparatively small and so far only small quantities have been obtained from them. Many years ago the mineral uraninite was reported from Mamainse on the eastern shore of Lake Superior and was described under the name of coracite. It was said to occur in a vein 2 in. in width in syenite in contact with a trap rock. Efforts have been made at various times within recent years to re-discover this vein but so far these have been fruitless. The mineral uraconite, a sulphate of uranium, has been observed lining cavities in the magnetic iron-ore of Snowdon in Peterborough county and a similar occurrence has been noted in Madoc in Hastings county; a pegmatite in the township of Lyndoch in Renfrew county has also yielded specimens of minerals possessing radio-active properties. These localities are in the Province of Ontario. In the Province of Quebec uraninite and its alteration product gummite have been observed at the Villeneuve mica mine in the township of Villeneuve and also in a pegmatite vein in Wakefield, both in Ottawa county; the mineral monazite, a phosphate of rare earths, which also possesses radio-active properties, has been found at the Villeneuve locality. In the township of Maisonneuve in the county of Berthier the mineral samarskite has been found in a mica-bearing pegmatite; this mineral was found by Hoffman to contain 10.75 per cent of oxide of uranium. Uraninite is also known to occur at a mica mine about 18 miles north of Murray Bay in the county of Saguenay. At this locality too a curious carbonaceous mineral resembling anthracite in its general appearance has been noted by Obalski. This mineral yielded 2.56 per cent. of uranium.

While as yet no commercial deposits of uranium ores are known to exist in Canada there is no reason to suppose that such may not be found, and prospectors would do well to maintain a close watch for anything that may contain this element. Special regard should be had for any minerals with a pitchy lustre and also for earthy or finely crystalline minerals having a bright yellow color. It might be well to provide oneself with one or two simple instruments for detecting radio-activity. An electroscope is particularly useful, but cannot always be carried about conveniently. For all practical purposes a scintilloscope is the most convenient instrument; one may be had for about a dollar, but it should be carefully tested with a mineral of known radio-active properties before taking it to the field and

great care should be taken to maintain its efficiency; its usefulness may soon vanish through careless handling.—Geological Survey, Department of Mines, Canada.

THE MOND PROCESS OF SEPARATING NICKEL AND COPPER*

By A. P. Coleman.

The bessemer matte produced by the Mond Company at Victoria Mines is shipped to Clydach, a suburb of Swansea, Wales, for final treatment by one of the most ingenious processes imaginable. It was discovered in 1889 by Dr. Carl Langer, working in conjunction with Dr. Ludwig Mond, that carbon monoxide, passed at a temperature not exceeding 80° centigrade over finely divided nickel, combined with the metal to produce a gas, nickel carbonyl, which could be decomposed again at a temperature of 180° C., thus depositing the nickel. The process was patented and an experimental plant was erected in 1892 at Smethwick, near Birmingham, to test it. As described by Roberts-Austen in 1899, the process was developed during some years of patient work, in which the plant had several times to be reconstructed to make it a practical success.

Essentially five operations are required in order to produce the nickel, (1) dead roasting to drive out as much of the sulphur as possible; (2) the extraction of about two-thirds of the copper of sulphuric acid the resulting sulphate of copper being sold in that form; (3) the reduction of the nickel and remaining copper to the metallic state by water gas or producer gas rich in hydrogen in an apparatus called a "reducer," the temperature of which is under perfect control, so that 400° C. is never exceeded; (4) from this apparatus the substance, now reduced to the metallic state, is taken through air-tight conveyers and elevators into another apparatus called a "volatilizer" in which it is subjected to the action of carbon monoxide gas at a temperature not exceeding 80° C.; (5) the nickel carbonyl thus produced passes into the "decomposer," a tower or horizontal retort heated to 180° C. so as to release the nickel in the metallic state.

The process is not complete in one passage through the five stages, however, and the materials are made to circulate for a period varying from 7 to 15 days between stages (3) and (4) until about 60 per cent. of the nickel has been removed as carbonyl. The residue from this operation, amounting to about a third of the original calcined matte and not differing much from it in composition, is returned to the first operation and follows the same course as before.

In operation (5) the carbon monoxide is released and is returned to the volatilizer to take up a fresh charge of nickel. When the operations are in progress the carbon monoxide gas and the partially reduced oxides of nickel and copper are continually revolving in two separate circuits which join and cross each other in the volatilizer (4). The nickel is deposited on granules of ordinary commercial nickel which are automatically removed after reaching a certain size; and the product contains between 99.4 per cent. and 99.8 per cent. of nickel.

Roberts-Austen describes the process as he observed it at Smethwick as follows:—

"The material under treatment during the author's visit was of Canadian origin, and had been received as calcined bessemer matte containing 35.4 per cent. of nickel, 41.8 per cent. of copper, and about 2 per cent. of iron. This material was first passed through a ball

*Extract from the monograph on the Nickel Industry, published by the Department of Mines.

mill and dresser with a sixty-mesh riddle, and was then treated in quantities of 3 cwt. in a small lead lined mixer with 200 lb. of ordinary sulphuric acid which had previously been diluted with about 20 cubic ft. of mother liquor from previous operations. The temperature of the mixture soon rises by the action between the copper oxide and the sulphuric acid, and is kept, by means of a steam jet, at a temperature of about 85° C., for half an hour. From this mixer, the charge is run out into a centrifugal hydro-extractor, provided with a filtering cloth, in which the solution of copper sulphate is separated from the solid residue containing the nickel. After the filtration of the charge is finished, the speed of the hydro-extractor is increased, and the residue is thus rendered sufficiently free from the liquor.

"The solution containing the extracted copper runs from the hydro-extractor into a well, from which it is pumped into crystallizing vats. After a period of about 8 days to 10 days, the crystals of copper sulphate are taken out of the vats and the mother liquor is mixed with fresh acid and is again used for the extraction of copper. As already mentioned, a small amount of nickel and a little iron are also dissolved in the sulphuric acid during the copper extraction, so that the mother liquor

reducing tower and discharges it through another rotary valve into this reducing tower.

"The reducer and the volatilizer in which the treatment with carbon-monoxide takes place, are fully described in Dr. Mond's patent (No. 23,665 of December 10, 1895). The reducer consists of a vertical tower about 25 ft. high, containing a series of shelves, which are hollow so as to admit of their being raised to a temperature of 250° C. by producer gas. The roasted matte falling on these shelves from above is stirred and made to descend from one shelf to that below it by rabblers actuated by a central vertical shaft. Water-gas passes up the tower to effect the reduction of the material. There are about fourteen of these shelves or trays in the tower. The five lower shelves are not heated by producer gas, but are cooled by a stream of water in order to reduce the temperature of the roasted and reduced matte to the temperature at which the volatilizer is worked.

"The volatilizing tower resembles the reducer, but the shelves are not hollow, as there is no necessity to heat them. The reduced nickel requires a temperature of only 50° C. to enable it to combine with carbon monoxide and form a volatile compound, and the matte and gas are sufficiently hot to maintain this temperature. In

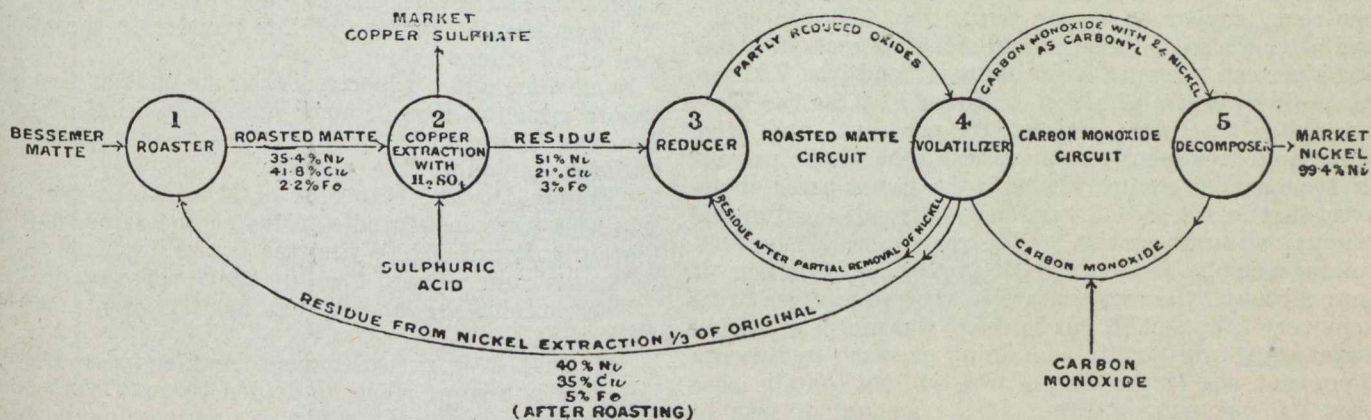


Diagram Illustrating the Five Operations Involved in the Mond Process

from which the copper sulphate has crystallized becomes gradually contaminated with these two metals. It is therefore necessary to replace some of the mother liquor from time to time by fresh water, and to recover the nickel from the solution. The simplest method is to evaporate the solution to dryness and to roast the nickel and copper sulphates so obtained. The oxidized material is again introduced into the main process. The copper sulphate crystals from the crystallizing vats are charged into a second hydro-extractor, where they are washed with a little clean water to remove all acidity; they are then dried and are ready for packing. The copper sulphate thus obtained is sufficiently pure for market, as it contains only 0.0 per cent. of nickel and 0.048 per cent. of iron.

"The residue from the copper extraction is taken from the hydro-extractor and stored in a bin until a sufficient quantity has been collected to make up a charge of 5 tons to 6 tons for the nickel extracting plant. It now contains 52.5 per cent. of nickel, 20.6 per cent. of copper, and 2.6 per cent. of iron. The material is charged by hand at the rate of half a ton per hour into a feeding hopper, which communicates, through a rotary valve, with the conveyer, consisting of a tube enclosing a revolving spiral, which transports the material to an elevator. This lifts the material to the top of the

the plant at Smethwick the volatilizer was made the same size as the reducer, but in the new plant it is somewhat smaller.

"The decomposer has been devised with much care, and has, in its present form, only recently been patented. The nickel is deposited in it, from its gaseous compound with carbon-monoxide, on granules of ordinary commercial metal. The arrangements by which this is effected are very ingenious, and may be described almost in the words of Dr. Mond's latest patent. The object is to obtain metallic nickel from nickel carbonyl in the form of pellets, which are specially suitable for the production of nickel alloys. For this purpose gases containing nickel carbonyl are passed through granulated nickel, which is kept at the temperature required for the decomposition of the carbonyl, about 200° C. The nickel which thus separates from the carbonyl becomes deposited on the granulated nickel, which consequently increases in size. In order to prevent cohesion of the granulated nickel, it is kept in motion. When a number of the pellets have attained a convenient size, they are separated by sifting without interrupting the depositing operation, the smaller granules being returned to receive a further deposit from the nickel carbonyl.

"A magnified section of a granule of nickel, shows a core of nickel with a crystalline and convoluted struc-

ture surrounded by concentric layers. The central core is ordinary commercial nickel, and the layers are nickel deposited from its carbonyl. In some cases granules of deposited nickel are found without any central core. These have grown from minute fragments of deposited nickel which have become detached during the course of deposition.

"The solid material from which the nickel is being extracted is kept circulating through the reducer and volatilizer for a period varying between 7 days and 15 days, during which time the oxides are gradually reduced to the metallic state and the nickel volatilized. When the material originally charged in has had the bulk of its nickel extracted it is run out through a rotary calciner roaster, which converts the metals into oxides, so that they may be treated for the second time with sulphuric acid and carbon-monoxide. The ratio between the nickel and copper in the residues from the nickel extraction is practically the same as in the calcined bessemer matte, with which the operations were started, but the amount of iron has increased by the removal of the copper and nickel, as the following figures show: Original matte contains, nickel 35.27 per cent., copper 41.87 per cent., iron 2.13 per cent. After the first treatment of copper and nickel extraction, the quantities are, nickel 35.48 per cent., copper 38.63 per cent., iron 4.58 per cent.; and after the second copper and nickel extraction, nickel 35.83 per cent., copper 35.56 per cent., and iron 7.82 per cent. The amount of nickel extracted in these two cases was, after the first treatment, 61 per cent., and after the second treatment 80 per cent. of the nickel present in the original matte. It must be remembered, however, that in the second treatment only one-third of the original amount remains to be treated, while the final residue is only one-tenth. To avoid the formation of iron carbonyl, the temperature in the reducer has to be kept very low, and if this is done, the nickel extracted from a matte originally containing as much as between 6 per cent. and 10 per cent. of iron will not contain more than 0.5 per cent. of iron. If the amount of iron in the residues rises above this percentage, the extraction of the nickel is very much delayed, on account of the low temperature which must be maintained in the reducer. It is necessary, in such a case, to re-smelt the residues before proceeding with the extraction of the nickel and copper."

The works at Clydach are equipped in the way described by Roberts-Austen but with many more units, so as to produce 1,700 tons of nickel, 7,000 tons of copper sulphate, and 800 tons of nickel sulphate including a little nickel ammonium sulphate. Dr. Langer states that the nickel now produced is 99.98 per cent. pure and is sold in the shot form to the Armstrong Co. for armor plate and to smaller firms of steel workers and producers of German silver and nickel plate. Some is sold also to Arthur Krupp, and to a pure nickel goods company at Berndorf near Vienna.

The works show none of the roughness and disorder of the usual metallurgical plant, but are as clean and scientifically managed as a laboratory, everything being accurately adjusted, and the temperatures of the different parts being frequently taken and recorded.

The gases employed in the process are very poisonous but so much care is taken as to joints and fittings that for eight years there have been no cases of poisoning.

The plant is run continuously except for a stop of three weeks in the year to clean flues and repair machinery; and the demand for nickel has increased so much that plans are made to double the present works.

Clydach, being in the midst of the Welsh anthracite and steam coal fields, supplies at a minimum of expense the varieties of coal needed for the production of carbon-monoxide and for other purposes in the running of the plant, as explained by Dr. Langer, and also gives a convenient distributing point for the sulphate of copper and other products resulting from the process.

ACCIDENTS FROM EXPLOSIVES.

The chief inspector of mines for British Columbia quite recently sent to all district inspectors of mines in that Province a circular letter, as reprinted below. Copies were also sent to managers of the larger mines.

In further reference to accidents from explosives in the metalliferous mines of the Province:

Drilling or picking into powder, either in miss-fire or cut-off holes or in the muck, accounts for a large percentage of the serious and fatal accidents in the metalliferous mines, and anything that can be done to reduce the number of these accidents will be of much value to the industry.

Within the past year the manufacturers of explosives have been placing on the market a non-freezing explosive, and several of the large producing companies have adopted the use of this powder to the exclusion of all others.

Some time ago a report reached me that at the Britannia mine, on Howe sound, where this kind of powder was in use, miss-fire holes had been drilled into without exploding the powder.

Through District Inspector of Mines John Newton, inquiries were instituted relative to the same, and on the authority of Mr. Wylie, the superintendent of the Britannia mine, I learn that the above reports are true.

The circumstances as stated by Mr. Wylie are as follows:

(1) That a workman named Pearson was drilling boulders in a stope when he drilled through a miss-fire hole containing six (6) sticks of non-freezing powder, with no explosion of the powder.

(2) That John McKinnon, a driller, was drilling a rise-hole in a stope when he drilled into a missed hole. This workman did not know he had drilled into powder until it came out of the mouth of the hole in the drillings.

(3) Mr. Wylie, the superintendent, reports seeing some of the explosive entering the rolls in the mill, and warning all the workmen near to run, expecting the powder to explode; no explosion resulted in this case. Several small explosions had occurred in the rolls while using the ordinary explosives.

It would seem from these facts that there is a greater margin of safety in the non-freezing explosive than in that formerly used, and this alone would justify the mine owner in investigating the same.

The benefits derived would seem to be:

1. Fewer accidents from actual contact with the powder by drill or pick.

2. No thawing required, reducing risks from thawing and extra handling in thawer.

3. Powder always in condition, reducing the chances of powder being unexploded.

The price of the powder is the same as of the ordinary dynamites, and the results in production of ore per lb. used are not affected.

The use of non-freezing powder by the prospector and small operating companies—where the means of thawing is often very crude—would seem highly desirable.

ORE DEPOSITS OF THE SIMILKAMEEN DISTRICT, B.C.*

By Charles Camsell.

Nickel Plate Mine.—The Nickel Plate mine is situated on the eastern slope of Nickel Plate mountain at an elevation of about 5,700 feet above sea level. The ore deposits in it are of contact metamorphic origin and occur at the contact of dykes and sheets of gabbro in limestones which have been altered by the gabbro. They are irregular in outline and have usually a well-defined boundary only on the side of the gabbro.

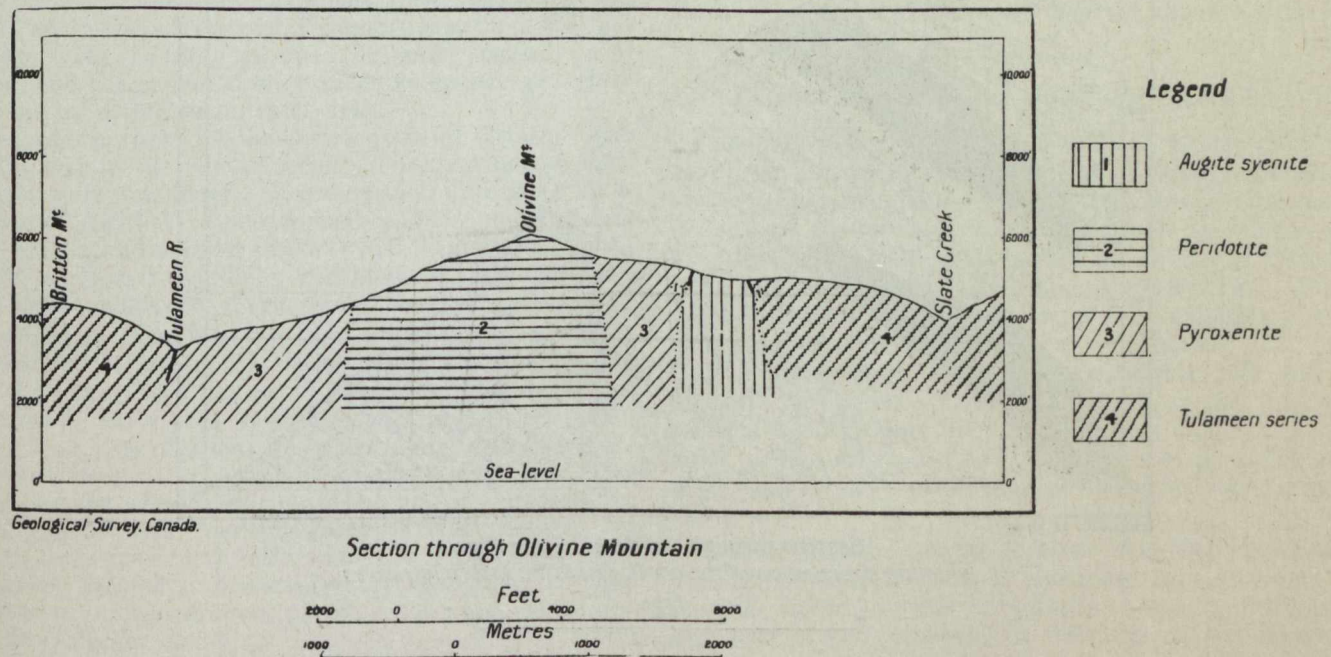
The gangue of the ore bodies contains minerals formed by the alteration of limestone, including garnet, epidote, diopside, amphibole, quartz, calcite and axinite.

The principal ore mineral is arsenopyrite, with which occur chalcopyrite, pyrrhotite, zinc blende, pyrite, native gold, and sometimes tetradymite. These minerals are distributed through the gangue in crystallized individuals, or fill minute fractures in it. The valuable content of the ore is gold alone, which in

the top of Nickel Plate mountain, and operates a system of electric and gravity tramways which carry the ore from the mines to the mill. The electric tramway is about a mile in length, while the gravity tramway is 10,000 feet in length, and drops nearly 4,000 feet.

The mill is situated at the town of Hedley and treats an average of 160 tons of ore per day. It is equipped with 40 stamps, two tube mills, and cyanide tanks, and is operated either by water power or steam. The ore being treated has an average value of about \$11 to the ton from which an extraction of 95 per cent. of gold is made. Up to 1913 a total of about \$3,250,000 in gold has been recovered from Nickel Plate ores mined.

Princeton Coal Seams.—On the east side of Similkameen River, at the end of the traffic bridge, the outcrop of a coal seam is seen. The total thickness of the



that now being mined, averages about \$11 to the ton. These deposits afford an excellent illustration of contact metamorphism induced by the intrusion of igneous bodies into calcareous rocks, and show the resulting alteration of the original carbonates to silicates. They illustrate also the formation of ore bodies by the transfer of ore material from the igneous rock to the sedimentary, under such conditions of temperature and pressure, that the constituents introduced, and those originally present and recrystallized, are intergrown together as a result of contemporaneous crystallization.

In the association of gold with arsenopyrite in deposits of this origin the Nickel Plate ore deposits are unique and have no known counterpart on the continent. In the classification of ore deposits, they are therefore placed in a division by themselves, and are called the "Arsenopyrite type" of contact metamorphic deposits.

The Hedley Gold Mining Company employs about 60 men in the Nickel Plate and Sunnyside mines on

seam is 25 feet, but it contains several small bands of clay. The associated rocks are shale and sandstone. The coal dips S. 30 degrees W. at an angle of 12 degrees and is traversed by a few normal faults which strike S. 45 degrees W. The throw is usually only a few feet, the downthrow being on the north-west side. The mineable parts of the seam are a bench 7 feet to 10 feet thick in the upper half, and another bench 7 feet thick in the lower half. Only the upper bench is at present being worked.

The coal is sub-bituminous, excellent for domestic use and for the manufacture of gas. A sample of the seam being mined gives the following proximate analysis:

	Per cent.
Moisture	16.17
Volatile combustible matter	37.58
Ash	4.58
Fixed carbon	41.67
	100.00

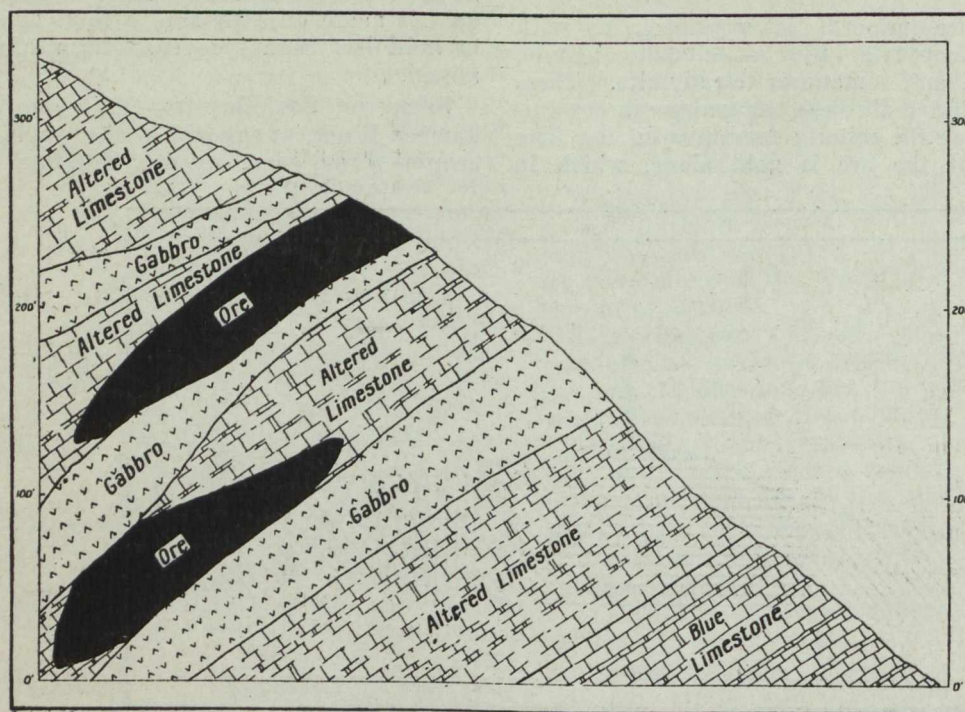
*Extracts from Guide Book, No. 9, prepared by the Geological Survey of Canada, for Twelfth Session International Geological Congress, August, 1913.

The coal-bearing rocks cover an area of about 40 square miles and virtually the whole of this area is taken up in coal mines. Prospecting and development work are being carried on at a number of points in the basin, but shipment of coal is being made only from the collieries of the Princeton Coal and Land Company, situated on the east side of Similkameen River, near Princeton. The coal is mined by an entry driven on the dip of the seam. The method employed is pillar and room, with the use of coal cutting machines.

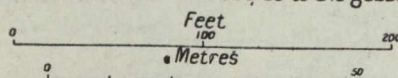
Tulameen Platinum Placers.—The principal streams in the district on which platinum bearing gravels have been found are: Tulameen River below Champion Creek; Slate Creek, Granite Creek, Newton Creek. The gravels are post-glacial in origin, and are found in the

The total amount of platinum obtained from the gravels has been variously estimated at 12,000 to 20,000 ounces. The present output, however, is only a few ounces annually.

Tulameen Diamonds.—The diamond bearing rocks are most conveniently seen on the Tulameen River at the mouth of Eagle Creek, 8 miles west of Tulameen Village. The river at this point cuts a valley nearly 3,000 ft. deep through the middle of a large stock composed of peridotite, pyroxenite and gabbro, which is intrusive in Triassic sediments and volcanics. A vertical section through the stock, given in the accompanying diagram, illustrates the relations of the various rocks to each other. The centre of the stock is composed of peridotite, and this is surrounded on all sides by a border of pyroxenite into which the peridotite passes



Section through the Nickel Plate Mine.
showing the relation of the ore bodies to the gabbro intrusives



stream beds and on the sides of the valleys at elevations not greater than 250 feet above the streams. Except in Tulameen River below Slate Creek they are not of very great extent. All the payable gravels contain both gold and platinum, the proportion varying in different streams and in different parts of the same stream. This proportion of gold to platinum varies in the streams mentioned from 4 to 1 to 1 to 1. The source of the platinum has definitely been traced to the elongated peridotite stock which crosses Tulameen River at Eagle Creek and extends south-easterly from there to the head of Newton Creek.

The mining of the platinum placers, which began in 1885, has up to now usually been carried on only by individual miners with the ordinary methods that such men use. Attempts have, however, been made at Eagle Creek, Slate Creek, and Granite Creek to mine by hydraulic methods, but none of these have been very successful. Old workings may be seen at several points on Tulameen River between Slate Creek and Eagle Creek.

by a gradual change in composition, the olivine of the one rock being replaced by the pyroxene of the other. Outside the pyroxenite is a thin border of gabbro, which in places passes into an augite syenite. The syenite, however, also occurs in intrusive relation to the pyroxenite. It seems clear that the three rocks were originally present in one common magma, which, in the course of injection into the overlying rocks and while gradually cooling, differentiated into three distinct types, the most basic in the central part and the most acid on the outside.

Chromite occurs in the peridotite in short irregular veins and in bunches, which are clearly segregations developed in the magma during cooling. Analyses made by Mr. R. A. A. Johnston of the Geological Survey of some of these chromite segregations, taken from the north slope of Olivine Mountain, yielded both platinum and diamonds in variable amounts. In making the original analysis the chromite was segregated into two parts, a magnetic and a non-magnetic part.

The non-magnetic part yielded three per cent. of diamond, and the magnetic part six per cent.

The diamond product obtained disintegrated to a powder shortly after being released from the rock, and the disintegrated particles were found on examination under the microscope to be individual crystals. Studied in thin sections, the diamonds were found to occupy small veinlets traversing the chromite.

Since the discovery of diamonds in the solid rocks the gravels of Tulameen River have been carefully examined. Gravel taken from the river in the neighbourhood of Eagle Creek was panned, and a large number of small diamonds obtained along with the black sand. Small rubies were also found to be present.

Some prospecting for diamonds of commercial size is being carried on in the valley of Tulameen River, but up to the present the results have not been satisfactory. Some diamonds have been obtained, but the largest is not bigger than a pin's head.

Merritt Coal District.—The town of Merritt is situated in Nicola Valley at the junction of Coldwater River with the Nicola. The district lies in the Interior Plateau region into which Nicola River has cut one of those deep, wide valleys, characteristic of the region. The bottom of the valley is about 1,900 feet above sea level, while the surrounding country stands 1,500 feet higher. The country is open or only sparsely timbered, and the slopes, though often steep, are generally covered by a thick mantle of drift.

The oldest rocks of the district are of Triassic age, and belong to the Nicola series. They consist of folded and metamorphosed volcanic flows, and some limestone and argillite. Unconformably above them are the coal-bearing Oligocene rocks which consist of sandstone, conglomerate, shale, and coal. These again are overlaid in places by more recent basaltic flows.

Particular Description.—Like other Oligocene areas in British Columbia the rocks about Merritt are believed to have been deposited in a lake basin and since elevated to their present position. The basin covers a superficial area of about 40 square miles, all of which, however, does not appear to be underlaid by coal. The rocks consist of sandstone, shales, and conglomerates, which dip at angles varying from 10 to 40 degrees. In places the strata have been folded into anticlines, and in others faulted and considerably displaced. They contain a variety of fossil plants from which their age has been determined.

The best natural section of these rocks is that exposed in Coal gully west of the town of Middlesboro. This was measured by G. M. Dawson of the Geological Survey of Canada, and in his report of 1877-78, he gives the following section in descending order:—

	Ft.	in.
Soft yellowish sandstone in thin beds.....	32	0
Coal, laminated, rather soft	15	4
Sandstone, rather soft, with some shale ...	89	0
Coal	5	4
Sandstone, with shale at the base	141	0
Coal, about	3	0
Sandstone, in thin beds	136	0
Coal, about	2	5

It is not definitely known how many workable seams of coal are contained within this basin, but there are four outcropping and being worked in the neighbourhood of Coal Gully, and two or three others in adjacent ground to the east, each of which, however, may be correlated with one or another of the four known seams. In the mines of the Nicola Valley Coal & Coke Company these four seams have thicknesses of 6, 10, 5 and 12 feet respectively.

An analysis of a sample of coal taken by R. W. Ellis of the Geological Survey and analyzed in the laboratory of the Survey is given below, and probably represents the general character of the coals of this field:

	Per cent.
Water	3.04
Volatile combustible matter	37.18
Fixed carbon	52.05
Ash (reddish white)	7.73
	100.00

Coke, per cent., 59.78. Firm, compact and coherent.

An estimate made by D. B. Dowling of the Geological Survey placed the total quantity of coal in this field at about 200 million tons.

Four companies are actively engaged in mining operations in this field, namely, the Nicola Coal & Coke Company, the Inland Coal & Coke Company, the Diamond Vale Coal & Iron Mines, and the Pacific Coast Collieries. The Inland Coal & Coke Company is producing about 100 tons of coal per day, while the Nicola Valley Coal & Coke Company produces annually about 200,000 tons. Room and pillar is the method of mining employed, and no coal cutting machines are used. The mines give employment to about 400 men.

CONSERVATION OF COAL IN CANADA.

Canada's dependence on the United States for its supply of anthracite coal is a point strikingly indicated in the report just issued by the Commission of Conservation, on the "Conservation of Coal in Canada." Practically all of the most populous portion of Canada lying between Montreal, Que., and Moose Jaw, Sask., relies solely on the United States for its supply of anthracite coal, further, there are indications that the United States may, in the comparatively near future prohibit the export of anthracite, and, as the only anthracite deposits thus far discovered in Canada, are confined to the area near Banff, Alta., it is of great importance that suitable substitutes be found as soon as possible.

Such a situation makes it clear that Canada should carefully husband her coal resources and, so far as possible, check all wasteful methods of mining and handling coal. With this end in view, the report suggests greatly needed changes in the form of coal-mine leases, the provisions of which should be carefully enforced by a competent engineering authority. This would go far towards preventing the careless practices followed at present in many coal mines. In addition to this, it is urged that the government should carry on investigations with a view to determining the suitability of slack and low-grade coals for use in gas producers for generating power, and their adaptability for the manufacture of briquettes for domestic use. By utilizing these inferior products in this way, not only would there be less waste, but the value of the public coal lands would be considerably increased.

Again, it is pointed out that central power stations situated in the vicinity of many of the lignite fields of Western Canada, could develop electric power for transmission to neighboring manufacturing centres. This would mean a great saving, especially in the case of lignites that will not stand shipping to any considerable distance.

The experience of Great Britain, the United States and other countries in the manufacture of coal bri-

quettes is given in some detail, and the method adapted to conditions in Canada are indicated.

Comparisons are made between the bee-hive ovens and the by-product ovens for the coking of coal and the economies effected by the latter over the former are clearly presented.

In addition, short descriptions are given of the principal coal mines in Canada, as well as of the by-product coke oven plant of the Algoma Steel Co., at Sault Ste. Marie, Ont. The report is well illustrated by means of maps, diagrammatic sketches and halftone engravings, and should prove of great value, not only to those directly engaged in coal mining, but to all who are interested in the economic welfare of the Dominion.

F. AUGUST HEINZE TAXATION CASE.

On March 12 Mr. R. S. Lennie, a special judge of the Court of Revision, sitting at Nelson, British Columbia, heard arguments by counsel for Mr. F. August Heinze and for the Government of British Columbia in a matter the chief point at issue in which is whether the Province of British Columbia has any right to tax Mr. Heinze on 307,800 acres of land in Kootenay and Boundary districts comprised in tracts representing one-half of the original land subsidy to the Columbia & Western railway from Trail, in Kootenay, westward to Midway, in Boundary district.

Under an agreement, dated February 11, 1898, between Mr. R. B. Angus and Sir Thomas Shaughnessy, representing the Canadian Pacific Railway Co., on one side, and Mr. F. August Heinze, on the other, the latter agreed to sell to the former the Columbia & Western railway (then partly constructed), smelting works at Trail erected and for several years operated by Mr. Heinze, and other interests, for \$800,000 and a one-half share in the Columbia & Western railway land grant from the Government as subsidy for the construction of the railway, but with a provision which gave Mr. Heinze the privilege of asking for possession of his share of the land whenever he should please to do so. Later the C. P. R. brought action in the Supreme Court of Canada against Mr. Heinze to compel him to select his half of the land, but failed, for the court found that partition could not be enforced and declared that none of the parties to the agreement of 1898—Messrs. Angus and Shaughnessy on the one hand and Mr. Heinze on the other—had any legal or equitable title to the land, the entire title being vested in the Columbia & Western Railway. In 1912 the Government of British Columbia agreed to purchase from that railway (which had meanwhile become a part of the Canadian Pacific system), the whole land grant, subject to the interest held by Heinze.

Lengthy arguments were submitted to the special judge, who declined to allow Mr. Heinze's appeal against the tax assessment of \$12,312 annually levied by the Government. Counsel for the Government stated that the position of the Crown is simply that the agreement under which Mr. Heinze still holds a one-half interest in the land "was a faked-up transaction to save Mr. Heinze from paying taxes. It would be a travesty on justice if by such a transparent dodge Heinze could escape taxation."

Mr. Heinze will carry his appeal to the Privy Council.

WESTERN FEDERATION CALLS OFF STRIKE IN MICHIGAN

(Houghton Mining Gazette.)

The strike of the Western Federation of Miners was voted off by a referendum of the strikers Sunday, April 14. This vote was canvassed by the district board at a meeting at Hancock yesterday. At the close of this session yesterday afternoon Secretary Hietela gave out the following statement:

"To whom it may concern: Complying with instructions of the district board, it was decided not to give any separate figures from each of the local unions. Total vote cast in favor of calling off the strike throughout the district, 3,104; total vote cast in favor of continuing the strike, 1,636; total vote, 4,740."

There was no explanation of the reason for not giving out official details and there were open doubts expressed among many of the strikers last night as to the correctness of the figures.

While the assumption was general on Sunday evening that the vote favored calling the strike off, the news that the referendum ends the only general strike the Lake Superior copper mining district has known in its long history was received with general satisfaction all over the copper country. Rejoicing was evident among all classes of people, the strikers more particularly, for it is generally known that the majority of them have all along wanted only the opportunity to express their desire to return to work. On every hand could be heard expressions of get-together sentiment and general inclination to help the strikers to get on their feet again.

Notwithstanding the official totals as given out by the strike leaders, the following table is generally accepted by those closely watching the strike as being accurate:

On the question of calling off the strike:

	For.	Against.
South Range	495	93
Calumet	281	391
Ahmeek.	600	72
Hancock.	365	255
Mass.	121	56
Total.	1,762	867

Secretary Hietela said on Sunday that he expected 8,000 votes, and he said yesterday that the vote was light. Observers of strike affairs in the several months past are of the belief that the vote was heavy. This gives nearly 3,000 active strikers, and there has been a doubt for months of even that strength.

Strikers Clamor for Work.

The stampede of the strikers began long before the vote even was begun. They were seeking work Saturday and all day yesterday they were at the mine offices looking for their old jobs. Reports from the offices indicate that 50 applied at Painesdale, 100 at Baltic, 75 at Trimountain, 150 at Quincy, 300 at Ahmeek, Mowhawk, Wolverine and the Calumet and Hecla properties.

At Quincy, Mohawk and Ahmeek a small proportion were given work at once. Quincy put on a considerable number in fact, and Ahmeek had 100 places open and they were filled. Mohawk and Wolverine will give the men work gradually as places can be found for them.

The policy of the Calumet & Hecla, announced by General Manager MacNaughton about two weeks ago, will be followed generally by all the companies. This is to take the names of the men who apply, each applicant being required to turn in his union card. As soon as work is found, the men will be selected from the listed applicants.

General Superintendent Knox of the Calumet & Hecla announced to the men yesterday that no work would be given to men from the outside, that the preference would in future be given to former employes.

The Tamarack is the only large property in the district that has not resumed operations. General Manager MacNaughton of the Calumet & Hecla, of which company the Tamarack is a subsidiary, is now in the east. The question of the resumption of the Tamarack will not be answered till his return. The mine will offer employment to about 1,000 men and with the numbers taken on at other mines the unemployed represented in the vote of Sunday probably will be taken care of almost wholly.

It is true that there are a few marked men in the district who will not be given work. These are men who have been concerned in violence, or who have helped to prolong the industrial discontent by reason of their inflammatory agitations. But this number is comparatively few.

Secretary Hietela says that any member of the Western Federation who cannot find work will be given money to get out of the district, but that this will apply only to men who cannot get work, not to men who will not work or who want to move on for the sake of moving.

Secretary Hietela says that various local headquarters of the Western Federation of Miners in the copper country will be closed at once, excepting the Hancock headquarters.

This strike and its failure, accompanied by the bitterest, most crushing and most complete defeat ever administered the Western Federation of Miners, one of the worst defeats ever gained over any body of organized labor, completely discredits the Western Federation of Miners throughout the labor world, in the opinion of copper country people. The federation has won but very few strikes and no important strikes in all its history of bloodshed and violence. Its history is a history of failures, mixed with murders of men, women and children, dynamitings, arson outrages, rapine, thievery and graft. It is officered practically by the same men to-day who controlled its early destinies.

Editorial Comments on the Michigan Strike.

Houghton Mining Gazette: Well, the great copper strike is off, officially off, nine months after it started. As soon as the strikers themselves had a chance to vote on it they declared themselves in favor of returning to work. Now the situation that confronts the mines of the district is to find places for the strikers. There is an oversupply of workmen.

In addition to the millions that the strike cost the strikers in loss of wages, the maintenance of the strike has required just about \$1,000,000 to finance. Most of this money came from the American Federation of Labor and from honest workingmen who were misled into liberal contributions to the cause of the strike by the misrepresentations in the newspapers and by the paid orators who did the collecting for the strike. The representatives of the American Federation of Labor who were at intervals in charge of the strike, never believed it could win. Neither did the American Federation of Labor countenance the strike. They simply made the best of a bad situation when they found that they could not help themselves.

When the strike started the Western Federation of Miners had but \$75,000 in the treasury. That money went rapidly. Then a loan of \$100,000 was secured from the United Mine Workers of Illinois. That deal was framed between Moyer and Walker, the same Walker

who openly advocated murder on the platform at the Indianapolis meeting of the United Mine Workers. Another little loan of \$25,000 was secured from a brewery union in Cincinnati. In actual cash contributions through the regular channels, the American Federation of Labor sent by far the larger sums, \$250,000 in all. And over \$200,000, it is estimated, came from various unions, straight to the strike managers, from various and divers locals affiliated with the American Federation of Labor. The strike cost the Butte union of the Western Federation more than any other organization, for that union is fat and rich and pays regularly. The average cost per member to the miner in Butte was \$25. In one month, through the regular assessment of a day's wages and by various contributions on the side the Butte contribution to the strike managers was \$80,000.

And now, nine months after the red socialists and the paid agitators succeeded in bringing about a period of riot and disorder, Mr. Mahoney, Mr. Miller, Mr. Tersich, Mr. Lowney and the others are nowhere to be seen. The men were permitted, finally, to vote their strike off. But none of the paid agitators are here to help them to secure jobs. The experience has been costly for the mining companies and more costly for the strikers. It has taught them not to believe the paid agitators. The chap who lives off the working men, who has his champagne dinners while the striker manages to get along on three dollars a week, is nowhere to be seen. He is in some other mining district now, doing the same tricks. He is somewhere else trying to stir up trouble. He is in a new field trying to bring about a strike. He quietly folded his tent and stole away into the dark night, just as soon as he saw that the inflow of money hesitated.

The fact, too, is generally acknowledged, that President Gompers of the American Federation of Labor did not desire a Congressional investigation and refused, at first, to favor such a step. But Moyer and Walker by their conduct and attacks on Gompers, at the Indianapolis convention, put Gompers in such a position that he had to do their bidding in this regard, and when he asked his lobby at Washington to see that the Congressional committee investigated the strike, action was secured without delay. The committee has not yet reported.

All of the mass of claims that the foreign agitators circulated among the strikers have proven untrue. The strikers believed the agitators when the strike started. Promise after promise was broken. Before the strike started the men were led to believe that \$1 a day benefits would be paid. Perhaps the most insidious lie that was circulated referred to Government ownership. The men were told that the Government would take over the mines and employ none but Federation workingmen. When Secretary Wilson of the Cabinet of the President made his speech at Seattle advocating Government ownership, this was utilized for the purpose of proving the claims of the agitators. Then it was promised that Wilson himself would come and take charge of the mines. That was held out for weeks as a bait. Then when the Congressional committee arrived and spent a month here, the very presence of the Congressmen was used by the strike leaders as evidence of Federal assumption of mine management. And some politicians seemed willing and anxious to participate in this misrepresentation of the situation.

Officially declaring the strike off, while it has, practically, been off, in effect, for some months, is a good thing and will clear the atmosphere. It means a more prosperous copper country. It means a larger working force at all of the mines than ever before in the history

of the district. It means higher wages for all of the men and it means greater efficiency in every way.

Ishpeming Iron Ore: While the strike in the Michigan copper district was over several months ago so far as the mining companies were concerned, the Western Federation voted on ending or continuing it, Sunday, with the result that it was practically unanimously agreed to call it off. It was a foregone conclusion. There were a number of Finn farmers, who came in from the country surrounding the mining towns, these protesting by their votes against the ending of the strike officially. They had been drawing money from the federation and marching boldly with the miners for months. Their interest was easily seen. There were also a number of men in other vocations than mining, some of them being mere loafers, who also protested against the movement to end the strike. And then there was a considerable number who knew they could not get back into the mines anyhow, and these desired the continuance of the strike benefits. For several days before the vote was taken the men knew what the result would be. The federation desired to get away from the expense. The copper country strike had cost their organization not far from a million dollars, and there wasn't the ghost of a show of winning. Many men, knowing the benefit rate was to be cut savagely, or taken away altogether, tore up their cards and sought employment at the mine offices.

And so it has ended. It didn't help the copper miners, or the federation or the mining organizations or the district generally. It injured everyone concerned in it directly or indirectly with the exception of the organizers and money handlers. These fellows did exceedingly well.

And the finish finds many men out of employment who will not be able to get back into the mines where they used to win good wages. They have been so bitter and unreasonable, so defiant of law and order, so un-American and altogether so undesirable that they cannot hope for reinstatement in their old jobs. These men will have to leave the Michigan copper country for that country's good. They will have to seek employment elsewhere and, if they succeed in getting it, their experience in Michigan may be valuable to them in showing them the error of their ways and in making them better citizens. The copper country is fast building up to its old-time activity and output of the red metal. It is a good country, fair to men, and with many advantages not possessed by some other mining fields. It will soon be back into its old stride and will have learned something from the experiences of the past half year that will be valuable in the years to come. The Western Federation will have gained some late information, too, on the subject of recognition of its body. It has discovered that there is yet another place it cannot dominate through a reign of terror, through murder and arson, or through any of the tactics it has always employed. It has found one district with a real backbone where the Stars and Stripes wave high and triumphantly over the red rag of anarchy, and where the spirit of independence is still alive and doing business.

Detroit Free Press: The strike, as an industrial weapon, has been badly discredited by the outcome of the copper country's lamentable disturbances. Estimates of the cost of this prolonged struggle are that the mine owners are out of pocket some four million dollars, the strikers a million in wages, the federation another million in strike benefits and Governments, county, state and federal, something like \$700,000. The figures are probably high—so far as the mine owners are concerned,

mining being a peculiar business and decreased output not necessarily representing ultimate loss as the ore unextracted remains to be marketed later. But allowing for all possible defects in the calculations the expense of this strike has been very great.

It is a question whether any strike is good business policy, regarded from the point of view of the public which must bear the cost of all industrial operations in the end, and upon which the added waste of these struggles falls harshly, but in this instance very much of the loss has no excuse whatever for existence. The copper strike has been prolonged months beyond the time when it could possibly effect any result. The issues had narrowed down last fall to the single dispute over recognition of the federation, and as to this everybody concerned agreed long ago that there was absolutely no chance for getting together. That the owners would not recognize the federation under any circumstances has been reported time and again by the investigators of the disturbance, and the inevitable might as well have been accepted last October as now. All the loss that has accrued in the meanwhile, whether to employers or employees, has been inexcusable.

If this added waste was caused by the impossibility of bringing the dispute to a termination earlier, the fact is all the more a reflection on the value of the strike as a weapon. It is a very poor implement that is so difficult to control, and in these times of seeking after efficiency it ought to be abandoned speedily and some better substitute found for settling differences. If the prolongation of the hopeless struggle was the deliberate work of interested leaders it is highly discreditable to them, and the more convincing an argument against the character of the organization which inaugurated this futile and costly warfare.

Michigan's experience with the Western Federation of Miners has been anything but agreeable. Without approving all that the mine owners stand for, the people of the state will generally be pleased that the federation has lost and will trust that it has been driven out for a very long time.

General sympathy will be felt for the dupes of the federation agents, the men who put their trust in it and who have been left by it to clamber out of their difficulties as best they may. The mines will take back as many of them as possible, no doubt, but there will be many sufferers.

Detroit News: The strike illustrates the ease with which workingmen of foreign extraction are imposed upon by the most worthless representatives of organized labor. The Western Federation and the I. W. W. fatten on the ignorance of aliens whose notions of conditions in America are sadly distorted and whose anti-governmental sentiments, still alive from the injustices of other lands, are ready to flare into flame under the misrepresentations of ignorant and anarchistic agitators.

The Daily News, Nelson, B.C., states that Mr. R. F. Green, M.P. for Kootenay district, has informed the president of the Nelson Board of Trade that an appropriation sufficient to carry to completion the experiments in electric smelting of lead-zinc ores, now being conducted at Nelson by the Mines Branch of the Canada Department of Mines, will be provided for in the Dominion Finance Minister's supplementary estimates. Mr. W. R. Ingalls, of New York City, who is consulting engineer to the Mines Branch in connection with the zinc-smelting investigations, was at Nelson about the middle of April.

BY-PRODUCT COKE OVENS.

Canada and the United States are far behind Germany and other foreign countries in realizing the economies resulting from the coking of coal in by-product ovens. In Germany, at the present time, little or no coke is made in retort (by-product) ovens. When the economies which may be effected by the use of such ovens have been so clearly demonstrated, not only by plants which have been constructed in Europe, but also by plants at Sydney and Sault Ste. Marie in Canada, and in the United States, it is difficult to understand why they are not more generally adopted in Western Canada. No doubt the greater cost of installing them, and the lack of markets for the resultant by-products have hindered progress in this direction in the past. The development of the West, however, is rapidly creating local markets for the products, and in view of the higher yield the greater initial cost should no longer be a deterrent.

The following are some of the economies which may be effected by the use of by-product coke ovens as against the use of beehive ovens:

1. The quality of the coke is just as good for metallurgical purposes as coke made in beehive ovens.
2. The yield of coke from by-product ovens is from 10 to 15 per cent. higher than the yield from beehive ovens.
3. While the cost of installation per oven is greater for the by-product than for the beehive oven, the capacity is from three to six times as great.
4. In the by-product ovens the following by-products are saved:

Gas.—Coke oven gas is an ideal fuel and may be used for burning under boilers, driving gas engines, for domestic purposes and illumination.

Ammonia.—The ammonia may be recovered as ammonium sulphate or ammoniacal liquor. In the former case it is used as a fertilizer, while, in the latter, it can be used for making many chemical products and also as the freezing agent for refrigeration purposes.

Tar.—The tar may be used in the manufacture of various kinds of roofing, for covering pipes, etc. It can be distilled, yielding pitch, creosote, light oils, carbolic acid, etc. Creosote is especially useful as a wood preservative. Pitch is used for road making and as a binder for the manufacture of coal briquettes.

Fuller information on this important subject can be obtained by persons interested from a report entitled "Conservation of Coal in Canada," by W. J. Dick, M.Sc., recently published by the Commission of Conservation.

WESTERN RAILWAY RATES.

The Canada Railway Commission, after having taken all available evidence relative to freight rates charged by railways in the Canadian West and given the question close consideration, has made a lengthy report in which many changes in rates are announced. The rate on pig iron from Port Arthur and Fort William to Winnipeg is reduced from 20 cents per 100 lb. to \$3 per gross ton or approximately 13.4 cents per 100 lb. Ores, concentrates, and smeltery products in and from British Columbia have been found to constitute a large proportion of the railway freight traffic of that Province, and the rates in force are remunerative only in the sense of contributing to the general prosperity. Reductions are made in rates for coal from mines in Manitoba, Saskatchewan, Alberta, and British Columbia to a number of specified market points.

BOOK REVIEWS

LINDLEY ON MINES—By Hon. Curtis H. Lindley, of the San Francisco Bar—A Third, New Edition, 1914—Three Volumes, Buckram—Price, \$25.00.

The first edition of this masterly treatise on the American law of mines and mining was issued in November, 1898. The sale was immediate and remarkable, resulting in the entire edition being exhausted in less than two years. The second edition, published in 1903, met with even greater favor, and it was not long before the then available stock was sold out.

The new edition not only faithfully develops and brings down to the present moment with authorities, the text of the earlier work, but presents to the American Bar the first philosophical text discussion of many new, vital questions that have arisen only within the last few years, with close practical analysis of related legislative enactments and regulations, including a discussion of pertinent adjudications.

The new chapters include a complete review of the recent U. S. policy of "Withdrawal of Mineral Lands," defining the legal effect of "Executive and Ballinger Withdrawals" and of the "Congressional Withdrawals" following.

The third edition includes an enlarged special treatment of "Public Land Classification," agricultural as well as mineral, the latter embracing, among others, special enactments, regulations and decisions covering coal lands, oil lands, phosphate lands, potash deposits, etc. Particular attention is devoted to the important "Alaskan Problems," including recent U. S. and territorial legislative enactments affecting mining of the Alaskan coal lands.

Not only will the work be of special value to all lawyers interested in mining laws, but will be of practical service to mining engineers. It takes up the geological problems related to mining as raised in litigation, and which have reference to the question of "Title to Mines." The problems related to "Extraterritorial Rights" have been given full attention, with an analytical treatment of "Rights on Secondary Veins."

A complete table of cases gives ready access to the many cases cited. Over a thousand new cases have been fully analyzed, discussed, cited and included as new matter in the third edition.

THE MINING WORLD INDEX OF CURRENT LITERATURE—Last Half Year 1913—By Geo. E. Sibley, Associate Editor Mining and Engineering World—Published by Mining World Co., Chicago—Price \$2.00—For sale by Book Department Canadian Mining Journal.

The fourth volume of this very useful publication, like previous volumes, covers the world's literature on mining, metallurgy and kindred subjects, and embraces all references of importance to the literature of the field it represents.

In the Mining World Index of Current Literature are classified all articles appearing in periodical magazines published in America, Europe, Africa and Australia on mining, mining engineering, metallurgy, mining geology, mineralogy, etc.; also the valuable publications of the world's mineral industries, institutes and affiliated engineering and technical societies, as well as publications of the Federal and State geological surveys and mining bureaus. All these are indexed by a simple plan, easily understood.

To all who have frequent occasion to refer to current literature, the Mining World Index has become a necessity. We recommend it to our readers.

PERSONAL AND GENERAL

Mr. A. McKnight, who died recently at San Diego, California, whence he had gone in the hope that the change of climate would benefit his health, was for years master mechanic at the Union Colliery Co.'s coal mines, Comox district, Vancouver island, B.C. Later he filled a similar position at the Britannia Mining and Smelting Co.'s smelting works at Crofton, also on Vancouver island, and during quite recent years he had charge of all mechanical equipment at the Britannia Co.'s copper mines and concentrating works near Howe sound, in Vancouver mining division, B.C. He was born in Scotland 66 years ago, and went to British Columbia in 1884.

Mr. Geo. Watkin Evans, of Seattle, Washington, who some time ago examined and reported on coal areas in the Groundhog field, northern Skeena district, B.C., and has since been to the Matanuska field, Alaska, superintending mining coal for a thorough test on one of the United States Navy ships, was among the visitors who took part in the meeting of the Western Branch of the Canadian Mining Institute, held on Feb. 19, in Vancouver, B.C.

Mr. J. W. Powell, formerly of Coleman and Bellevue, Alberta, and afterward with the Columbia Coal and Coke Co. in the Tulameen country, British Columbia, is now superintendent for the Cottonwood Coal Co. at Windham, Montana.

Mr. A. H. Gracey, of Nelson, B.C., who has for some time past been developing the Venus gold mine at a lower level than had been worked in past years, has been on a visit to California.

Mr. C. R. Hamilton, K.C., who in the capacity of a special commissioner, took much evidence in the case of Wm. Wilson, overman at one of the Coal Creek Colliery mines of the Crow's Nest Pass Coal Co., has suspended Wilson's certificate for four months, having found proved the charge of gross negligence on the part of Wilson in permitting the use of a defective haulage cable, the breaking of which resulted in the death of a miner.

Mr. John Hunt is now general superintendent of the Western Fuel Co.'s several coal mines in the neighborhood of Nanaimo, Vancouver Island, B.C., for which company Mr. Thomas R. Stockett has for years been general manager.

Mr. L. Muller, superintendent of Mr. John Hopp's hydraulic placer-gold mines in Cariboo district of British Columbia, has returned to Barkerville, Cariboo, after having spent part of the winter in California.

Mr. E. H. Nutter, of San Francisco, chief engineer for the Minerals Separation American Syndicate, was at the concentrating mill of the Silverton Mines, Ltd., on Four-mile creek, Slocan, B.C., recently, in connection with turning over to the company a flotation process plant the syndicate had put in and had been operating until all necessary adjustments had been made.

Dr. J. Bonsall Porter, professor of mining engineering at McGill University, Montreal, has arranged for his summer mining school to visit Nelson and Rossland in West Kootenay, and Phoenix in Boundary district, British Columbia, during May.

Mr. J. M. Ruffner, general manager for the North Columbia Gold Mining Co., operating in Atlin camp, British Columbia, while in the Eastern States some time ago, organized a company to work placer-gold ground on O'Donnell river, Atlin district, along which much ground has been taken up during the last two years.

Mr. Chas. H. Palmer, Jun., of Los Angeles, California, has been examining the Hartney mining property, near New Denver, Slocan lake, B.C., for United States people interested in it.

Mr. Neil J. Ogilvie, of Ottawa, who spent the last three field-work seasons on the Alaska-Yukon boundary survey, went to the Pacific coast last month on his return to Yukon Territory. It is expected that the boundary survey will be completed this year.

Mr. B. A. Stimmel, chief chemist at the Consolidated Mining and Smelting Co.'s smelting works at Trail, B. C., has been away for a short time on a vacation.

Mr. J. J. Streit, of Whitewater, B.C., superintendent of the John L. Retallack & Co.'s group of mines, has been taken to Rochester, Minn., to there obtain special surgical treatment.

Mr. J. T. Towers, who last season had charge of test drilling on Big Valley creek, Cariboo, B.C., has returned to that district and will this year direct drilling operations on the Williams Creek flats to determine whether there is sufficient gold-bearing gravel there to warrant a gold dredge being put in to recover the gold.

Mr. Harry H. Yuill (B.Sc., with British Association medal, McGill, 1909), is now in South Africa in charge of important mining operations.

Mr. Chester F. Lee, of Seattle, Washington, recently visited the Similkameen, B.C., a second time to examine placer-gold ground along the Similkameen river, above the town of Princeton.

The Western Branch of the Canadian Mining Institute will hold a meeting in Nelson, B.C., during the latter half of May. The organization meeting of that branch was held in Nelson in January, 1908, so that the branch has been in active existence six years.

A meeting of the Toronto branch of the Canadian Mining Institute was held on Saturday, April 18.

Mr. C. F. Cretney is in charge of operations at the Jupiter mine, which has been reopened by the McKinley-Darragh-Savage Mining Company.

Mr. G. G. S. Lindsey, president of the Canadian Mining Institute, has returned to Toronto after attending the annual meeting of the Nova Scotia Mining Society at Sydney.

Mr. George H. Garrey wishes to announce that he recently severed his connection with the American Smelting & Refining Co., and allied companies, as their chief geologist, and has opened an office as consulting mining geologist and engineer at 115 Broadway, New York.

Mr. F. F. Combemale has joined the staff at Cordova mine, Cordova, Ont. Mr. Combemale is a mining engineer of wide experience, who has spent considerable time in Venezuela.

Mr. Frank Oliver has accepted the position of assistant manager at Cordova mine.

On April 9th, M. Beatty & Sons, Welland, launched a dipped dredge for the C. S. Boone Dredging & Construction Company of Toronto. This dredge is of steel, 100 ft. long, 40 ft. wide 10 ft. deep at bow, and 8 ft. at stern. It is of the crane type the crane being 40 ft. long. The dipper is of 5 cubic yards capacity, the dipper handle is 61 ft. long, which will allow it to make 40 ft. of water.

Mr. C. C. Mendham who has been connected with the outdoor staff in Toronto of the Herbert Morris Crane & Hoist Company Limited, has now been appointed Resident Engineer in Berlin for the same company.

The 108th meeting of the American Institute of Mining Engineers will be held at Salt Lake City, Utah, August 10-14, 1914.

The Northern Electric Co., has issued a bulletin describing low voltage lighting outfits suitable for installation in places remote from the territory covered by central station power lines.

OBITUARY.

Thomas Starbird, who died at Wilmer, East Kootenay, B.C., on April 12, was born in Maine, and during his boyhood lived in Haverhill, Massachusetts. In later years he lived at Great Falls, Montana. Ten or eleven years ago he was manager of the property formerly known as the McDonald mines, but acquired by a syndicate of Eastern United States men, who operated in East Kootenay, under the name of the Ptarmigan Mines of the Selkirks. The Ptarmigan mine has been inactive about nine years, owing to lack of transportation facilities. Mr. Starbird, however, took up land and remained in the district ever since, where he was well and favorably known. He has left a widow and two young sons.

The Westinghouse Electric & Manufacturing Co. reports a number of important orders recently received from the metal mining industry, indicating lively activity along the line of metal mining. The following are among the more important orders received:

United Verde Copper Co., Jerome, Ariz., one 24 panel switchboard for the new smelter at Clarkdale; El Paso (Texas) Smelting Company, two 55 h.p. direct-current back-g geared motors for operating Stillwell Pierce converters; Magna Copper Co., Superior, Ariz., nine A. C. squirrel-cage motors, totalling 267 h.p. and 90 k.v.a. transformer capacity for operating copper concentrating mill being built by the General Engineering Company. An interesting point in connection with this installation is that the energy for operating the motors will be supplied from the Roosevelt Dam Power project. Anaconda (Mont.) Copper Mining Co., six 150 k.v.a. oil-insulated, self-cooling transformers for the Washoe Smelter; also 14 A. C. motors totaling 290 h.p. for driving mine ventilating fans. National Copper Mining Co., Wallace, Idaho, one 4-ton barsteel locomotive for tandem operation with a locomotive previously purchased. Utah Copper Co., Magna, Utah, four 15 h.p. slow-speed vertical D. C. motors for direct connection to agitators used in oil flotation process. This is a new application especially developed by the Westinghouse Elec. and Mfg. Co., after considerable experimentation; also two 50 kw. motor generator sets with switchboards; and three 100 kw. transformers. Alaska Gastineau Mining Co., Juneau, Alaska, two 18-ton barsteel locomotives for underground and surface haulage. This locomotive is especially designed for a low height in order to permit them entering the mine. Kennecott (Alaska) Mines Co., one 50 h.p. back-g geared A.C. motor and three 25 k.v.a. transformers. Alaska Juneau (Juneau, Alaska) Mining Company; one 5½-ton storage battery locomotive for 30-inch gauge equipped with two V-50 motors and 68 cells of A-10 battery. Mason Valley Mines Co., Thompson, Nevada, two 15 h.p. D.C. back-g geared motors with brakes, controllers and resistors, for use in ladle tilting in copper smelter. Tonopah Belmont Co., Tonopah, Nevada, one 75 h. p. A.C. motor used for driving an Aldrich pump. Brunswick Consolidated Gold Mining Company, Grass Valley, Cal., three 100 k.v.a. oil-insulated, self-cooled transformers.

BRITISH COLUMBIA.

It is customary for one of the members of the Government to deliver an address at the annual meeting of the Victoria, British Columbia, Board of Trade. This year the duty was undertaken by Hon. W. J. Bowser, Attorney-General for the Province. In the course of a carefully-prepared and well-received address, which was an interesting and valuable survey of the resources and progress of British Columbia, he made brief reference to iron manufacture, and to the mining industry of the Province, as under:

"My opinion is that in British Columbia we are making very substantial, almost rapid, progress in our industries, and we may be sure that capital, which is always looking for profitable investment, will seize upon any favorable opening as soon as it presents itself. Take the iron industry, for instance. A great many people wonder why, with our immense accessible deposits of iron ore and many other natural advantages for the manufacture of iron and steel, we have no blast furnaces. I am told that it is not altogether the price of labor or the lack of material that accounts for this, but that it is the price of fuel, or, in other words, the cost of producing coke, which is three or four times that on the Atlantic side. I am also told, however, that the electrolytic system of smelting, by the use of water-power is being rapidly developed in certain countries in Europe, and that by the new processes it is possible here to establish a small and paying industry with comparatively limited capital. Thorough investigation along these lines should be well worthy of the serious attention of our Boards of Trade.

"I need not refer at length to the mining industry. It is now on a well-established basis, producing steadily and in a substantially increasing ratio year by year. Its problems have, as the result of years of experience, been largely solved, and the policy of our Premier, the Minister of Mines, has been to carefully and justly administer his Department with as little change of laws or regulations as possible, and the result has been satisfactory in the extreme. The revenue of the Province from mining during the current fiscal year, exclusive of the tax on coal lands, is estimated at \$580,000, an amount likely to be considerably exceeded, which is a fair return from the industry involving so much capital, representing as it does more than 25 per cent. of the dividends paid to mine operators."

A definite announcement has been published to the effect that the Northern Navigation Co., one of the most important corporations operating in Alaskan and Yukon waters, has sold its steamers, barges, and terminal facilities to the American Yukon Navigation Co., and the latter will continue to transact the transportation business to all points on Yukon river and its tributaries. The Northern Navigation Co., which was controlled in San Francisco, California, operated 43 steamers and 54 barges, and owned terminal facilities in Alaska. The American Yukon Navigation Co. is stated to be backed largely by English capital, and to be part of a big organization which includes the White Pass and Yukon Route, owning and operating the railway from Skagway, at the head of Lynn canal, to Whitehorse, in Southern Yukon, and steamers and winter stage lines thence to Dawson.

Granite from a quarry near Nelson, B.C., is being used in the erection of a Mormon temple at Cardston, Southern Alberta.

YUKON.

Dr. Alfred Thompson, member of the Canadian House of Commons for Yukon Territory, recently presented H.R.H. the Duke of Connaught, Governor-General of Canada, with an invitation from the Arctic Brotherhood, Dawson, to visit the Yukon next summer. Accompanying the invitation, which was written on caribou skin and enclosed in a gold sack, was a beautiful lamp made for the Brotherhood by a Dawson lady artist, Miss Ogburn. The lamp is triangular in shape and is made of caribou skin decorated with designs peculiar to the Arctic region. On the upper part of the lamp are a gold pan, pick and shovel, emblems of the Arctic Brotherhood, with real gold nuggets being poured from the pan. On the sides of the lamp are photographs illustrative of scenes in the North—the midnight sun, aurora borealis, a garden in Dawson in summer, a steamboat passing through Five Finger rapids on Yukon river, a train on the White Pass-Yukon railway, and a view of the city of Dawson, the whole having a most picturesque effect. On one side of the lamp is burnt a verse from one of Service's poems descriptive of the Yukon. His Royal Highness expressed himself as being delighted with the present, and requested Dr. Thompson to convey the members of the Arctic Brotherhood his warmest thanks for their invitation, which, however, he keenly regretted he could not at present accept, since he would not be able to visit the Yukon during the current year.

BEAVER LAKE.

A press despatch from Prince Albert, Saskatchewan, states that approximately 500 mineral claims had been staked by the middle of April at Beaver lake since public attention was several months ago turned to that part of the Province as a promising field for gold. On Saturday, April 11, registrations of 104 locations of claims were made at the Dominion Land Office, Prince Albert, which number constituted a record for any one day, but lately the rush to the field has been such that it is expected that record will soon be surpassed.

ONTARIO MAGNETITE ORE DEPOSITS.

The Iron Trade Review in its March 12 issue says: Recently there has been offered to the iron interests a proposition which on the face of it appears to be exceedingly interesting. It relates to a reported deposit of magnetite in Ontario near Sunridge, north of Parry Sound. The deposit is included in an area recently acquired by certain Pennsylvania interests. It has been test-pitted to some extent and about a year ago some drills were used in the exploration of the property. The owners now come forward with a claimed tonnage of 100,000,000 tons and submit several assays to indicate that the ore will run 60 per cent. in iron. It has long been known that there were deposits of magnetite in that locality, some of which have been considered of commercial importance, but none of the information which has been made public up to this time indicated any figures within a long range of these claims. The property has been examined several times within the past few months by representatives of large iron ore users and recently it has been reported that a Pittsburgh company had made an offer for the property after a preliminary examination. The deposit is near one railroad and could be easily transported to a deep water harbor on Georgian Bay and thus become available for distribution at lower lake ports. It will be interesting to

watch the verification of the claims in regard to this property and particularly in view of the fact that, if it is of large magnitude, it will be a factor in supplying the American and Canadian market and will have some advantage in a shortened lake transportation haul over any of the deposits in the Lake Superior country.

DOMINION ASSAY OFFICE, VANCOUVER, B.C.

The quantity of gold contained in 783 lots received at the Dominion Assay Office, Vancouver, during the calendar year 1913 was 111,479.95 oz.; net value was \$1,448,625.37. Corresponding figures from five earlier years follow: In 1912, 527 lots, 59,068.83 oz., \$974,077.14; in 1911, 442 lots, 39,784.70 oz., \$647,416.38; in 1910, 490 lots, 46,064.31 oz., \$746,101.92; in 1909, 573 lots, 48,478.60 oz., \$789,267.94; in 1908 (nine months), 590 lots, 90,175.48 oz., \$1,478,893.74. It will be seen that the last mentioned year, or rather nine months' period, was the only one in which the receipts for 1913 were exceeded. Going back to the first year on record—the fiscal year 1901-1902—the gold receipts were generally comparatively small, the chief exceptions having been a value of \$1,153,014.50 in 1901-1902, and \$751,693.97 in 1907-1908 fiscal year. It is still the custom to send the gold received at the Dominion Assay Office in Vancouver to the United States Assay Office in Seattle, Washington, and not to the branch of the Royal Mint at Ottawa.

ALGOMA STEEL CORPORATION.

Sault Ste. Marie, Ont.

Mr. J. Frater Taylor, president of the Lake Superior Corporation, in a statement regarding the increase in the iron and steel duties, says:

"The changes will benefit the industry as a whole, but in our specific case, that is the case of the Algoma Steel Corporation, the promise of definite assistance in the manufacture of the larger sizes of structural steel is a decisive step forward and will enable the Algoma Steel Corporation to immediately progress with its plans for the installation of a heavy structural mill of large capacity. This has been contemplated for some time and now that protection is afforded in respect of rolled sections over 35 pounds a yard there is some incentive to our taking the necessary steps to mature our plans and to arrange our finances.

"Nothing definite has been done in the matter of encouraging mining of iron ore, but an investigation is promised and it is hoped that this will bear fruit."—Financial Times.

MAP OF WHITE RIVER & CHISANA DISTRICTS.

The Geological Survey of Canada has just published a map showing Canadian routes to White River district, Yukon, and to Chisana district, Alaska. The map shows waggon roads, Government trails, navigable water routes and winter routes, rough trails, winter roads and road houses. The map shows the road from Whitehorse to Dawson, the road from Whitehorse to Kluane and the trails from Kluane, Dawson and Fort Selkirk to the White River and Chisana districts.

CORDOVA MINE.

Mr. P. Kirkegaard announces that the Cordova mine, Peterboro, Ont., will soon be in operation. Financial assistance has been secured and the litigation brought about by differences among the owners has been disposed of.

SPECIAL CORRESPONDENCE

PORCUPINE, SWASTIKA AND KIRKLAND LAKE

The Hollinger four weekly report for March 25 shows that there was again an increase in the gross profit, although the value per ton was considerably lower, but on the other hand costs were lower by about a dollar a ton. The periods March 25 and February 25 compare as follows:

	Feb. 25	March 25.
Gross profit	\$11,679.60	\$121,641.23
Net surplus	721,805.68	753,446.91
Total costs per ton..	5.518	4.328
Average value per ton	17.50	13.30
Milling costs	1.313	1.117
Mining costs	2.373	2.116

Mr. A. R. Globe, assistant manager notes that operations were under normal conditions in the period of March 25th, in contrast with the four weeks ending Feb. 25, when a break down in power caused a lessening of production. It will be noticed that while production was maintained a rich stope had to be pulled in order to keep the general average. The comparative

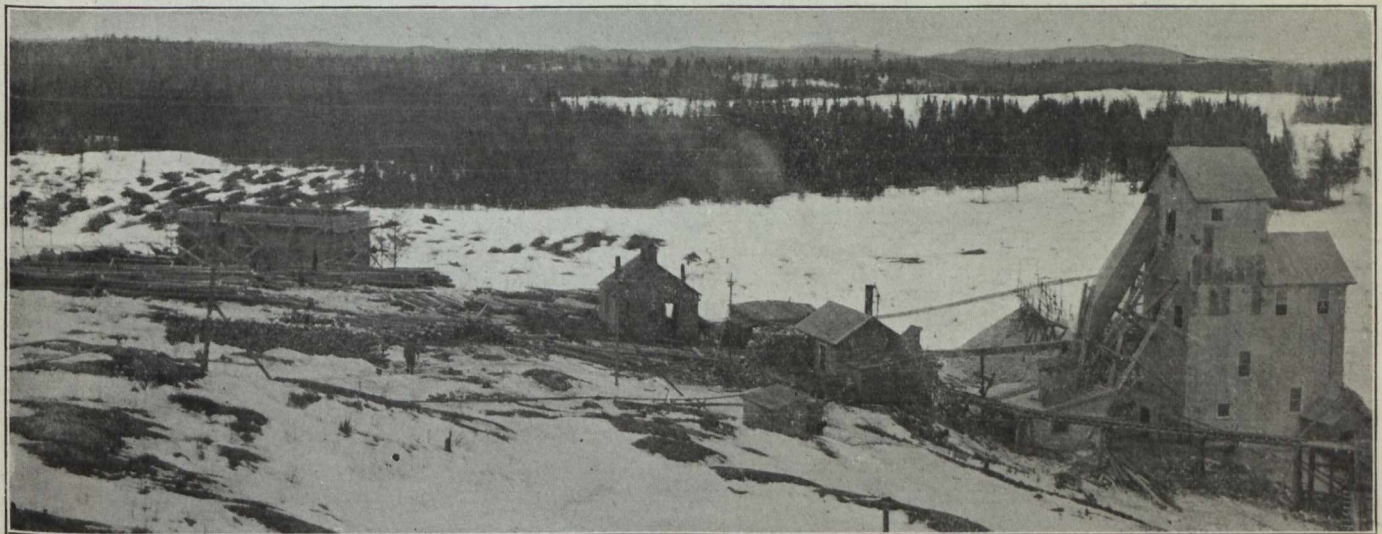
with an average width of 3 ft. of \$42 ore. This vein is entirely in the porphyry. From the No. 3 shaft a vein only about 6 in. wide is being followed in the conglomerate. It will average \$92 to the ton. All development so far is on the 75 ft. level.

Work is proceeding with a small compressor, and is necessarily slow until the hydro-electric power from Charlton is available for the whole district.

Dome.—The official report of operations for the Dome mines for the month of March shows that both tonnage and average value per ton were a little better than in the preceding month. There was milled 14,970 tons. The value of gold produced was \$87,657. The mill was operated for 88 per cent. of the possible running time.

A preliminary summary of mining operations at the Dome shows that for the twelve months ending March 31st, 145,210 tons was milled of a value of \$1,204,263, giving an average value of \$8.29 per ton in gold recovered.

Goldfields, Ltd.—A contract has been let to sink a shaft 200 ft. below the open cut at the Goldfields, Ltd., at Larder Lake. An endeavor will be made to open up



Tough-Oakes Mine. New Compressor House at Left

low value per ton for the period ending in March is a reaction from this pulling of reserve ore. The costs show a welcome declination from the high level obtaining at the beginning of the year. A fall of more than a dollar a ton in a month is noteworthy.

The assistant manager, Mr. A. R. Globe, comments upon the reports as follows: "The mill ran 94 per cent. of the possible running time, treating 14,820 tons, of which 541 tons were treated for the Acme gold mines. The average value of Hollinger ore treated was \$13.30 per ton; approximate extraction \$96.40; milling costs were \$1.117 per ton.

During the period a new ore body, 6 ft. wide, at \$12 per ton, was crosscut on the 200 ft. level. Diamond drilling on the 100 ft. level, with lateral holes, located two new ore bodies of medium grade ore, 13 and 31 ft. in width respectively. General development amounted to 766 ft. and diamond drilling 880 ft.

Teck-Hughes.—Development of the Teck-Hughes at Kirkland Lake is proceeding very satisfactorily under the management of Mr. A. H. Smith. An ore shoot 120 ft. long has now been developed on No. 3 vein,

new levels and put in sight ore of a more profitable grade than has been milled heretofore.

Jupiter.—The McKinley-Darragh-Savage Mining Co. started work on the Jupiter on Good Friday, Mr. C. F. Cretney, for many years superintendent of the Savage at Cobalt, taking charge of operations. The water has been lowered in the shaft down to the 200 ft. level already, and the plant is being overhauled. The No. 2, or main shaft, of the Jupiter is down to the 300 ft. level and a winze on the main vein gives an additional 100 ft. It is proposed to continue the winze down another 100 ft., giving a total depth of 500 ft.

The Jupiter shareholders ratified the agreement with the McKinley-Darragh in Montreal on May 8th, and the purchasing company lost no time in getting to work.

Tough-Oakes.—Development of the No. 3 vein at the Tough-Oakes mine is very satisfactory. At 90 ft. the vein which is being followed down shows 12 in. of \$500 ore. At 100 ft. a drift will be started on the vein.

The 300 ft. level at the main shaft has now been es-

tablished. There is no change in the formation and the vein continues about the same width and with much the same values.

Work is being delayed by inadequate power. It was hoped that hydro-electric power would be available by May 1st. Good progress has been made, but it is hardly expected that it will be ready by that time. The installation at Charlton has been completed.

Swastika.—Prospectors report some good discoveries in the vicinity of Sesikinika and Kenogami, north and west of Swastika. This part of the country has only been very lightly prospected, and results so far have justified efforts to discover more veins.

COBALT, GOWGANDA AND ELK LAKE

Peterson Lake.—After a lengthy dispute as to the boundary between the Savage mine and the Peterson Lake Mining Company's property, the McKinley-Darragh-Savage Co. staked approximately four acres of property adjoining the Savage, and which they allege is open for staking. The mining recorder at Hailey.

This area is shown on geological maps of the Department of Mines as belonging to the Gould Consolidated lease of Peterson Lake Mining Co. The action has aroused great interest in the camp, inasmuch as the land staked is right in the centre of the most interesting section of the camp. The area staked is all conglomerate, and although nothing of importance has been discovered upon it, the results being obtained on the Gould and Seneca give it a high potential value. Discovery was made from the 200 ft. level of the Savage, a crosscut being continued into the ground disputed.

There is little doubt that the dispute will be aired in the courts.

Nipissing.—The net earnings of the Nipissing showed a substantial increase, being \$261,378, against less than \$200,000 during the preceding month.

The discovery of the month was made in a long crosscut from the Meyer vein. It is two in. wide of 1,000 oz. ore. It is now in broken ground and if precedent is to be relied upon will improve as the drift draws away from the faults. This vein, which is supposed to be No. 98, has not been encountered previous-



Shaft on No. 3 Vein, Tough-Oakes Mine, Kirkland Lake

ly underground, though it shows on the surface as cobalt ore with a little silver.

A depth of 900 ft. has been attained at No. 64 shaft and crosscutting to the main vein is proceeding.

The high grade mill treated 184 tons and shipped 696 oz. of fine silver. The low grade mill treated 6,802 tons.

The diamond drilling on Peterson Lake has been completed. The diabase-slate contact was found at 300 ft. and the slate-Keewatin contact at 334 ft. The diamond drill has now been set up on Cart lake, with the purpose of picking up the extension of the Seneca-Superior vein.

The hydraulic pump will be moved from Cobalt to Peterson Lake as soon as a very small area on the west side of Nipissing hill has been cleared.

Kerr Lake.—The pumps used for dewatering Kerr lake have been started up again. During the winter a considerable amount of water has flowed back into Kerr Lake from the sorting plant of the Kerr Lake.

bury accepted the staking, as the area showed it to be open on the maps. The application is made in the name of Mr. T. R. Finucane, manager of the McKinley-Darragh-Savage Mining Co., and is described as follows:

“A point of land formerly under the waters of Cart lake, in the north-west corner of lot 5, concession 4, township of Coleman, commencing at the point where the boundary line between Con. 4 and 5 join the east shore line of Cart lake, thence in a south-westerly direction along the old shore line to No. 2 post, thence in a north-westerly direction along the old shore line to No. 3 post, thence north along the old shore line to No. 4 post, where shore line joins the boundary between concessions 4 and 5; thence east along the said boundary line to point of commencement. The claim was staked on April 10th, in the name of T. R. Finucane, license No. 11290B, by G. E. H. Booth, license No. 5178F. The discovery post is located 166 ft. from No. 1 post.”

This is considered rather fortunate than otherwise, since it is hoped to be able to pump out a good deal of mud lying at the bottom of the lake. This mud must be cleaned out of the bottom of the lake so that the workings can be carried to the surface.

Gould.—Upon the Gold Consolidated lease on Cart Lake the vein which was struck at the 200 ft. level has been picked up again at the 280 ft. level in a cross-cut from the bottom of a winze. The vein here is an inch and a half wide, and in the 20 and 30 ft. of drifting done appears to be much stronger than at the upper level.

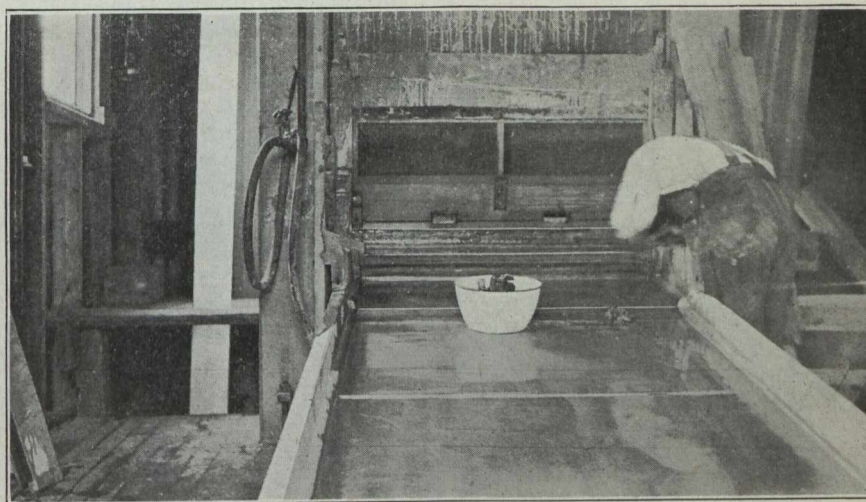
Caribou-Cobalt.—Owing to the fact that the Dominion Reduction cannot take as much ore as they can produce the Caribou-Cobalt is now sending 50 tons of ore a day to the Northern Customs mill. The Northern Customs mill is now treating La Rose and Caribou-Cobalt ore and will take up their contract with the Chambers-Ferland on May 1st.

The Green Meehan mine at North Cobalt is now in the hands of the sheriff. The machinery and plant has been seized and will be sold for debt. The Green

the United Mine Workers of America are slowly, though reluctantly, realizing that they will not succeed in compelling the companies owning the collieries to come to their terms. Their places in the mines have already been filled, and more coal is being produced than can at present be sold.

East Kootenay.

Society Girl.—A few men have been sent up to the Society Girl mine to resume work after the winter shut down. The Society Girl group, as described in the official annual report, consists of seven Crown-granted mineral claims, situated two miles to the south-east of the town of Moyie, just over the summit of the first range of hills lying east of Moyie lake, and an altitude of from 5,000 to 5,200 ft. at the upper workings, or 2,000 ft. above the lake. It has for years been owned by the Society Girl Mining Co., composed of working miners and prospectors, with Mr. Charles Farrell as the chief moving spirit. In some years the miners have been paid for their work chiefly in shares of the company, so that the enterprise has been much



Amalgamating Plates, Tough-Oakes Stamp Mill, Kirkland Lake, Ont.

Meehan was one of the famous mines of the district in 1906 and 1907, but the high grade was very shallow. It has been leased a number of times, but never met with any success.

BRITISH COLUMBIA

Mining is being resumed in those metal mining districts in which winter conditions necessitated a temporary suspension of work while the snow was deep. In the placer gold camps preparations are being made for the ensuing season's work. Coal mining is at present least satisfactory of all classes of mining in the Province, for although labor difficulties no longer seriously interfere with production of coal, demands are comparatively small. This is due to a mild and short winter, so far as affects interior mines, and to foreign coals and fuel oil having secured a strong hold of markets that prior to the Vancouver Island coal strike were supplied chiefly from Coast coal mines. It is hoped, though, that gradually a return will be made to former activities. Meanwhile there are more coal miners obtainable for Island mines than there is regular work for, and the strikers who still stay with

in the nature of a miners' co-operative partnership. Though, without money to pay for extensive development, much work has been done by the shareholders. The workings are chiefly open cuts and prospect shafts, which have exposed ore in a number of places. One adit was driven 250 ft. and ore stoped to the surface 80 ft. above, about 700 tons having been taken out. Another adit, about 40 ft. lower, was driven 800 to 900 ft. The country is much broken near the surface, which has made the vein irregular in the upper workings, but it is thought that the strata will be undisturbed at depth, as was the case in the St. Eugene mine, situated near to Moyie. The ore is galena, containing on an average .5 oz. silver to one per cent. of lead; it occurs in a quartz gangue and is associated with some zinc. Near the surface it is chiefly lead carbonate with some galena.

Similkameen.

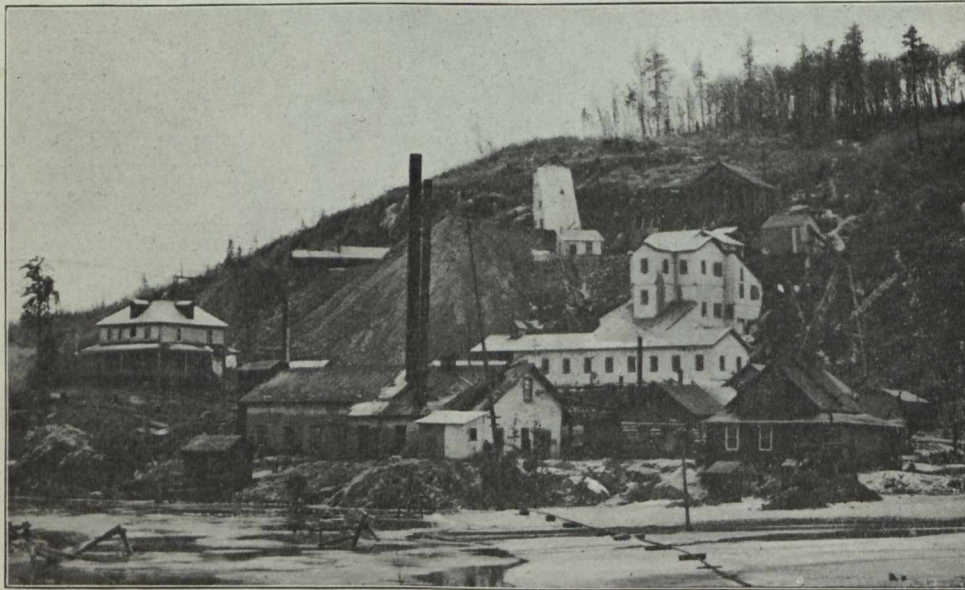
Platinum Placers.—It is reported at Princeton that the placer leases of Coulthard, Kirkpatrick, McGowan, and Snowden Bros. have been acquired by American capitalists. The ground covered by these leases is known as the Roany placers. It is situated along Tula-meen river, between Granite creek and Princeton, the

most westerly part being a short distance below the confluence of Granite creek with Tulameen river. From its junction with the Similkameen river at Princeton, the Tulameen for fully 25 miles, up to the mouth of Champion creek, has been for many years worked by placer miners for gold and platinum. Mr. Charles Camsell of the Geological Survey of Canada, in his report on the "Geology and Mineral Deposits of Tulameen District" (Memoir No. 26, 1913), states that there is some evidence that the Tulameen placer deposits were worked to a limited extent many years before 1885. In that year they came into considerable prominence through the discovery of coarse gold on Granite creek. For the few years following, the district produced remarkably well for such a small area, and about 1891 it came to be recognized as the most productive platinum region on the North American continent. Since then the production has steadily declined year by year, until it has become so small that placer mining is now done in only a very small way by a few miners here and there along the river and its tributary creeks. The streams that have yielded an appreciable amount of gold or platinum or both are: Tulameen

of Canada of diamonds in chromite segregations in the peridotite of Mt. Olivine, Mr. Camsell found many small diamonds in gravels of Tulameen river.

Lillooet.

Attention is again being called to the mining possibilities of Cayoosh creek, in both lode and placer mining. It is well known that years ago Chinese took much placer gold out of this creek. One local merchant repeatedly stated that he had bought more than \$200,000 worth of gold from them, and that this amount represented only the exchange for the supplies they had purchased from him. Although there is now difficulty in finding out what parts of the bars in the creek have not been worked, higher water bringing down fresh gravel each season, and so effacing indications of where work has been done in the past, it is known that there is gold-bearing ground on the creek above high-water mark, some within ten miles of Lillooet, adjacent to old claims from which much gold was taken—ground that has not been worked to any extent. Such places are above Gold basin—where there are possibly half a dozen claims—both sides of the stream above the mouth of Cottonwood



Penn-Canadian Silver Mine, Cobalt, Ont.

river, Granite creek and its tributary Newton creek, Collins gulch and Cedar, Slate, Bear, Hine, Eagle, Champion and Boulder creeks. The river has not been proved to be everywhere productive in gold or platinum. The reason for this is not apparent, but it is probably because bed rock is not easily reached in some parts of it. Mining has been carried on in three separate sections, namely, near the mouth of the river at Princeton; about two miles below Granite creek, including the Roany placers above mentioned; and between Slate creek and the mouth of Champion creek, along a length of five or six miles. Other facts in connection with the mineral resources of the Tulameen are noteworthy, namely, that (1) the platinum recovered from the gravels of the district has been variously estimated at from 10,000 to 20,000 oz.; that (2) Prof. J. F. Kemp, Columbia University, in 1900 spent three months in the district investigating the original source of the platinum of the placers (see U. S. Geol. Survey Bull. 193); and (3) that after the discovery by the Geological Survey

creek, and still farther up Cayoosh creek. The gold up there is coarse and easily saved, but as a rule the wash is heavy, so that placer miners are not likely to get much gold without working the ground thoroughly.

Skeena Mining Division.

The Granby Consolidated Mining, Smelting & Power Co., which in March commenced smelting operations at its new reduction works at Anyox, Observatory inlet, has not yet blown in a second blast furnace, owing to difficulty in obtaining sufficient competent machine miners to allow of ore being got out of the Hidden Creek mines in large enough quantity to keep two furnaces supplied. This is a contingency that had not been taken into account by those who had expected a comparatively large production of copper at the new smeltery almost immediately after making a commencement to smelt the ore. The company has done what it could to attract men in sufficient numbers, by erecting accommodation buildings of modern style and providing them with con-

veniences and furnishings, ensuring comfort to those who occupy them. Now that winter has been passed through, there is a long season of good weather to be expected. It is hoped that when it becomes known in other mining camps that conditions underground are satisfactory and accommodations for miners even better than in some of the old established camps, while communication with "the outside" by steamer is frequent, and supplies of all kinds easily and quickly obtained, that many experienced and capable machine men will go to Hidden Creek, where employment is now regular and will be lasting.

General Notes.

Work has been resumed at the Rambler-Cariboo silver-lead mine and concentrating mill, the melting snow now supplying sufficient water to run the Pelton wheels that operate compressor and mill machinery.

The Nelson "Daily News" has published a news item stating that during March 2,020 tons of copper ore was shipped from the British Columbia Copper Co.'s Queen Victoria mine, near Nelson, to the company's smelting works at Greenwood.

On the Coast it is reported that Tonopah-Belmont Co., of Philadelphia, Pa., has acquired an option of the gold mining property of the Surf Inlet Gold Mines, Ltd., situated on Princess Royal island, and that conditions of the provisional sale require that a stamp-mill and cyanide plant, to have a treatment capacity of 400 to 500 tons of ore a day, are to be erected and equipped by the first mentioned company.

An interesting reminder of the early days of Rossland camp is contained in the following excerpt from "Spokesman Review," of Spokane, Washington, which under the heading of "Twenty Years Ago To-day," on April 5, reprinted the following news item: "The first steamer-load of ore from the Le Roi mine was taken down the Columbia river from the Trail landing to Northport on Monday. There was 987 tons at the landing, the result of the winter's work; the steamer took away 64 tons."

During the period from January 1 to April 7 of this year there has been treated at the Granby Con. Co.'s smelting works at Grand Forks, Boundary district, 323,141 tons of ore, of which 315,909 tons was from the company's mines at Phoenix and 7,232 tons was custom ore. The quantity of blister copper shipped to the refinery during the same period was 5,578,550 lb.

A report has been published in Vancouver that the Horsefly hydraulic gold mine will be operated during the coming summer. It is also stated that several other placer gold mines in the Horsefly section of Quesnel mining division, Cariboo district, will be worked as well.

GRANBY.

Boston, April 27.

A call has been sent Granby Consolidated stockholders for a special meeting to be held May 13, "for the purpose of authorizing directors to borrow and secure repayment of moneys for purposes of the company up to \$3,000,000."

President Nichols of Granby Consolidated, in supplementing recent report to stockholders, says that on March 16 the first furnace at Hidden Creek smelter went into commission, and the second started April 11.

"The new plant starts up in a very gratifying manner, and while it is yet too early to give exact smelting figures which will be reached, enough has been

learned to warrant assumption that we shall deliver refined copper in New York at less than ten cents a pound.

"Under our charter directors are not permitted to borrow in excess of \$1,000,000 without sanction of stockholders. As our output of copper will be more than doubled, a large portion of which will at all times be in transit, additional working capital will be required and directors should be in position to take advantage of temporary loans whenever it is more desirable than to sell bonds which can be paid off at 110."—Boston News Bureau.

In our last issue we published a despatch from Vancouver stating that the delay in starting the new smelting plant of the Granby Cons. M. S. & P. Co. was caused by a break in the dam. We are advised by our B. C. correspondent, Mr. E. Jacobs, that no such accident occurred. Mr. Jacobs also calls attention to the fact that the Granby Co.'s engineers estimate that at the Hidden Creek property there has been developed about 9,000,000 tons of ore, carrying 2.2 per cent. copper, besides a large quantity of lower grade ore.

DANE MINING CO.

According to the secretary of the company, the Dane Mining Co., Ltd., owns 240 acres of patented lands in the townships of Teek and Lebel, all in one block, good buildings and an up-to-date plant. About 72,000 tons of low grade copper ore has been blocked out. The company shipped 62 tons of 8.4 per cent. to the smelters at Chrome, N.J., in January of this year. The works have been closed down since December 1st, 1913, partly on account of damages sustained by fire and the lack of sufficient power. The company's properties are very promising and will, no doubt, be further developed in the near future. The location of the Dane mines is two and a half miles directly south of the Tough-Oakes gold mines in the Kirkland Lake district. Mr. Shirley Ogilvie is president and Mr. Alex. McKinnon is secretary-treasurer of the company.

THE IRON INDUSTRY.

According to reports from Ottawa the Government proposes to institute an enquiry by the Mines Department into the iron resources of the country and improved methods of treating iron ore.

Mr. Frederic Nicholls, Consul for Portugal, Toronto, has received the following letter from the Commercial Association of Lisbon, Portugal: "Being desirous of enlarging our commercial business, especially the foreign one, the directors of the Association have approved of the installation of a room for catalogues of the most important commercial houses in the world, in order to have our business men acquainted with prices of all articles in the world's market, and for the above reason we ask you to be kind enough to invite by the most practical means the commercial houses of your district that export their products to present their catalogues to the Association."

PAINKILLER LAKE.

Mr. H. C. Crow, of the Cartwright Gold Fields, Ltd., states that it is the intention of the company to sink a shaft on one of the veins on the property at Painkiller lake. The report of Mr. E. W. Phillips states that deposit contains gold tellurides.

MARKETS

STOCK QUOTATIONS.

(Courtesy of J. P. Bickell & Co., Standard Bank Bldg., Toronto, Ont.)

April 23, 1914.

New York Curb.

	Bid.	Ask.
American Marconi	3.75	4.00
Alaska Gold	26.12	26.38
British Copper	1.50	1.75
Braden Copper	8.00	8.12
California Oil	285.00	290.00
Chino Copper	39.38	39.50
Giroux Copper	.25	1.00
Green Can.	30.00	31.00
Miami Copper	22.37	22.75
Nevada Copper	14.18	14.75
Ohio Oil	163.00	166.00
Ray Cons. Copper	20.37	20.62
Standard Oil of N. Y.	207.00	209.00
Standard Oil of N. J.	395.00	399.00
Standard Oil, (old)	1340.00	.....
Standard Oil (subs)	940.00	.....
Tonopah Mining	6.12	6.38
Tonopah Belmont	7.00	8.00
Tonopah Merger	.55	.56
Inspiration Copper	16.50	17.50
Goldfield Cons.	1.43	1.50
Yukon Gold	2.50	2.62

Porcupine Stocks.

	Bid.	Ask.
Apex	.02½	.03
Dome Extension	.08¼	.08½
Dome Lake	.41	.41½
Dome Mines	8.00	8.50
Foley-O'Brien	.19	.21
Hollinger	15.90	16.00
Jupiter	.10½	.11
McIntyre	.28	.31
Moneta	.02	.04
North Dome	...	.05
Northern Exploration	2.25	2.75
Pearl Lake	.07	.07½
Plenaunum	...	.50
Porcupine Gold	.09¾	.10
Imperial	.01½	.02
Porcupine Reserve	...	.07
Preston East Dome	.02	.02½
Rea	.15	.20
Standard	...	.01
Swastika	.02	.02¼
United	...	.01
West Dome	.10	.12
Porcupine Crown	.75	.90
Teck Hughes	.12	.14

Cobalt Stocks.

	Bid.	Ask.
Bailey	.03	.03¼
Beaver	.28	.29
Buffalo	1.00	1.15
Canadian	.06	.08
Chambers Ferland	.20½	.21
City of Cobalt	.47	.50
Cobalt Lake	.45	.50
Coniagas	7.00	7.50
Crown Reserve	1.23	1.26
Foster	.06	.07
Gifford	.02½	.03

Gould	.02¾	.03
Great Northern	.09¾	.10
Hargraves	.02½	.03
Hudson Bay	74.00	78.00
Kerr Lake	4.00	4.15
La Rose	1.40	1.43
McKinley	.61	.63
Nipissing	6.30	6.40
Peterson Lake	.37	.38
Right of Way	.03	.04
Rochester	.02	.03
Leaf	.01¾	.02
Cochrane	.35	.50
Timiskaming	.14½	.15
Trethewey	.20	.25
Wettlaufer	.06	.07
Seneca Superior	2.75	3.00

TORONTO MARKETS.

April 24.—(Quotations from Canada Metal Co., Toronto).

Spelter, 5¼ cents per lb.

Lead, 5 cents per lb.

Tin, 39 cents per lb.

Antimony, 8½ cents per lb.

Copper, casting, 15 cents per lb.

Electrolytic, 15 cents per lb.

Ingot brass, 10 to 15 cents per lb.

April 24.—Coal—(Quotations from Elias Rogers Co., Toronto).

Anthracite, \$8.25 per ton.

Bituminous, lump, \$5.25 per ton.

GENERAL MARKETS.

April 22.—Connellsville coke, (f.o.b. ovens).

Furnace coke, prompt, \$1.85 to \$1.95 per ton.

Foundry coke, prompt, \$2.35 to \$2.50 per ton.

April 22.—Tin, straits, 35.60 cents.

Copper, Prime Lake, 14.50 to 14.75 cents.

Electrolytic copper, 14.20 to 14.30 cents.

Copper wire, 15.50 cents.

Lead, 3.80 cents.

Spelter, 5.15 to 5.25 cents.

Sheet zinc, (f.o.b. smelter), 7.00 cents.

Antimony, Cookson's, 7.15 to 7.25 cents.

Aluminum, 18.00 to 18.25 cents.

Nickel, 40.00 to 45.00 cents.

Platinum, soft, \$43.00 to \$44.00 per ounce.

Platinum, hard, 10%, \$46.00 to \$47.50 per ounce.

Platinum, hard, 20%, \$49.00 to \$51.50 per ounce.

Bismuth, \$1.95 to \$2.15 per pound.

Quicksilver, \$38.00 per 75-pound flask.

SILVER PRICES. New York London

	cents.	pence.
April 9	58½	26½
" 10	58¾	...
" 11	58¼	26½
" 13	58¼	...
" 14	58¼	26½
" 15	58¼	26½
" 16	58¼	26½
" 18	58¼	26½
" 17	58¼	26½
" 20	58¾	26½
" 21	58¾	26½
" 22	58½	26½
" 23	58½	26½
" 24	58½	26½