THE CANADIAN MINING JOURNAL

VOL. XXXIV. TORONTO, May 15, 1913. No. 10

The Canadian Mining Journal

With which is incorporated the

"CANADIAN MINING REVIEW"

Devoted to Mining, Metallurgy and Allied Industries in Canada.

Published fortnightly by the

MINES PUBLISHING CO., LIMITED

Head Office - Room 36, Canadian Birkbeck Building, 10 Adelaide Street East, Toronto.

Branch Office - - - - - - - 34B Board of Trade Building

London Office - - - Walter R. Skinner, 11-12 Clement's Lane London, E.C.

U. S. A. Office - Ward & Smith, 931 Tribune Building, New York

Editor

J. C. MURRAY. B.A., B.Sc.

SUBSCRIPTIONS—Payable in advance, $2.00 a year of 24 numbers, including postage in Canada. In all other countries, including postage, $3.00 a year.

Advertising copy should reach the Toronto Office by the 8th, for issues of the 15th of each month, and by the 23rd for the issues of the first of the following month. If proof is required, the copy should be sent so that the accepted proof will reach the Toronto Office by the above dates.

CIRCULATION.

"Entered as second-class matter April 23rd, 1908, at the post office at Buffalo, N.Y., under the Act of Congress of March 3rd 1879."

CONTENTS.

LEGISLATURE NEEDS

The session at Ottawa is drawing to a close. Nothing has been done as regards mining legislation, nor is there much possibility that anything can be done this year. The Naval Bill has, of course, occupied almost completely the attention of the House. And this has been but one of the evidences of the costliness of His Majesty's Loyal Opposition. How far the blocking tactics may have been necessary from a political point of view is not for us to say. Yet we believe that we are expressing the view of the generality of Canadian citizens when we state that the whole naval incident, or series of incidents, has been nauseating. Not only has the proper administrative business of the country been relegated to the background, but a large number of urgent questions have been given no consideration whatsoever.

Some weeks ago we drew attention to the carelessness of the Dominion Government's attitude towards the mining industry. Let us here quote one paragraph from our published editorial:

"There has been ample mincing of words and phrases heretofore. The Canadian Mining Institute, through its delegations and at its meetings, has voiced the desire of the mining man for better treatment. Whilst its delegates have walked softy and talked politely, they cannot have failed to impress upon the Rt. Hon. Mr. Borden and his Ministers the fact that the Institute as a whole deplores and resents the futility of the past and present situations. Briefly, therefore, the treatment accorded the mining industry appears to be calmly deliberate."

As a corrective to this Governmental indifference we urged the organization of mining men into an organic entity that would count politically. The longer the present circumstances are permitted to exist, the more pronounced will the industry's grievance become. It matters not whether it be the Naval Bill, or any other disturbing factor, we are convinced that the Government will not give due consideration to mining affairs until it is forced to.

As a piece of constructive legislation there is nothing more needed than a uniform Canadian mining law. True, it will take much effort and much time to bring about a clear understanding between the various Provinces and the Dominion. The proposed law will be a process hather than an event. But it is high time that a start were made. We are losing prestige with every day of delay.

To bring the whole matter to a head, we would propose that the Canadian Mining Institute, the only or-

ganization that can be utilized for the purpose, canvass its members for an expression of opinion. To this end it will be necessary that a draft of the representations be printed and circulated. The membership of the Institue is abundantly comprehensive. A plebiscite of this kind will be instructive and impressive. To the argument that such a step might be bad politics, we would reply that there is not the slightest need of considering political expediency as it is self-evident that the mining industry gets little consideration from the politician.

In closing, we may remark that the present Dominion Government is obviously ignorant of the needs of the industry that we have the honour to represent. If it is not ignorant, then the only conclusion is that it does not care—a painful and pregnant conclusion.

THE OTTAWA LABORATORY

On another page we reproduce a list of the mechanical equipment installed in the new ore testing laboratory of the Dominion Mines Branch at Ottawa. The official designation of the laboratory is the Dominion of Canada Ore Dressing and Metallurgical Laboratory. The object of this establishment is to supply to the mining public of Canada a means whereby large lots of ore can be efficiently tested.

The equipment appears to be well chosen and complete. One of the chief items is a 5-stamp battery. The cyanide testing outfit, although of laboratory size, is capable of handling sufficiently large samples. The minimum limit for small scale tests is placed at 200 pounds, for large scale tests the samples must be at least five tons.

The Mines Branch reserves the right to publish the results of all tests.

While at several of our universities there are ore testing establishments, no private individual has yet organized one in Canada. There are, it is true, several customs mills and one large shipment sampling plant in Canada, but these handle silver ores only.

While we are entirely in sympathy with the movement, it must be pointed out that extreme care should be taken not to overlap or compete with the work of the private assayer. It must also be remarked that there is danger of the official Government report being misused. Unfair sampling may easily lead to complications, and be made the basis of raising money for mining schemes.

Moreover, there is room for much difference of opinion as to the relative value of large scale and small scale tests. It does not follow that because five tons or twenty tons have been milled, the results are more accurate tha nthose obtained from careful sampling on a small scale. Naturally, much can be learned by means of the larger tests as to treatment. But it must always be borne in mind that mechanical considerations make the control of any given sample shipment a matter of extreme difficulty, whereas the small laboratory sample can, with proper care, be depended upon for accurate results.

We repeat, therefore, that whilst we wish the new enterprise all success, we think it most necessary that every pains be taken not to interfere with private assayers.

THE NIPISSING REPORT

According to the eighth annual report of the Nipissing Mines Company, just issued, the operations during the calendar year 1912 were highly satisfactory. Dividends to the amount of $1,800,000 were distributed, the sum of $240,000 was added to the surplus, and the ore reserves were increased by 1,750,000 ounces. In addition, the new "low grade" mill, costing $325,000, was paid for out of earnings.

The total silver produced was 4,688,260.79 ounces, having a gross value of $2,896,990.10, and costing altogether $815,279.95, or 17.39 cents per ounce. General operating expenses accounted for 12.08 cents per ounce, high grade milling for 2.12 cents, low grade milling for 0.66 cent, and depreciation for 1.12 cents. The average price received for the silver was 61.457 cents per ounce.

Nipissing, up to the end of last year, had paid $10,-168,297.25 in dividends. Of this magnificent total more than 70 per cent. was distributed in the last four years. On account of the large territory to be prospected, the exploration charges are high, and will probably remain so for some years to come. Of drifting, crosscutting, raising, and sinking, a total footage of 13,020 feet was covered during the year, and 15,764 cubic feet stoped. During the summer, 33.2 acres of ground were hydraulicked, an expeditious and efficient means of prospecting, far more satisfactory than the costly trench. Although most of this territory had been trenched before, numerous small veins and stringers were discovered.

With ore reserves carrying a total of nearly ten millions ounces, with a surplus of $1,443,953.09, and with an admirably complete plant, Nipissing is in an enviable position.

EDITORIAL NOTES

International Geological Congress preparations are going forward smoothly. We may venture to suggest that thoroughly organized newspaper publicity should not be neglected.

Gold mining in Nova Scotia, quiescent as it may seem, is not yet dead. Four properties are being examined by American engineers at present, and there are other symptoms of activity.

MORE ALCHEMY

The high-water mark for pure and applied nonsense has been reached by Mr. G. W. Rumble, of South Berkeley, California. Rumble even eclipses our lamentable friend, Mr. Thurber, who, our readers will remember, was the father of a process for getting gold out of any old rock.

Mr. Rumble's idea is ostensibly the application of a "new, simple, cheap, efficient solvent" to refractory ores and black sands. In his own elegant phraseology "it's a Salts." A flat cost of 25 cents per ton of ore is indicated. "Come on" invites the rambling Rumble.

The strange fact is that somebody will be sure to "come on." The Rumbles and the Thurbers and all the varieties of the type find easy victims in the unthinking public. It is not probable, however, that Mr. Rumble's career will be either long or glorious.

G. W. RUMBLE
CONTRACTOR
MINER

PHONES { PIEDMONT 5586
HOME H 6311
USE THE HOME PHONE PREFERABLY

IRRIGATING
RANCHING
GOLD MINING

CABLE ADDRESS
HYGO
SAN FRANCISCO

BEDFORD-McNEILL'S
CODE

SOUTH BERKELEY, CALIFORNIA, U. S. A.
1511 FAIRVIEW ST.

191

APRIL, 1913.

ORE SOLVENT.

I have a new, simple, cheap, efficient solvent for refractory ores and Black Sands whereby the refractory condition of the ore is neutralized so the values go into the Quick. Gold. Platinum.

It comes nearer to recovering ALL the values than any other known method.

It's a Salts, to be wholly dissolved in water, 48 water to 1 salts.

Cost for Salts, 25 cents per ton of ore.

FOR PLATES IT IS THE BEST ON EARTH.

It prepares copper plates to take and hold the Quick and keeps them in condition the best ever.

Come on, I have a small Laboratory and test plant here. Will tell and show you all, and send you sample of Salts so you can test.

(PATENTED.)

G. W. RUMBLE.

THE MINING MANUAL AND MINING YEAR BOOK —1913. Price, $5.00. Published by Walter R. Skinner, London, E.C. For sale by the Canadian Mining Journal.

From year to year Mr. Skinner's directory increases in size and value. It is one of the prime necessities of the mining investor or engineer who has business relations in other countries.

It contains in this annual addition particulars of 3,050 mining companies. In addition to this, it gives the names of 5,300 companies, 6,000 directors and 1,300 secretaries are listed, and the names and addresses of 1,200 mining engineers and managers are given. The amalgamation of the Mining Manual with the Mining Year Book (formerly published by the Financial Times), widens the scope of the directory so as to include nearly all the important mining companies of the world.

We note with regret that Mr. Skinner in his prefatory review, avers that "the Porcupine field has quite failed to answer expectations." This is not the case and we would suggest that an apology is due.

Mr. George B. Burchell, formerly manager of the Joggins collieries, Nova Scotia, has removed to 274 Addington Avenue (Notre Dame de Grace), Montreal.

Mr. L. B. Orchard, formerly connected with the Londonderry Iron & Mining Company, has just returned from South America and is at present in Calgary.

Mr. G. C. Bateman recently visited Porcupine.

NIPISSING ANNUAL

EXTRACTS FROM GENERAL MANAGER'S REPORT.

Shipments in 1912.

	Dry Tons	Gross Ounces Silver	Net Value	Per Cent. of Total. Net Value
High Grade Ore	121.5635	325,246.92	$ 183,140.83	6.48
Low Grade Ore	1,414.4910	330,990.97	168,574.96	5.96
Concentrate	180.6080	153,373.21	85,081.54	3.01
Total Ore	1,716.6625	809,611.10	436,797.33	15.45
Silver Bullion	146.1580	4,258,640.81	2,612,812.50	92.41
Bullion from Ore milled by Nova Scotia Co.	.7140	20,827.56	11,130.05	.39
Total Shipments	1,863.5345	5,089,079.47	$3,060,739.88	108.25
Less Bullion from Ore purchased	12.6715	369,501.26	233,440.30	8.25
Shipments of Nipissing Product	1,850.8630	4,719,578.21	2,827,299.58	100.00%

Summary of Shipments, 1912.

Nipissing Production Only.

Dry Tons Shipped	1,850.863
Gross Ounces Silver Contained	4,719,578.21
Gross Silver Value	$2,892,581.42
Average Price Received per oz., cents	61.457
Received from Sales of Cobalt	$673.90
Gross Silver Value plus Cobalt paid for	$2,893,255.32
Smelter Deduction, Treatment and Freight	65,955.74
Net Value Received from Sales	$2,827,299.58

Production in 1912.

	Dry Tons	Gross Ozs. Silver	Gross Value	Net Value
Shipments in 1912	1,850.8630	4,719,578.21	$2,893,255.32	$2,827,299.58
On Hand at Mine, December 31st, 1912	253.9550	712,897.44	432,355.86	416.634.67
	2,104.8180	5,432,376.65	$3,326,611.18	$3,243,934.25
On Hand at Mine December 31st, 1911	267.9815	744,115.86	428,621.08	413,990.35
Production in 1912	1,836.8365	4,688,260.79	$2,896,990.10	$2,829,943.90

Cost of Producing Silver.

Based on Production of 4,688,260.79 Ounces.

		Per Oz. Silver
General Operating—		
Hydraulicing and Clearing Land	$ 19,292.67	
Development and Exploration	268,906.08	
Stoping	83,548.52	
Ore Sorting and Loading	17,770.78	
Jigging	5,978.06	
Sampling	6,271.50	
Assaying, Engineering and Research	14,096.45	
Administration and Office	24,145.80	
Boarding House and Camp Maintenance	22,974.56	
Insurance and Taxes	75,438.39	
General and Legal Expense	28,110.01	
	$566,532.82	.1208
High Grade Mill, including Treatment of Ore on Hand	99,271.79	.0212
Low Grade Mill	30,917.42	.0066
Depreciation	52,418.14	.0112
Custom Milling—		
By Nipissing Reduction Co.	38,176.51	.0081
By Nova Scotia Co.	2,892.20	.0006
Marketing Product	61,577.03	.0131
Corporation, New York Office and Traveling	13,869.03	.0030
	$865,654.94	.1846
Less Rents and Interest	50,374.99	.0107
Total Cost of Production	$815,279.95	.1739

THE WITWATERSRAND—THE CITY DEEP

By ROWLAND GASCOYNE.

Transvaal.

The City Deep mine is regarded as one of the coming mines on the Rand. Formerly this deep level area was not regarded with much favour, as several of the outcrop mines, notably the Spes Bona and New Goch have not been conspicuously successful, owing to the low grade of the ore, others like the Wolhuter, Meyer and Charlton and City and Suburban have excellent records. The work done by the City Deep has, however, disclosed a more than usually rich main reef leader, and the recovery values rank amongst the half dozen highest on the Rand.

Milling operations commenced just over two years ago, but during the short time that has elapsed since the stamps were first dropped, operations have not proceeded as smoothly as could be wished, either above or below ground. Many of the difficulties were trifling, but those underground were the most serious. The layout of the mine did not conduce to economical working, ventilation troubles arose, and, last, but not least, there was a chronic scarcity of native labour. These difficulties are being gradually overcome one by one, and at the time of writing 150 stamps out of 200 stamps originally erected have been got to work and last month the City Deep figured, by reason of its gold output, amongst the twelve leading gold producers in the Transvaal.

vaal.

It was not until 1908 that by amalgamation with neighbouring mines that the City Deep assumed its present shape and importance, and to-day its total area is only one claim short of a round two thousand, a gold mining claim in the Transvaal measuring 154.95 English feet on the strike, 413.2 feet on the dip, being in area approximately 1½ English acres. The capital of the company is £1,250,000 in £1 shares. The company also possess an estate of over 3,500 acres upon which the workmen are offered building sites for the erection of their own dwellings on highly advantageous terms, with the object of inducing the white employes to settle, and not move from mine to mine as is usual on the Rand.

From east to west the property of the City Deep extends about two miles. Two vertical rectangular seven-compartment shafts have been sunk to the reef, each shaft measuring 44 feet by 8 feet in the clear. The No. 1, or eastern shaft, is 3,100 feet from the eastern boundary and 3,261 feet deep. Cross-cuts have been driven north from this shaft to strike the reef on the 8th and 9th levels, and sinking has been resumed with the object of striking the reef at a vertical depth of a little over 4,000 feet. 4,400 feet further west is the No. 2 or western shaft, where the reef was struck at a depth of 2,876 feet. This shaft is situated about 3,500 feet from the eastern boundary. It is the rule on the Rand to place the shafts considerable distances apart, a practice which has many disadvantages as regards ventilation, particularly before the shafts are connected, the value of which has only been recently recognized.

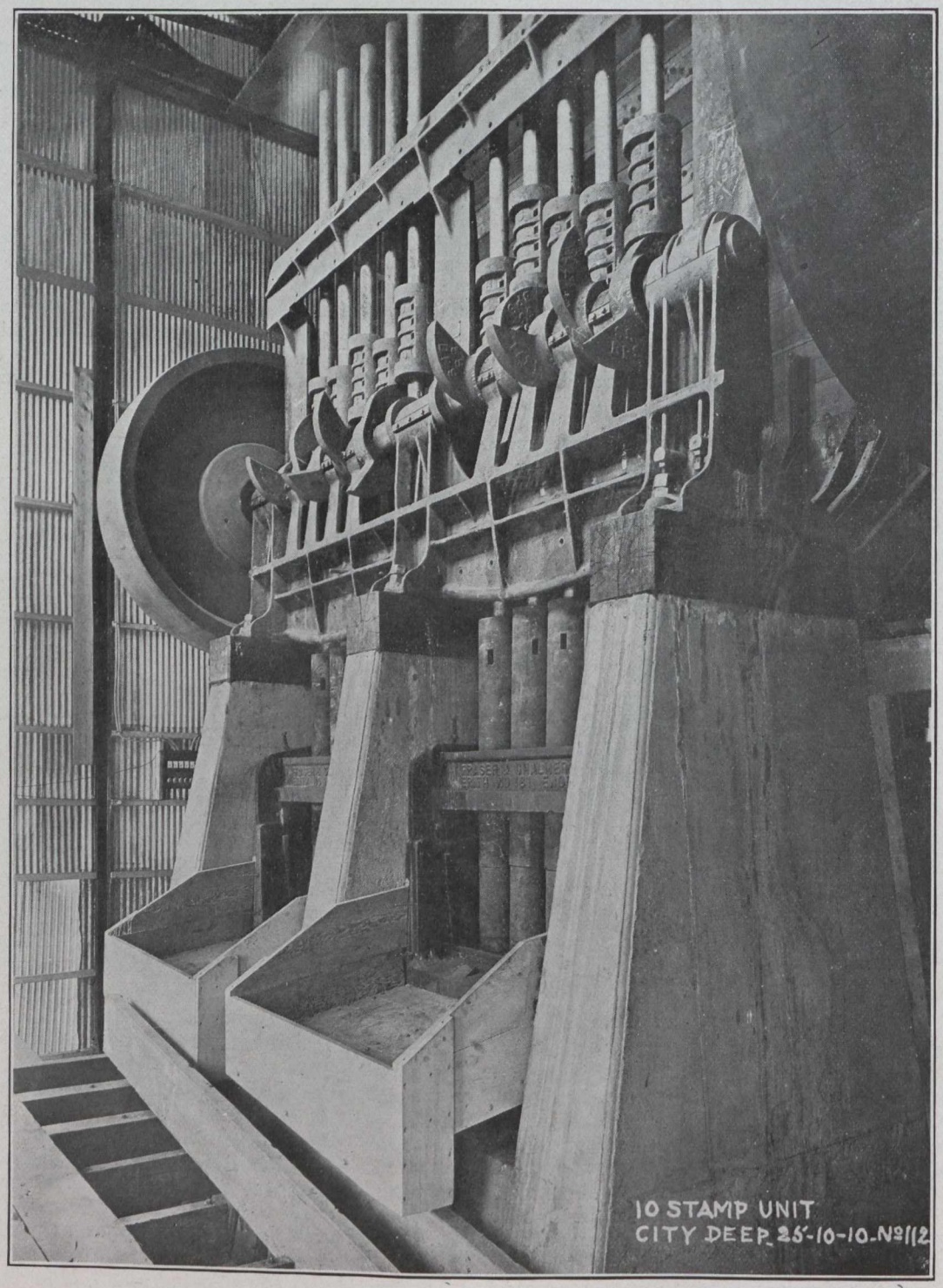
What is known as the main reef leader is the principal reef, little work having so far been done on the main seef or south reef, although it is possible that as in some of the neighbouring mines both these reefs may be drawn upon in the future. Several miles of driving on the main reef leader show that it is wonderfully consistent, both in width and values, the average width running twenty inches and the assay value twenty-two dwts. of gold to the ton. The reefs dip south at an angle of 38 degrees, the distance between the south reef and main reef leader varying from 60 feet to 80 feet, the main reef leader being apparently thicker in the eastern than in the western section of the property.

No. 2 Shaft, Sorting and Crushing Station.

The two shafts are situated about 2,000 feet south of the northern boundary of the property, thus leaving a larger area than usual to the rise which is worked through cross-cuts from the shaft. The proposed method of working is to drive main collecting levels 1,000 feet apart, designed to be fed by inclines from the dip by chutes from the rise. These main levels are at present worked by mule traction, but petrol locomotives are being fitted together on the property, with the object of displacing mule transport. They are of single cylin-

der horizontal type, 9-inch diameter, 12-inch stroke, horse power 25 to 30. The main levels are laid with a double line of heavy rails, the ore being conveyed to large ore bins at the shaft built of re-inforced concrete, and fitted with Kimberley chutes for rapidly loading the skips.

gear pulleys 16 feet diameter. The skips carry 5 tons, maximum speed of hoisting, 3,000 feet per minute, so that each hoist can raise 165 tons per hour. There is also an electric man hoist, three-phase type, driven by a 1,600 h.p. motor operated by power at 2,100 volts 50 cycles. The braking arrangements of this man hoist



Californian Stamps

It was intended to use electric power purchased from the Victoria Falls Co., exclusively, but as such was not available when wanted, a boiler plant of nine boilers was installed at No. 2 shaft. The hoisting plant consists of two double compound tandem Whiting hoists, with 17-inch and 28-inch cylinders and 5-ft. stroke. Driving sheaves 12 ft. diameter, ropes 1½-inch, head-

are interesting. In addition to the usual post brakes worked by compressed air, there is an "eddy current" brake, the direct current being obtained at 120 volts from a rotary converter in the engine room or alternately from a storage battery. The drums are of cast steel, 11 feet diameter and 4 feet wide, each drum carries 4,200 feet of rope. The man cages are of the

three-deck type for carrying 20 men on each deck. Synchronous speed of motor 100 revolutions per minute giving a rope speed of 3,500 feet per minute.

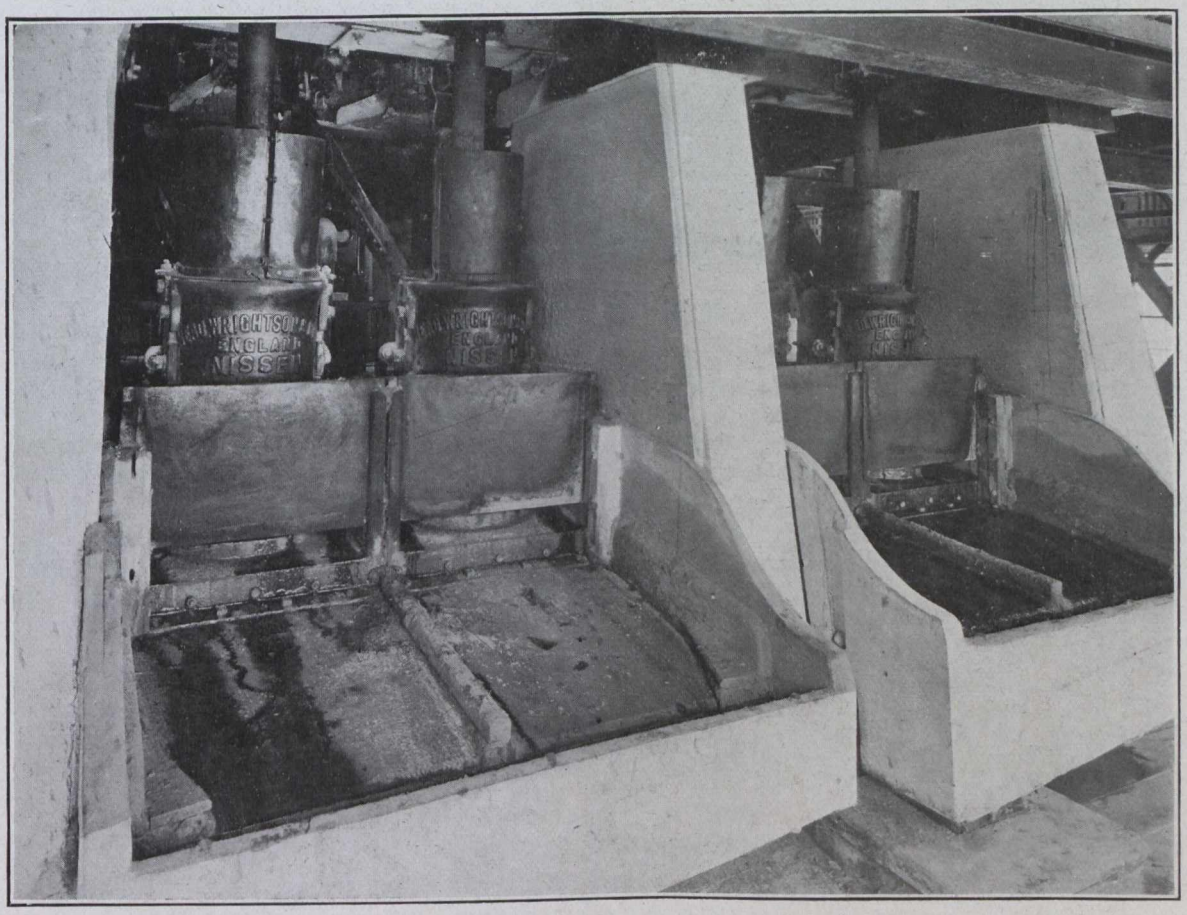
Both compressed air and electrical power are purchased from the Victoria Falls and Transvaal Power Co., the former being delivered at 110 lbs. per square inch, the electrical power by underground cables to sub-stantions at a pressure of 20,000 volts and transformed to 2,100 and 525 volts as required. There are some 120 motors on the property, aggregating 7,500 h.p. They vary in size from 3 h.p. to 1,600 h.p., those of 40 h.p. and over working at 2,100 volts and the smaller ones at 525 volts.

All the sorting and crushing at present is done at No. 2 shaft, the ore being passed over 1½-inch grizzlies and the fines conveyed direct to the crushed ore bin by a 24-inch belt, the coarse ore passing to four 36-inch. conveyor belts and washed by sprays to facilitate sorting, the waste being thrown on to the return side of belt. The sorted ore passes to twelve 30-inch by 12-inch Blake crushers, adjusted to give a product approximately 2-inch cube. Each crusher is driven separately by a 60 h.p. motor. The crusher ore bin is built of re-inforced concrete, fitted with doors worked by compressed air and has a capacity of 1,000 tons.

Forty-ton hopper trucks convey the crushed ore to the mill bin hauled by electric locos. Each loco consists of two units driven by a 150 h.p. motor of the three-phase type, the power being supplied through "buffer" transformers to overhead lines and eath.

The mill, originally of 200 stamps, has now 190 Californian and 4 Nissen stamps. The Californian stamps have a dropping weight of 1,650 lbs. and the Nissen stamps 2,000 lbs. The mill is arranged in units of ten stamps each, driven by a 50 h.p. motor. The outstanding feature of the mill as originally designed is the absence of wood, the king posts being constructed of cast steel. The mill, when in full operation, is estimated to deal with over 60,000 tons per month, at present only 150 out of the 194 stamps are at work.

The pulp on leaving the mill is lifted by 12-inch Robeson-Davidson centrifugal pumps to the tube mill cone thickeners. The cones are of diaphragm type, fitted with auxiliary cones to arrest any coarse material in the overflow. There are nine tube mills 22 feet by 5 feet 6 inches diameter, driven direct by 100 h.p. motors, the speed reduction being effected by Citroen gearing. The amalgamating tables and extractor boxes are all under the same roof. The amalgamating tables are fixed and dip at an angle of 8 degrees about two-thirds of the total gold recovered being in the form of amalgam. The extractor boxes are divided into six compartments and built of steel. Zinc-lead couple method of precipitation is used.

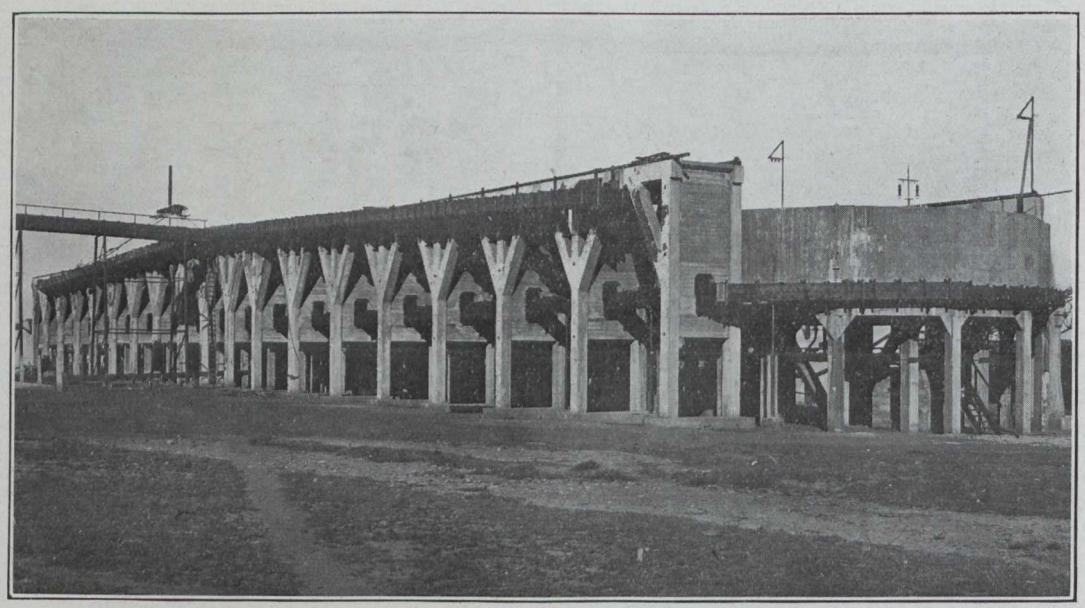


Nissen Stamps

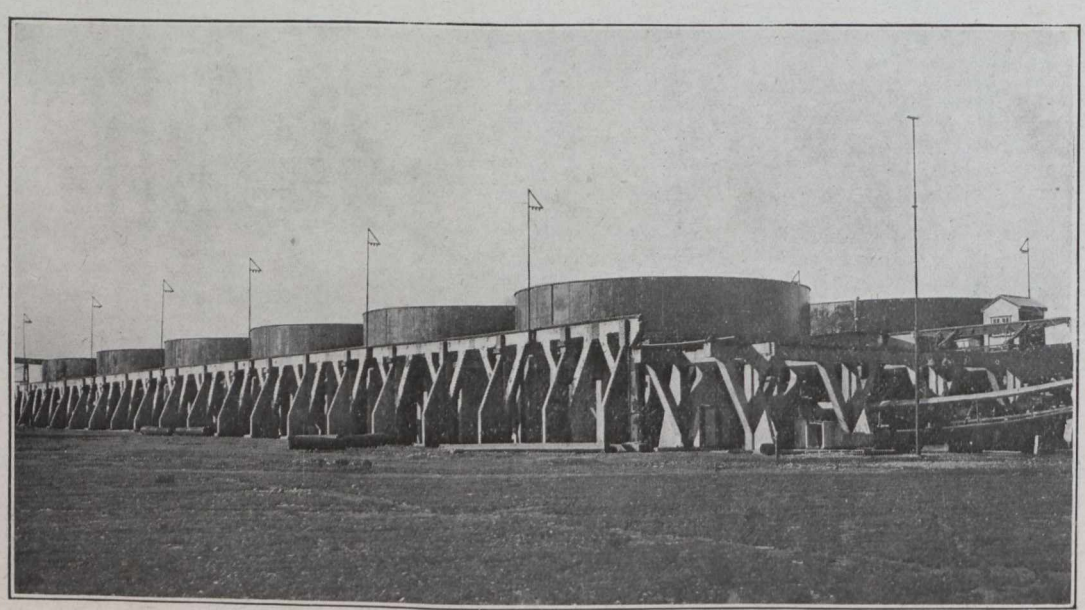
After amalgamation Robeson-Davidson pumps are again used to elevate the pulp to the classifiers, the coarse going again to the tube mills and the fines to the sands collector tanks, each of a capacity of 800 tons. The collecting tanks are built of reinforced concrete on similar material for the foundations, the overflow passing into a series of cones where the sand is returned for classification to the tailing pumps, the slimes passing on to the slimes plant. The sand, after draining, is discharged by a Blaisdell excavator and then conveyed by belt to the sands treatment plant consisting of twelve steel tanks on re-inforced concrete foundations. On completion of treatment the sands are discharged by another Blaisdell excavator into trucks and transferred

by mechanical haulage in the ordinary way to the residue dump. When milling operations first started the stailings were conveyed to the dump by a Bleichert transporter, consisting of cantilever fitted with conveyors. This method of transporting the tailings to the residue dump proved so expensive in use, repairs, and maintenance, that after a few months' use it was abandoned in favour of the common practice of using mechanical haulage. The slimes are treated by the ordinary decantation process. There are six collecting tanks each 60 feet in diameter, and eight treatment tanks of 70 feet diameter. There are also two Brown agitator tanks in which the slimes pulp is aerated with compressed air.

The general progress at the City Deep has been far less rapid than was expected on the completion of the mill. The Victoria Falls Power Co. found that it was quite impossible to meet the requirements of the mines of electrical power and compressed air at that time, the City Deep had perforce to instal steam plant as a substitute. This, of course, meant some delay, inconvenience and loss, milling operations starting first with 50 stamps only. Some little trouble was caused by the new ideas introduced in the structure of the mill, but more serious trouble was met with underground, owing to the faulty method of opening the mine and ventilation drawbacks. By far the greatest drawback, however, was the chronic scarcity of native labour with the result that to-day although the native labour scarcity has been almost removed, only 150 stamps out of a total of 194 are at work. It has taken the company two years since milling operations, instead of one year, as expected to reach the dividend-paying stage, owing principally to the scarcity of native labour.



Sand Treatment Plant



Sand Collection Plant and Blaisdell Excavator

The progress made since the start of milling operations is shown in the following figures:

Year.	Stamps.	Tons milled.	Revenue. Amount per ton. £ s. d.	Expenses. Amount per ton. £ s. d.	Profits. Amount per ton. £ s. d.
1911	90	349,713	537,548 30 9	406,634 23 3	130,914 7 6
1912	123	479,530	852,039 35 6	567,158 23 7	292,600 12 2

There is developed sufficient payable ore in the mine to last the mill when fully employed at least four years. With regard to the life of the property all will depend to what extent the milling operations are extended. In the present mining area there must be at least 30,000,000 tons of ore available for the mill sufficient to last the present mill when fully at work, say 30 years, so that if milling operations be considerably extended there ought to be reckoned at least a life of 20 years for present mining area, whilst the additional available mining ground to the south makes the definite calculation of the life of the property impossible.

DOMINION OF CANADA ORE DRESSING AND METALLURGICAL LABORATORY

The Mines Branch of the Department of Mines has installed at Ottawa a modern well-equipped laboratory for purposes of experimental concentration and metallurgical tests with Canadian ores and minerals.

The following lists of full scale and laboratory size apparatus will convey some idea of the magnitude and latitude of the plant.

STANDARD SIZE MACHINERY.

Crushing and Screening.

One Hadfield and Jencks 12 in. × 8 in. Blake crusher.
One Allis-Chalmers 24 in. × 14 in. "Style C" rolls.
One Hardinge 4 ft.—6 in. conical ball mill.
One Ferraris 6 ft.—0 in. screen for coarse sizing.
One Keedy ore sizer, No. 3, for fine sizing.
One Puplex Callow screen.

Sampling, Recording, Etc.

Sampling is provided for by two Standard Vezin machines, placed in favourable position to cut out preliminary samples of coarse materials. The fine material will be sampled by an eight unit system of the Flood automatic samplers.

Provision has also been made for hand sampling by means of the Jones riffled samplers.

All water lines serving standard apparatus will be equipped with Keystone water meters, to enable the keeping of accurate records of water consumption.

Amalgamation and Concentration.

One Allis-Chalmers 5-stamp battery, with 1,250 pound stamps, equipped with a 10-ft. tilting amalgamating table, followed by a Pierce amalgamator. The mortar of this mill may be, if so desired, arranged for inside amalgamation.

Six Callow tanks, 8 feet diam., for de-sliming and settling.

Two Richards pulsator classifiers, launder type.

One Overstrom sand table.

One Deister slime table.

One Richards pulsator two-compartment jig.

One tandem unit Grondal magnetic separator, for wet separation of strongly magnetic minerals.

One Grondal magnetic cobber, with dust collector for dry separation of strongly magnetic minerals.

One Ullrich four pole magnetic separator, for either dry or wet separation of weakly magnetic minerals.

One Huff electrostatic unit, comprising a standard generator and two laboratory size separators.

Small Scale Apparatus.

One Sturtevant 2 in. × 6 in. laboratory crusher.
One Sturtevant 8 in. × 5 in. laboratory rolls.
One Sturtevant 12 in. × 24 in. laboratory screen.
One Braun planitary pulversizer.
One Abbe six jar pebble mill.

One Gyratory screen (Hoover type), for making dry screen analyses with nested screens.

One Richards combined laboratory pulsator jig and classifier, with glass side.

One Grondal laboratory magnetic separator, for either dry or wet separation of strongly magnetic minerals.

One Wilfley table, 24 in., laboratory size.

One laboratory cyanide plant of 200 pounds capacity, consisting of a Parrel agitator and air pump, with the necessary solution, zinc, and sump tanks.

Two laboratory filter presses.

One complete set of I. M. M. standard screens.

One complete set of Tyler standard screens, after the Rittinger scale.

The installation of an experimental roasting and sintering plant will be undertaken some time during the year.

The plant will be operated free of all charges, including assays necessary for test purposes, on Canadian ores, under the following conditions:

(a) Samples must be bagged and delivered to the plant free of all transportation and unloading charges.

(b) For small scale tests, not less than 200 pounds will be accepted.

For large scale tests, not less than 5 tons will be accepted.

(c) All testing products are to become the property of the Mines Branch, unless otherwise arranged before commencement of tests.

(d) Reports of tests will be incorporated in the publications of the Mines Branch, but single copies will be given to owners of samples when their tests are completed.

Under ordinary conditions tests will be made by the Mines Branch officials, but arrangements may be made be made whereby engineers or other competent persons may supervise their own experiments.

It is expected that the plant will be ready for operation by the first week in July, 1913.

All communications regarding arrangement of tests should be addressed to

EUGENE HAANEL, Ph.D.,
Director Mines Branch,
Dept. of Mines, Ottawa.

A NOTE ON THE COMPARATIVE EFFICIENCIES OF COMPRESSED AIR VERSUS HYDRAULIC POWER FOR MINING OPERATIONS*

By G. A. Denny.

I have been invited by the Council to contribute a paper to the Institute, which may serve as a type of the communication which the Council specially desires to obtain, namely, short papers dealing with subjects particularly adapted for discussion.

My aim in the following note will be, I believe, perfectly patent to my colleagues. No attempt is made to support by more than generalizations, the statements made, the object being to supply a skeleton around which useful and informing discussion may build a body of opinion and experience, which will be instructive to us all.

In choosing the subject of compressed air transmission, I have especially in mind, that it is one in which we are all interested, and all have more or less costly experience. Morever, it is a branch of our mechanical operations—invaluable and essential though it may be despite its deficiencies,—which offers an excellent target for the critic purposely seeking only its misdeamours, in order to invite discussion in its defence.

In a similar spirit, but from an opposite stand point, the benefits of hydraulic transmission are touched upon, with the intention of provoking critical discussion.

The problems of air compression and transmission are as numerous as they are complex. Pressure, temperature, and volume, have an interchangeability of relationship, which whilst fully covered by theoretical formulae, are most elusive in habit, and unsubmissive to theoretical demands in every day practice.

Our definitions of free air, generally apply to pressures of one atmosphere at sea level, or 14.7 lbs., and 60 deg. temgerature F. But what infinity of variation is there from those bases. Every latitude, every elevation, almost all specific localities, have their own peculiar involutions of volume, temperature and pressure, each new combination giving rise to relationships singular to themselves. Absolute temperatures, must be considered in all cases, whether dealing with free or compressed air, as weight and pressure will vary in accordance with the absolute temperature of the original volume, the latter also suffering variations in conformity with the rise or fall of the absolute temperature. At 30 deg., or 491 deg. absolute, a cubic foot of dry air at sea level and average atmospheric pressure weighs .0811 of a lb., and the volume of 1 lb. at this temperature and pressure, is 12,336 cubic feet. At 90 deg. F.—absolute 551 deg.—a cubic foot weighs .0722 lbs., with a volume for 1 lb. of 13,853 cubic feet. At 200 deg.—absolute 661 deg.—a cubic foot weighs .0602 lbs., with a volume of 16.907 cubic feet.

The relationships of temperature, pressure and volume have been succintly stated as under:

1. The absolute pressure of air, varies inversely as the volume, when the temperature is constant.
2. The absolute pressure varies directly as the absolute temperature, when the volume is constant.
3. The volume varies as the absolute temperature, when the pressure is constant.
4. The product of the absolute pressure and the volume is proportional to the absolute temperature.

*From the Bulletin of the Mexican Institute of Mining and Metallurgy.

When air is compressed, an increase of temperature takes but not proportionate to the pressure, nor will air which is taken into the cylinder at zero, have a temperature increment similar to air which is taken in at 100 deg. At two atmospheres gauge pressure, for instance, air of an initial temperature of zero, will have risen to 170 deg., whilst air of an initial temperature of 100 deg. will have risen at the same gauge pressure to 320 deg. In the higher pressures, the rate of temperature increase is much lower. For instance, air of an initial temperature of 100 deg. will only rise about 20 deg. between gauge pressures of 21 and 23 atmospheres.

The importance of the question of original temperature of the free air, cannot be overestimated, since that volume of free air which we take into the cylinder, is in the last resort the unit we have to count upon for work. If the air is so heated at the moment compression begins, that its volume is increased by say 20 per cent., we are actually reducing the capacity of our machine—from a basis of cool air—to that degree, and have to exert as much power for the compression of an 80 per cent. cylinder charge, as would be required for an 100 per cent. charge of cooler air.

Even when every precaution has been taken to provide the coolest and cleanest supply of air available, to the compressor, we still have the heated condition of the air cylinder itself to contend against, which causes an immediate rise in the temperature of the entering air, reduces the volume, and deprives us of a fixed, but unascertainable amount of eventual energy. No determination has ever been made of the exact rise in temperature of the entering air, in any given instance, nor does it appear likely from the nature of the case, that it will ever be accurately fixed, as the indicator gives us no information on the point.

The safest way to minimize losses in this direction is to lead the air into the cylinders from cool places, in channels or conductors of wood or concrete, or other material which is a bad heat conductor or radiator.

Having the air in the cylinder, we now proceed to reduce its volume and increase its pressure. If this could be done without creating heat, the air would conform to the ordinary law of gases, namely, that its volume would vary inversely to the pressure, and a diagram of the operation in the cylinder would give us an isothermal compression line. In that case (if it were possible), assuming the air to be originally at one atmosphere pressure, sea level, and 60 deg. Fah., and that we have compressed it to 80 lbs. gauge pressure, the original volume of air taken at 1, would be reduced to .1552, and the mean pressure per stroke would be 27.33 lbs.

It is well to keep these ideal conditions in mind, in order to see how far short of them our actual practice falls.

In the same conditions as above, and assuming no air cooling, the volume of air after compression is .267 of the original unit, and the mean pressure per stroke 36.6 lbs. That is to say, in practice, where no cooling arrangements exist, we require 34 per cent. more power

for the air compression, because the volume of air has been increased by heat. In the best practice, with all the cooling arrangements possible, or practicable, a result somewhere between the two figures is attainable. The methods of air cooling that have been tried are three, namely:

1. Water jacketing of the cylinders.
2. Water spraying in the compressing cylinder.
3. Cooling in a special apparatus between the compression stages.

As we are treating at the moment of only single stage compression, the first two are all to which we need refer.

Of the two systems under notice, that of water jacketing, is the one almost universally adopted. In this system, however, the cooling effect is at best, very ineffective, since the inner surface of the cylinder can only be slightly cooled, and can, therefore, only effect a film of adjacent air, leaving the large bulk of air, in the central portion of the cylinder almost untouched. For this reason cylinders of small diameter must allow of better cooling than large cylinders, but other mechanical considerations will out weigh this advantage, where a large output is required. The practice of water spraying in the compressing cylinder has almost been abandoned. The practical objections to it are:

(a) That it produces very moist air, which freezes in expanding, and blocks the exhaust passages of pumps, etc., with ice;

(b) That it necessitates very large clearances in the cylinders and restricts operations to comparatively low piston speeds;

(c) That it gives rise to serious difficulties in the lubrication of the cylinder; increases friction; induces excessive cylinder wear, and reduces efficiency.

If it were possible to utilize the heated air immediately, without loss in volume due to cooling, we should not have to deplore the large power losses represented by the difference between isothermal and adiabatic compression. But in practice the air after compression is discharged into receivers and pipe lines, and returns more or less to its original temperature, with a corresponding shrinkage in bulk, and with lessened energy possibilities. Attempts to restore in part the lost energy due to volume shrinkage, are made by reheating the air, near the point at which it is to be used, but it may be said in general, that no reheating apparatus finds a place in mining installations, and therefore no recovery of the loss due to adiabatic compression is made.

It is perhaps well to emphasize the fact that an air compressor has two quite separate and distinct functions to perform, namely:

(a) That of increasing the pressure of the air from a pre-existing to some determined pressure;

(b) That of discharging the air of a determined pressure into the mains.

We have seen that the admission of the maximum volume of cooled air into the cylinder is the first desideratum in the process of increasing pressure, since the capacity of the machine is reduced, and power is wasted in proportion to the temperature of the air above a certain practicable minimum.

Similarly with the discharge. As the volume of air, owing, firstly, to the admission of warm air, and, secondly, to the heat generated by the compression, will have greatly increased, the power required for its discharge will be proportionate to the bulk of air discharged. If at the moment compression begins, the air has a temperature of 60 deg. and if it were compressed, insolthermally, or .3144 if adiabatically compressed, and the temperature in the latter case would be 375 deg. In this instance, the volume of air after compression has a bulk 60 per cent. greater than it would have had if the air had been kept down to a temperature of 60 deg. Again if the air at the moment of compression had a temperature of 80 deg., or 20 deg higher than before, and were compressed to 80 lbs. gauge, its final volume would be .1552 isothermal, or 267 adiabatic, and the temperature in the latter case would be 432 deg. Here the air after compression has a bulk of over 71 per cent. greater than it would have had, could the isothermal conditions have been realized. In order to discharge the increased bulk of air, therefore, we require over 71 per cent. more power than would be necessary if the temperature of the air could be retained at 80 deg. F. throughout the operation.

The horse power required to compress 1 cub. foot of free air to a pressure of 80 lbs. adiabatically is .184 of a h.p., and the power necessary for the discharge of 1 cubic foot of the compressed air into the receiver, is 1.85 h.p.

The important practical considerations in the figures just given are that:

(a) The air is not in a condition to be applied to our purposes, until we hace expended a considerable amount of power in the reduction of its volume.

(b) The power required for the discharge of the air is to a large extent wasted, because in the conditions we have taken, we must discharge a bulk of 1.71 units of heated air, which, after cooling, becomes only one unit available for power.

We may examine, further, in the light of the foregoing statements into the pneumatic efficiency of the compressor.

If a normal diagram from a single stage compressing cylinder be examined, it will be seen that it is exactly the opposite of a steam cylinder diagram; steam admission being represented by air delivery; steam expansion by air compression; and steam compression by the air re-expansion line. An interpretation of a normal diagram from a single stage machine compressing free air at 60 deg., to 80 lbs. gauge, will show that the work done may be divided as under:

(a) Work done in raising air pressure;
(b) Work done in excess due to heat;
(c) Work done in expelling compressed air to the receiver.

These operations may be expressed numerically as under, having reference to one stroke of the piston:

1. .734 of the stroke used, at a mean effective pressure of 20.5 lbs. for bringing the air from atmospheric pressure to 80 lbs. gauge, or .734 x 20.5 equals 23.911 stroke pressure units.

2. The excess bulk due to heat is 71.4 per cent., and the volume of compressed air at 60 deg. is .1552 of the original volume. Therefore the excess work done due to heat is .714 of .1552 or .1108 of the stroke, at the delivery pressure of 80 lbs., or .1108 x 80 equals 8.864 stroke pressure units.

3. The part of the stroke which furnishes us with power in the receiver, that is for our purposes, the really useful portion of the stroke, is that proportion of it which is required to expel the volume which the compressed air will occupy when cooled, namely, .1552 stroke working against a pressure of 80 lbs. or .1552x80 equals 12.416 stroke pressure units.

We thus have for the total stroke an aggregate of 36.327 stroke pressure units.

The only portion, however, as before stated which provides us with air at working pressure is that re-

ferring to the discharge, namely, 12.416 units, the remainder being losses in bringing the air up to pressure, and in heat. That is to say, we get a useful result only from 34 per cent. of the power put into the work, and 66 per cent. may be reckoned as loss. Apart from, and in addition to this loss, are the losses inseparable from the machine, as such. To begin with, the volume of air compressed is never the full contents of the cylinder, since there is clearance to be reckoned with, and lateness in reaching full atmospheric pressure, on the admission side. The mechanical losses may be put down at 10 per cent. for the friction of the machine, 10 per cent. for losses due to increased temperature of the air after admission, 10 per cent. for losses due to clearance, leakage, valve resistance, etc. This leaves 70 per cent. only available for air compression, and of this available amount of power, we have seen that only 34 per cent. does useful work. Then 34 per cent. of 70 per cent., or 23.8 per cent. is all the useful effect we get, expressed in terms of air delivered to the receiver.

We have so far dealt with figures relating to single stage compression, and the question now arises, as to what extent the losses in single stage practice will be minimized by double stage compression.

The sole object of double stage compression is, of course, the avoidance to the greatest extent practicable, of the heat losses, by cooling the first stage air, before it enters the second stage cylinders.

Below are the figures so far as they relate to temperatures, of an actual test. The test was made upon a horizontal cross compound two-stage compressor, with suction air valves mechanically operated, delivery valves of automatic design to close in equilibrium, air cylinders water jacketed both on barrel and ends, intercooler between the cylinders.

Temperature of air at intake	81.6 F.
Temperature of air low pressure delivery.	252.1 F.
Temperature of air intercooler	...148.2 F.
Temperature of air high pressure delivery.	262.4 F.
Pressure of air in intercooler	34 lbs.
Pressure of air in receiver	91.7 lbs.

It is interesting to note the effect of the jacket cooling on the air of the low pressure delivery. The final temperature of the air, without any jacketing would be 310 deg. F. therefore the jacketing has lowered the temperature only 58 deg. and has affected the volume of air, therefore, to a very limited extent.

If isothermally compressed, the volume of air would be over 30 per cent. less than the adiabatic volume, showing that the water jacketing in this case has given far from an efficient result.

Turning now to the intercooler, we find that it lowered the temperature of the air by 104 deg., but still the air had a temperature of 148.2 deg. or 66.6 higher than the original intake, and the capacity of the delivery cylinder would be prejudiced and its useless power increased proportionately to the excess volume occupied by the heated air. The complete cooling which is often claimed in the intercooler, was therefore far from being realized in this instance.

It is still a matter of opinion amongst many of the best informed engineers on this subject, whether for ordinary working pressures, say up to 80 lbs. gauge, there is any advantage in double stage practice. In a booklet published by a well known maker of compressors, the following statement is made.

"The very processes of compounding may too easily lead into mechanical difficulties which in the aggregate, may not only counterbalance the gain by compounding, but may actually swing the balance in the other direction, and result in a machine of lower efficiency, as compared to the single stage machine of the best class."

Following upon the losses incident to the compression and delivery of compressed air to the receiver, we have the losses in the pipe lines and in the machines which utilize the air for power purposes. Theoretically the losses in air mains should be very low, given perfect conditions, and not great distance, but in ordinary mining practice, there is no question that they are frequently very high. A test made under my own supervision in a large South-African mine, showed that the receiver and pipe line, losses amounted to 11.5 per cent. of the indicated horse power of the engine. This loss is, of course, made up mainly of two components, friction and leakage, in what proportions could not be determined. It is probable that 10 per cent. would be a fair figure to adopt for leakage and friction in the ordinary mine installation.

We have now to consider for a moment what efficiencies are obtained from compressed air in ordinary mine usage. Rock drilling and pumping are perhaps the principal applications of compressed air power in mines, though it is used for a variety of other operations such as hoisting, signalling, ventilating, etc.

Considered as an engine, the ordinary rock drill is not an efficient machine, since it uses air at full pressure throughout the piston stroke. The average drill develops about 1.5 h.p. In order to obtain this power, it has been proved by test that the steam engine working the air compressor must develop anything from 25 to 32 h. p., so that the overall efficiency of the system is terms of power at the rock drill bit is in the neighbourhood of, say, 5 per cent. It seems incredible, that rock drilling operations are so inefficient, but it is nevertheless true, that the above rate is probably representative of the large majority of mine installations.

Pumping by compresser air is largely resorted to in mines because of its convenience, or expediency, or both. On a test made under my own supervision on a large mine, in which all the auxiliary pumping was done by compressed air, using 7 pumps, the efficiency of the pumps as a whole, on the original power put into the compression, worked out at between 9 and 10 per cent. The pumps used were the ordinary steam pump, in which all losses due to clearance and unsuitability for the pressure used, were greatly exaggerated. Still they represent average practice in this respect, and the losses, similarly to those occurring in rock drilling, are so high as to seem almost incredible.

I have said enough, I think, about the losses incident to the generation and use of compressed air, to stir up a vigorous defence amongst its champions, from which we must all benefit.

In contradistinction to the losses involved in an air compressing and transmission system in its application to rock drilling I will now state very briefly the features and advantages of hydraulic transmission for a similar application.

The outstanding difference between air and water from the point of view of power development and transmission is, that water is non-elastic.

Unimportant as this apparently simple difference is on first view, it will be found on closer examination to describe practical immunity from nearly all

the heavy losses incident to air transmission and compression, as under:

1.—There is no initial capacity loss due to increased temperature after admission to the working cylinder.

2.—There is no complicated and expensive mechanism required in developing power, whether the head be gained by artificial or natural means, and there are no large friction losses.

3.—There are no heat losses.

4.—No power is required for the preliminary compression, and in consequence, instead of suffering the tremendous losses incident to the process of bringing the water up to working pressure, all the power is utilized in discharging it into the pressure mains. The importance of this is better appreciated, when we state that one unit volume of water at 1,000 lbs. pressure allowing 5% for cylinder and other losses, would transmit 95,000 volume units of pressure, whilst one unit volume of air compressed to 80 lbs. gauge, owing to the small percentage of the stroke available for delivery to the mains, would not transmit to exceed say 2,000 volume units of equal pressure.

5.—There are no clearance losses.

6—With extremely simple mechanism very high working pressures from 500 to 1,000 lbs. and upwards per square inch may be developed.

7.—At working pressures such as mentioned in the previous paragraph, the transmission losses are negligeable, and the volume of water required, and the hydraulic mains are very small.

The overall efficiency of a hydraulic system, in terms of power delivered to the hydraulic drills would not be less than 80%. The efficiency of the drill would range, according to the type employed from say 60% to 80%. Therefore the over all efficiency of the entire system would not be less probably than 50%.

On the same basis, the efficiency of a steam driven compressed air system will not exceed 6%.

Mexico is a country of water powers, and potential hydraulic transmission projects. In view of the great advantages offered by hydraulic transmission and and hydraulic drills, it is greatly to the interest of the mining community, to make most careful enquiry into the possibilities of adopting it.

Where natural fall is not available for pressure purposes, a pump of comparatively simple and efficient type is all that is required to develop any working pressure desired.

GRANBY CO'S. OPERATIONS

The Boston Commercial has published the following information concerning the operations of the Granby Consolidated Mining, Smelting and Power Co., Ltd.

The Granby Consolidated Co. produced 5,539,419 lbs. of copper during the first quarter of the current year and made a net profit of about $194,000. The production by months compares as follows:—

	Copper. lbs.	Silver. oz.	Gold oz.
January.	1,792,245	23,952	
February.	1,779,212	24,645	3,430
March.	1,967,962	28,352	4,211
Total for 3 months.	5,539,419	76,949	10,907

It is understood that the grade of the ore at the Phœnix property improved somewhat during the past month or two. This has offset to some extent the lower prices received for copper and the slightly increased mining costs resulting from interrupted operations in February, chiefly due to inclement weather.

The March run of the smeltery was a record breaker with the full battery of eight furnaces operating for 31 days, as compared with a 20-day run in the preceding month.

Construction work at the Hidden Creek property is well under way, with foundations being laid for the various buildings.

Mr. William H. Nichols, President of the Granby Co., issues the following report to the stockholders:—

"Since the last quarterly report, January 22, 1913, the forward policy of the company recommended by the directors has been adopted by the shareholders and the company is in position to avail itself of any opportunities which conservative judgment may dictate ant at the same time to push to completion the work already undertaken, and resume payment of a moderate dividend out of the profits from current operations.

"At Anyox the work laid out has steadily progressed without any disappointment to, although some construction work was somewhat hampered by the winter snows which have been quite unusual for that region. Our engineers, however, still expect to have the works in condition to operate in November and December of this year.

"The operations of the Phœnix mines and Grand Forks smeltery for the month of March showed a profit of $87,770, and for the nine expired months of the fiscal year, to March 31, $990,255. The yield of metals has been fully maintained, and the cost of copper for March slightly reduced, but current profits for a portion of this period were interfered with by the decline in the price of copper. All figures are now based on copper at 14½ cents, and on March 31 we had on hand 1,935 tons taken in at that price.

"Reports from the development work of the old properties indicate that ore reserves there have been fully maintained."

Mr. Alex. H. Smith is expected to reach Toronto early in June.

Mr. A. A. Hassam is examining the mine of the Boston and Goldenville Gold Mining Company at Shiers Point, Nova Scotia.

ANNUAL REPORT OF THE BRITISH COLUMBIA CO., LTD.

The annual report of The British Columbia Co., Ltd., for the fiscal year ended December 31, 1912, follows:—

President's Report.

Mr. Newman Erb, President of the company, reported as under:

"The report of the Acting General Manager, with Auditors' Certified Balance Sheet, and Profit and Loss Account, for the fiscal year ended December 31, 1912, is herewith respectfully submitted by your Board of Directors.

"The results of operations include the month of December, 1912, by reason of a change made in the fiscal year, as a matter of convenience, to correspond with the calendar year, and the reports therefore cover a period of thirteen months.

"The quantity of ore treated at the company's smeltery was 740,589 tons, of which 443,022 tons was derived from the company's mines, the remainder having been custom ore. Metals were: Fine copper, 11,146,811 lb.; silver, 142,025 oz.; gold, 25,863 oz. The proceeds of these metals amounted to $2,483,663.96.

"The net results of operations were $425,985.40, being the largest in the history of the company. From these profits there were paid during the period covered by the reports, two dividends, Nos. 4 and 5, aggregating $177,512.70.

"During the fiscal year the company paid on account of new properties and in their exploration and development, $229,489.46. Because of the great importance of supplementing the ore reserves of your company, as has been referred to in previous reports, and in furtherance of the the policy adopted, options, through bonds, were taken upon a number of properties which your operating officials believed were of sufficient promise to justify exploratory work. These consisted of the following, all in British Columbia, and were considered properly tributary to the company's smeltery:

1. Ada B. group, in Princess camp.
2. Silver Dollar claim, in Princess camp.
3. Annie L. claim, in Princess camp.
4. Princess Maud claim, in Princess camp.
5. Red Eagle claim, in Princess camp.
6. Triangle Fractional claim, in Princess camp.
7. Eureka group, near Nelson.
8. Queen Victoria group, near Nelson.
9. L. H. group, near Silverton.
10. Riverside group, on North Fork of Kettle river.
11. Copper Mountain district.
12. Greyhound mine, Deadwood camp.

"The development on Nos. 1-9 of the foregoing, on which $57,918.39 was expended, proved to be so encouraging that the company concluded to acquire them and made payments, on account of the option bonds, amounting to $21,000. On the last two very extensive explorations were conducted, but further development was, for the time being, abandoned. The company, however, acquired one-half interest in the Frisco and thirteen other claims in the Voigt camp, on Copper mountain, and subsequently acquired a mortgage which covered the other half interest on these latter claims, which are all embraced in the Copper Mountain district.

"Indications are that in the Princess camp the company will develop a copper mine of considerable extent and value, and the work still in progress is intended to determine the extent of ore-bodies and the method of their treatment. It appears the products of these mines can be successfully concentrated and, if so, profitably transported to be treated at the company's smeltery. The exploration work under way at the close of the fiscal year will be continued.

"During the year under review the company has added to its holdings of New Dominion Copper Co. securities bonds of the par value of $237,675, which cost $122,249.25.

"Operations for the fiscal year were on the whole encouraging and satisfactory. With the opening of the new mines and the completion of the plans now under way for supplementing the ore reserves, which appear to be assured, it is believed stability will be given to the company for the future.

"The management desires to express its obligation to the operating force, and to the intelligent co-operation, fidelity and zeal of its officers, for the results obtained during the year."

Acting General Manager's Report.

Mr. Frederick Keffer, Acting General Manager, reported as follows:—

For the fiscal year of thirteen months, ended December 31, 1912, the following review of the company's operations is submitted:

"Shipments of ore were made from the company's mines, as under:—

	Tons.
Mother Lode	410,688
Wellington group	9,935
Lone Star and Washington	2,101
Napoleon	17,118
Queen Victoria	1,080
Total	440,920

"**Mother Lode Mine.**—The transverse stope method of mining has been followed throughout the year, and has proved most successful in extracting the maximum quantity of ore at a minimum of cost. The tonnage shipped was the greatest for any one year in the history of the mine, and the cost of crushed ore, f.o.b, cars. at the mine has been the lowest, namely, 56.58 cents per ton. The drilling of new ground has been kept well ahead of requirements, there having been at the close of the year 5,000 holes, aggregating 65,000 lineal feet, in readiness for blasting.

"The ore reserves have not been materially increased during the year. The average grade of ore mined was below the normal grade of former years.

"The mining plant has been maintained in good condition, and the large quantity of ore has been extracted without serious accidents to either men or machinery.

Wellington Camp Group.—The ore that had been developed here was mined out during the seven months in the earlier part of the year, and in June the mine was closed for the time being. There is a large area of unprospected territory included within the company's holdings in this camp, but owing to extensive prospecting in other localities it was thought best to postpone further operations at the Wellington group until a later period.

"**Lone Star and Washington.**—This mine was operated in June, July and August only as, on account of the refractory nature of the ore, but little of it could be smelted directly. Working tests on large lots of the

ore, using ordinary water concentration method, did not prove sufficiently successful to warrant the erection of a concentration plant. We are, however, making tests on other lines, which so far have proved satisfactory, and lead to the expectation that the problem of successful concentration and elimination of the refractory constituents of the ore will shortly be solved. The 300,000 tons of developed ore in this property, comprised within less than seven per cent. of its area, together with the comparatively high grade of the ore, make the ultimate solution of the problem of treatment a most important matter.

"**Napoleon.**—The 17,118 tons of sulphide flux shipped from the Napoleon mine during the year was of better grade, both as to gold and sulphur contains, than that for a number of earlier years. Mining and tramway costs were reduced to an average of $1.588 per ton of ore. The ore shipped was offset by new ore developed, leaving the ore reserves unchanged. These reserves are sufficient to serve all needs for many years to come. The machinery, plant and aerial tramway have been maintained in good condition.

"Through delays in receipt of machinery and by reason of further alterations found necessary at the Napoleon mill, it was late in September before all the problems relating to the treatment of the ore were finally and successfully solved. The quantity of ore milled was 6,483 tons. On account of the increased expense of mining and milling the oxide are in the winter season, when in the open quarry work it becomes mixed with snow and freezes into masses not readily handled, it was decided to close the mill until the spring of 1913, after which a steady and successful run should be had.

"**Queen Victoria.**—This property, which is situated nine miles west from Nelson, B.C., was purchased in November, 1912. The ore in it is an altered limestone similar in self-fluxing properties to the Boundary district ores, but it contains a higher percentage of copper. The mine is equipped with an electrically-driven compressor plant, and is connected with the Canadian Pacific Railway by an serial tramway.

"The months of November and December were occupied mainly in getting the mine into general working shape, and in opening new ground for stoping. In December, 1,080 tons of ore was shipped.

"**Smeltery.**—The smeltery at Greenwood was operated steadily throughout the year and smelted a larger quantity of ore than during any similar period in its history. During the first two and a half months, until a sufficient supply of coke was secured for the entire plant, only two furnaces were operated. The total quantity of ore smelted during the thirteen months of the fiscal year was 740,589 tons, as compared with a total of 608,945 tons for the twelve months of the fiscal year ended November 30, 1911. The sources of the material smelted were:

	Tons.
From B.C. Copper Co.'s mines	443,022
Custom ores	284,575
Converter slags	12,992
Total	740,589

"The quantity of coke consumed was 103,154 tons.

"The converter slags included:

B.C. Copper Co.'s ores	914
Custom ores	4,104
Clay	1,205
Total	6,223

"There was produced 11,250,140 lbs. of blister copper, containing:

Gold	25,862,681	oz.
Silver	142,025.06	oz.
Copper	11,0148,811.00	lbs.

"No material additions were made to plant during the year, the machinery as a whole having been maintained in its normal condition.

"It is planned to use basic instead of acid lining for the converters, should this be found practicable without considerable additions to the plant. Through decreased cost for clay and elimination of labour in relining converters, it is probable that a decided reduction in the cost of converting can be effected.

"**Prospecting Operations.**—During the year twenty-three groups of mining claims in British Columbia or adjacent parts of the United States are examined by our engineers. This work resulted in the bonding of the Eureka group, near Nelson, B.C., and of a group of mineral claims on Copper mountain, near Princeton, B.C., known collectively as the Princess group. On these two properties exploration is being vigorously pushed by both handwork and diamond-drilling, with generally favourable results to date. Much exploration work was also done in Voigt's camp, on Copper mountain, with fairly successful results. The bond on the group in Voigt's camp was allowed to lapse, but negotiations are now in progress for renewal. Among the groups examined are three others of much promise; it is planned to explore these during the coming season.

"**Operating Costs.**—The yield i ncopper, gold, and silver for the past year was less per ton of ore than for any other year in the history of the smelting works; the costs per ton for ore-handling, etc., were lower than for any other year. On account of the low yield of metals, the cost of producing copper per pound was 12.85 cents, notwithstanding the very low handling costs.

"The following table gives a comparison of the principal items for the last five years:

	1908	1909.	1910.	1911	1912.
Yield of copper per ton of B.C. Copper Co.'s copper-bearing ores	17.8 lb.	17.7 lb.	18.0 lb.	16.4 lb.	13.6 lb.
Yield of gold and silver per ton of B.C. Copper Co.'s Ores	$0.985	$1.03	$1.23	$1.133	$0.762
Average price realized for copper	0.13504	0.1308	0.12778	0.1233	0.16664
Costs of producing, refining and marketing per pound of fine copper, after crediting expediture with value of gold and silver contents of ore	0.09996	0.09829	0.09048	0.11635	0.12855
Costs of handling ore per ton, including all charges from ore in place to sale of the contained metals	2.632	2.683	2.730	2.882	2.4596

"In concluding this report the writer wishes to bear testimony to the uniformly loyal support and excellent work of all those in charge of the various departments of the company, whose collective work has enabled the company to attain the results set forth in the statement of the auditors."

Profit and Loss Account.

"For thirteen months ended December 31, 1912:

"To operating disbursements—		
Mining, smelting, freight, refining and selling charges, general office and administration expenses, maintenance of plant and equipment	$1,570,205.16	
To custom ore purchased	495,087.12	
By proceeds of metal shipments, including those unsettled for at December 31, 1912		$2,483,663.96
By miscellaneous earnings		7,613.72
To balance carried down	425,985.40	
	$2,491,277.68	$2,491,277.68
By balance brought down		$425,985.40
By balance at November 30, 1911		717,264.11
To dividends Nos. 4 and 5	$177,512.70	
To balance carried to Balance Sheet	965,736.81	
	$1,143,249.51	$1,143,249.51

BALANCE SHEET AS AT DECEMBER 31, 1912.

Liabilities.

Captal Stock—		
Authorized $3,000,000 in 600,000 shares of $5 each.		
Issued ..... 596,709 shares of $5 each.		
Less in Treasury ..... 5,000 shares of $5 each.		
591,709		$2,958,545.00
Sundry Creditors—		
Accounts payable, open and accrued	$289,971.68	
Accounts payable, covered by cheques in transit	46,938.73	
		336,910.41
Reserve for employers' liability	$5,365.32	
Reserve for contingencies	5,000.00	
Profit and loss account		965,736.81
		$4,271,557.54

Assets.

Properties at cost, including smeltery site and plant, mines and mining equipment, and shares in other companies	$3,771,444.82
Metals and smeltery products, supplies, etc., as per certified inventories	193,054.96
Copper on hand and in transit to refinery	214,769.09
Prepaid insurance and taxes	4,763.37
Accounts receivable	3,923.64
Cash on hand and in banks in New York and Greenwood	83,601.66
	$4,271,557.54

THE OCCURRENCE OF PYRITES IN CANADA*

(Continued from April 15th issue.)

NORTHERN ONTARIO OCCURRENCES.

Northland Pyrites Mine.—This property is located on the shore of James Lake, about three-quarters of a mile west of the Temiskaming and Northern Ontario Railway at the 83rd mile post. The discovery was made in 1903, but active development was not commenced until December, 1906.

The main shaft has a depth of 300 feet, with levels at 100, 175 and 275 feet. A winze was sunk from the second level, 75 feet north of the shaft, a depth of 100 feet, a drift running to the shaft, and then a raise was put up to connect with the shaft at the second level. Some of the ore north of the shaft has been removed by open cut workings, and a considerable amount of ore has also been stoped out on the second and third levels.

The main shaft on the deposit dips with the schist at an angle of about 70 degrees to the west. The lens-shaped ore body lies in a soft green schist about 100 feet east of the contact with a grey hornblende granite. The only impurity in the ore consists of small veinlets of quartz and massive pyrrhotite on each wall of the lenses. Occasionally, pyrrhotite is also finely disseminated through the pyrite. The ore breaks nicely, making very little fines in the course of mining

*See page 316 for General Map.

The ore is usually mined by underhand stoping. It is hoisted to the shaft house, where it is broken and cobbed. It is then dumped directly from the storage bin to the cars, a siding from the Temiskaming and Northern Ontario Railway having been built to pass under the ore bin. The greater part of the ore was shipped to Buffalo, N.Y.

The mine is equipped with two 100 h.p. boilers, a 12-drill air compressor, and a hoist.

The property is at present closed down.

In 1909, Mr. L. Hanna was manager. The head office of the operating company is at London, Ontario, and Mr. John Smallman is treasurer.

WESTERN ONTARIO OCCURRENCES.

Helen Iron Mine Pyrites Deposits.—Located in the Michipicoten mining division, about 15 miles northeast of Michipicoten harbour, Lake Superior.

The Helen iron mine has been fully described in various reports of the Ontario Bureau of Mines.*. Underground working has revealed the existence of pyrites in large quantities. The pyrite and hematite deposits lie in a roughly elliptical rock-rimmed amphitheatre bounded on the east by a steep hill of iron carbonate, on the north by cherty carbonate and quartz porphyry schists, on the south by quartz-porphyry schist, and on the west by pyritous and cherty iron carbonates. The rock structures are almost vertical.

The Helen iron mine occupies the eastern end of a great pit-like depression. The ore body, as shown by the plans of the several levels, is elliptical in outline with an east and west axis about 500 feet in length, and a width of about 300 feet.

Lenses of pyrite occur throughout the hematite deposit, and the sulphide also occurs to the east, north and west of the hematite ore body. The pyrite consists almost entirely of granular ore. Lumps of hard ore are occasionally found, but the greater portion of the sulphide is in a fine granular condition resembling very clean concentrates. Occasionally, small veins of a clear, white quartz sand occur. Samples of ore will assay over 50 per cent. sulphur. Mine shipments will grade about 42 per cent. or better, dependent upon the amount of hematite that may become mixed with the ore.

The pyrite in the lenses or pockets, being closely confined by the hematite and of a saccharoidal structure, flows readily, like hot dry sand, wherever the pressure is relieved. Therefore, if an opening happens to be made in one of the lenses, it is necessary to take prompt measures to prevent the flow and to regulate it, if necessary. Special timbering is necessary, and even then the pressure is so great that opening into the pyrite can only be maintained with difficulty and for a short time.

Arrangements are being made to maintain a steady annual output of pyrites from this mine, which will probably be one of the largest pyrite producers in Ontario.

Conmee Township.—Thunder Bay district, Lot B, Concession V. Some work has been done on a deposit which lies on this lot about a quarter of a mile west of Bridge 31A, on the Canadian Northern Railway, some distance below Mokoman Station.

Tip-Top Copper Mine.—This property is situated 9 miles by trail southwest of the Canadian Northrn Railway at Kashaboiwe station. The main shaft is 200 feet deep, dipping 70 degrees to the north, and four levels, 50 feet apart, have been driven. The following is a synopsis of the work done in the various levels:

1st level. Drift to east. 80 feet in length.
1st level. Drift to west. 40 feet in length.
2nd level. Drift to east. 70 feet in length.
2nd level. Drift to west. 40 feet in length.
3rd level. Drift to east. 60 feet in length.
3rd level. Drift to west. 40 feet in length.
4th level. Drift to east. 65 feet in length.

Cross cuts:

1st level to the south. 60 feet in length.
1st level to the north. 140 feet in length.
4th level to the north. 130 feet in length.

Stopes:

1st level east. 40 feet long, 25 feet high, 8 feet wide.
1st level west. 30 feet long, 15 feet high, 10 feet wide.
2nd level east. 40 feet long, 10 feet high, 10 feet wide.
2nd level west. 30 feet long, 10 feet high, 8 feet wide.

Shaft No. 2, about 600 feet north of east from No. 1, is 50 feet deep.

Shaft No. 3, about 500 feet east from No. 2, is 20 feet deep.

The plant consists of 2 boilers one 70 h.p. return tubular, and one 30 h.p. marine; one hoist, cylinders 6 in. × 8 in., one Ingersoll-Sergeant 4-drill air compressor.

The associated rocks, according to Miller,† are a series of talc and green schists. Diabase occurs as a dyke rock and also felsite. The ore consists of copper pyrites, pyrrhotite and iron pyrites. It carries values in gold in addition to the copper.

The Tip-Top is essentially a copper prospect. Massive pyritic lenses in the mine would run upward of 40 per cent. sulphur, but there are extensive associated bodies of leaner and very highly siliceous ore.

Steep Rock Lake Deposits.—The depsits in the vicinity of this lake were very thoroughly prospected for iron ore. They lie north from Atikokan station on the Canadian Northern Railway.

Three-quarters of a mile west from the shore of the lake, the Mackenzie and Mann locations AL 461 and 462 have been prospected by four diamond drill holes. These are said t ohave disclosed a deposit of pyrites, but details are not available. The country rock on the surface is interbanded silica and highly altered green schist.

A very large deposit of iron pyrites has been uncovered at the southern extremity of Straw Hat lake. This is reached by a trail to the westward from the southern part of the eastern arm of Steep Rock lake. The work done comprises trenching, test pitting, and 4 diamond drill holes on locations 857 X and 858 X. The south trench shows a width of pyrite of over 140 feet, the eastern 60 feet of which would be quite high grade at shallow depth, as the only impurity was gossan. The ore showed unequal banding and nodular weathering. The astern portion of the ore shown in the trench is somewhat siliceous, and would not run more than 38 per cent.-40 per cent. sulphur. A test pit 100 yards to the north near the camps, shows very fair pyrites under a heavy capping of limonite and hematite. The hill, on which the south trench is located, is 30 feet high, and the whole gully to the west appears to be underlain with pyrite. Diamond drilling disclosed the

*O. B. M. Reports for 1898, 1901, 1902, 1903, 1904, 1905.

†Ontario Bureau of Mines, 1903, p. 102.

pyrite in the form of a vast crescent, between the horns of which lies a deposit of hematite, an occurrence resembling very much that of the Helen iron mine.

The country rock to the west is an eruptive greenstone, and to the east it is a green chist. These, along the trail to Steep Rock lake, show at times a curious ellipsoidal weathering.

The deposits is 4 miles level draw from the Canadian Northern Railway to the southwest.

Vermilion Pyrites Mine.—This property, formerly the Vermilion Pyrites mine, and still earlier the Michie Pyrite mine, is now operated by the Northern Pyrites Company, 25 Broad Street, New York. The mining locations, H.W. 715 and H.W. 716, are situated on the shore of Big Vermilion lake, about 35 miles northeast of Dinorwic on the Canadian Pacific Railway, and about 4 miles from Graham on the Grand Trunk Pacific Railway.

The deposit lies in a depression between a rocky ridge which strikes somewhat north of east, and the shore of Big Vermilion lake. In runs into the lake towards the west end. The surface is covered by a heavy blanket of boulder clay varying from 8 feet to 20 feet in thickness. The only place where the gossan cap was exposed was on the shore of the lake where wave action had removed the clay cover. The lake derives its name from the discolouring of the water by iron oxide from this gossan cap, and the discovery was made by a prospector when searching for gold ores.

Two shafts have been sunk on the ore body. Number 1 shaft is vertical, 8 ft. x 10 ft. in section, and is used only as a manway and for pipe lines and ventilation. It is 260 feet in depth. This shaft is equipped with a standard 41 ft. Lidgerwood single drum hoisting engine. Number 2, the working shaft, is a 3-compartment shaft sunk in the foot wall at an angle of 58 degrees. The hoisting compartments are each 4 ft. x 6 ft., and the shaft is 260 feet in depth.

The aerial tramway, which was constructed two years ago to convey the crushed ore from the rock house to the spur from the G.T.P. Ry., about 3 miles distant, has been furnished with new equipment and a new terminal erected at the spur where the ore may be either direct to railway cars or stocked in piles for subsequent loading by means of a 10-ton locomotive crane alongside.

The mine has been equipped with new rock drills of both the piston and hammer styles as well as with new mine cars, air piping, tracks, etc. Overhead stopes have been opened preparatory to the resumption of shipments during the coming season.

A new office and warehouse, dry house for the underground men, powder magazine, machine shop, water lines, mess and bunk house, as well as several cottages have been provided.

About a year and a half ago, some 6,000 tons of ore were shipped, but since then there have been no shipments. The ore mined during development work was stock-piled. It is hoped that about 25,000 tons will be sent out this season (1911), if transportation facilities will permit; this will include ore mined in development work.

The ore body has been developed for 800 feet on the 2nd level. In addition, there is considerable drifting on the 1st and 3rd levels; the total amount of drifting in December, 1911, exclusive of cross cuts, was 1,500 feet. The width of the ore body varies from 30 to 63 feet.

According to Fraleck the interbanded pyrite and rock near the hanging wall side, as disclosed by the shaft and cross-cut is suggestive of vein filling, especially as some tourmaline was observed along the northern edge of the deposit. The laminated structure of the ore, however, renders it more probable that the deposit is of the replacement type, and that the banded pyrite and rock along the northern edge represent incomplete replacement of the schist. The country rock along the hanging wall side is composed of a greenish highly calciferous schist. The gangue matter of the ore is quartz. The ore body strikes northeast and southwest, and dips to the northwest at an angle of about 61 deg.

The ore consists of pyrites (with some pyrrhotite) which apparently runs about 40 per cent. sulphur; this also being the proportion of sulphur in the lost of ore already shipped. The ore is a hard and fine grained pyrite and will be mostly lump ore, with some fines. It has proved to be an excellent ore for acid making, the residual sulphur lost in the cinder being often less than one per cent., although this will be increased by any admixture of pyrrhotite.

The mine is operated for the Northern Pyrites Company, by Robert K. Painter, of Benson Mines, New York, as consulting engineer, and H. V. Smythe, local superintendent at the mine.

Geological Relationships.—In discussing the geological relationship of the pyrite occurrences in Ontario, Fraleck states that pyrite deposits have been found throughout an area of approximately 170,000 square miles, including eastern, northern and Western Ontario.

On the basis of their rock associates, he divides the deposits into three classes as follows:

1. The gneissoid, comprising the Brockville and Mattagami deposits. In both cases basic dykes are in close proximity.

2. Those of the iron formation, comprising the Helen, Straw Hat lake, and probably the Goudreau lake reposits; those in the cyrstalline limestone of Eastern Ontario are similar in origin, if not in age.

3. The remainder are associated with the crystalline schists with, in almost every instance, an eruptive greenstone close by.

PYRITES IN BRITISH COLUMBIA.

The mineral pyrites is reported from many localities in this province. For the most part these occurrences are associated with gold or copper ores, and the deposits are not valuable because of the sulphur content of the ore. At the present time no pyrites is mined in British Columbia for its sulphur, nor, so far as the writer was able to learn, is any imported. The sulphides which are mined are smelted to recover copper and the precious metals, and the sulphur is burned off. It is possible that in the future, with the development of manufacturing industries, there may be a market for sulphur content of suitable ores. Present needs are satisfied by the importation of Japanese raw sulphur, which costs between $17-$18, per ton ton, in cargo lots at seaboard points.

There are two localities, at which pyrites deposits occur that are worthy of special mention, viz.: the Hidden Creek property of the Granby Consolidated Mining and Smelting Company, and an occurrence on the Ecstall River about thirty-five miles above Port Essington, owned by the British Columbia Pyrites Company.

Hidden Creek.—This property is located about three-quarters of a mile from tide water, on Goose Bay at

the head of Observatory Inlet. It is now controlled by the Granby Consolidated Mining and Smelting Company, which owns 14 claims and has mining rights in several others. This company has been exploring and developing this prospect as a copper property for about two years, and it is probable that a smelter will be ererted in the near future.

A large body of sulphide ore has been developed by a system of tunnels and supplementary diamond drilling. A tonnage estimated at about 6,000,000 tons of 2 per cent. (copper) ore, or about 12,000,000 tons of 1.65 per cent. ore has been shown to be present. In addition, development work has shown a very considerable tonnage of ore of a higher grade—above 5 per cent.—and a large tonnage of low grade. A large force is now employed in preparing the property for operation on a large scale as a copper mine.

Much of the ore which occurs on this property is almost pure sulphides with high sulphur content, and a large tonnage occurs that is nearly pure pyrite.

Under present conditions there is no market for the sulphur content of the ore, and, as a consequence, the sulphur will be burned off and discharged into the air in the process of smelting. Should it be warranted by market conditions at any time before the deposit is exhausted, a large tonnage of pyrites with a low copper content will be available from this mine. As the mine is practically at tide water, it would be comparatively easy to deliver the ore very cheaply at any point on the coast. After treatment in a roasting furnace to recover the sulphur content, the cinder could easily be subjected to treatment to recover the copper and other values which it would contain.

Ecstall River.—This property is situated on Red Gulch Creek, a tributary of the Ecstall River, at the head of tide water, and about 35 miles above Red Essington. The portal of a prospecting tunnel, which is driven into the roe, is about 2,400 feet from the river. There is said to be an iron stained band on the west side of the creek, presumably pyrites, traceable for several thousand feet, and varying in width from 12 feet to 200 feet.

The writer visited the prospect tunnel on Red Gulch Creek, but was not able to visit the outcrop on account of the weather conditions. The sill of the tunnel portal stands only a few feet above the creek and the tunnel is driven into the side of the gulch. At about 50 feet from the entry it cuts an ore body of almost pure pyrite about 15 feet in width. Ore has been stoped out on each side of the tunnel for about 20 feet and the full width of the ore chute.

Outcroppings showing pyrite are said to occur in a number of other places further up the creek, and on the side of the valley. These were not visited. Exploratory work has been confined to the opening of this tunnel.

A sample shipment of ore from the tunnel, said to be about 100 tons, is reported to have been made to the Chemical Works at Victoria. The test of the trial shipment of ore showed that it is a very satisfactory ore for acid making.

Samples which were assayed show small values in gold, silver and copper. The sulphur content varies from 40 to 48 per cent.

Further exploratory work is required to definitely determine if the pyrites ore bodies on this property are large enough to be operated economically. At present there is no market on the coast for ore of this character and no work is being done on the ore bodies.

PYRRHOTITE IN ONTARIO.

Pyrrhotites are not usually considered to be sulphur ores, since a pure pyrrhotite contains only 39.2 per cent. sulphur, which can only be recovered with difficulty, while pure pyrite assays 53.4 per cent. sulphur. Pyrrhotites have, however, been successfully roasted in several types of fines burners, without supplying additional heat from an external source; the gas produced contains a lower percentage of sulphur dioxide than that made from pyrites. Conditions might easily arise whereby it would be economical to employ ores of this kind for acid making.

Ores of this class have been found at a few localities in Eastern Ontario, but the most important known deposits are the nickel-copper-bearing pyrrhotites of the Sudbury district. Exploration work has shown that there are probably nearly 50,000,000 tons of this ore available in the district. Much of it will contain above 25 per cent. sulphur, some of it will run above 30 per cent. Present practice is to roast the ore in open heaps, driving off slightly more than one half the sulpsur. It does not appear to be commercially practicable to save this sulphur at the present time, i.e., the cost of recovering and marketing the sulphur would be greater than the value of the sulphur recovered. The expansion of the market for sulphur diovide and the introduction of improved processes may, in the future, so modify conditions that it may be practicable to recover and market some of the sulphur which is now valueless and is thrown away under present practice.

HEDLEY GOLD MINING CO'S. REPORT FOR 1912

The annual report of the Hedley Gold Mining Co. (operating in British Columbia) for the year 1912, includes the reports of the President (Mr. I. L. Merrill), the General Superintendent, and the Treasurer, as follows:—

Report of the President.

"During the past year things in general, at mines and mill, have gone along very well.

"We acquired the adjoining claims known as the 'Windfall Group,' lying to the northwest of our property. Our exploration work demonstrated that the ores pass into this acquired territory, which promises well for a lang life to our mines.

"For detailed information, I submit the reports of the Superintendent and the Treasurer."

Report of the General Superintendent.

Mr. Gomer P. Jones, General Superintendent, reported as under:—

"For the year 1912 your mill has treated 70,455 tons of ore, having an average value of $11.19 per ton, or a total value of $788,715.05. The value of the gold won was $748,133.14—an extraction of 95 per cent. The profits were as shown in the Treasurer's statement.

"Owing to the increase in tonnage, which used practically all the power available, we have been able to

do but little development work on the company's properties, excepting the Nickel Plate, where stoping and development work, in the orebody, has been carried on between the No. 3 and No. 4 tunnel levels, and the ore won has proven to be of a higher grade than estimated last year. The usual reserve tonnage of 10,000 tons of broken ore has been maintained.

"Mining below the No. 4 tunnel level has been very satisfactory and has proven that the orebody, as indicated last year by diamond drill, is a valuable addition to these reserves. An incline shaft (No. 5) has been sunk in the ore for 420 feet, three levels have been opened and a fourth commenced. Drifting and sinking proves this ore to be about 16 feet in width between walls and of an average value of $14 per ton. At the collar of the incline the length of the ore shoot is 130 feet; at the 100-foot level it has been drifted on for 180 feet, and on the third level for 80 feet. These drifts are in good ore all the way, and including the bottom of the incline all the faces are in ore. This incline is in good shape to ship from, with ore-pockets in each level and plenty of good ground for stoping.

"A section of the ground under the Nickel Plate orebeds has been proven by diamond drill; also a section of the company's property lying to the north; but owing to delayed negotiations for an option on the Windfall group of mining claims, adjoining the Iron Duke (one of the company's original claims), we did not commence drilling on this ground until July. By October seven holes were put down, and three of these showed good value. The last two holes were discontinued before they entered the ore zone, owing to the severe cold weather freezing the water in the long pipe-lines. These holes would, if completed, have aided us considerably in making an estimate of the reserve tonnage; however, we have no hesitation in stating that the minimum of reserve ore, as shown by development and diamond drill, available in the Nickel Plate and Iron Duke claims, is 413,000 tons, and that this ore will average at least $11.35 per ton.

"While the above-mentioned ground was being tested, and option was held for the purchase of the Windfall group, comprising five claims, namely, the Windfall, Morning, Winchester Fraction, Big Horn, and Czar, and on October 30, the purchase of these properties was consummated. The terms of the option did not allow time to prospect the ground, as it would have been necessary to drill each hole 500 feet at least before striking the ore-bearing sedimentary beds, but from indications in the hole drilled nearest the optional property and the high value in the remaining holes, we consider these claims valuable.

"To mine the new ore-bodies, as well as the other orebodies below the No. 4 level in the Nickel Plate mine, we have received instructions to sink and have started another incline shaft, to be known as the Dickson incline. The intention is to sink this to 3,000 feet in depth. It is located so as to be under all the known ore-bodies, and will have payable ore above it continuously. The probability is that it will be extended next year.

"The Sunnyside No. 4 incline has been extended 160 feet, and is in promising country. Development work in the Silver Plate showed some good ore, but it is apparently cut off by a large diorite dike. Both these properties are in a good formation, with favourable conditions.

"The cost per ton for mining and milling, for the year has been reduced 53 cents, and the total cost, 73 cents, although we have been paying a higher rate of wages, and the following additions, improvements, etc., have all been charged to operating expenses: Removing the old and installing the new boiler (150 h.p.), together with the cost of the boiler, new diamond drill, new hoist, improvements to the flume, general improvements to the mill, and all mine development.

"The mill has been kept in first-class repair and is doing good work; the water-flume is also in better shape than last year; and changes have been made on the tramway, so that its operation is more satisfactory.

"Altogether we believe the last year to have been most prosperous. We expect to see the ore reserves increased during 1913.

"Development was as follows: Nickel Plate mine: sinking 420 fet, drifting 510 feet; raising, 110 feet; Silver Plate mine, drifting 140 feet; Sunnyside mine No. 4, sinking 160 feet. Total development 1,340 feet. Diamond drilling, 6,380 feet."

Report of the Treasurer.

The report of the Treasurer, Mr. C. D. Fraser, follows:—

"Attached is Balance Sheet as at close of December 31, 1912, and detailed statement of earnings.

"The net profits for the year were $385,880. The dividends for the year aggregated $360,000, or 30 per cent. upon the issued capital stock. The undivided profits, after payment of all dividends, were $226,841.34 at the close of the year.

"New mining claims were acquired at a cost of $145,913.13, which outlay was capitalized. All other expenses of every kind during 1912 were charged to operating expenses; these included new 150 h.p. boiler, diamond drill, hoist, etc., as shown in the report of the General Superintendent.

"The low earnings for December were caused by extra heavy development work, which compelled the crushing of an unusual proportion of low-grade ore. In addition, much trouble was caused during that month by snow." (The January, 1913, earnings were normal.)

Balance Sheet at End of 1912.

—Assets.—

Mines, mine buildings, machinery, reduction plant, etc.:		
Original investment	$ 920,000 00	
Net expenditures for additions to plant	127,294 08	
Net expenditures for new mining claims	145,913 13	
		$1,193,207 21
Cash		233,634 13
		$1,426,841 34

—Liabilities.—

Capital Stock—Authorized issue, 150,000 shares at $10, par.	$1,500,000 00	
Less $30,000 shares in Treasury	300,000 00	
		$1,200,000 00
Undivided profits January 1, 1912	$ 200,931 34	
Net profits for 1912	385,880 00	
	$ 586,841 34	
Less dividends paid in 1912	360,000 00	
Undivided profits at close of year		226,841 34
		$1,426,841 34

Operations and Earnings for 1912.

	Tons. milled.	Assay value.	Recovery at mill.	Expenditures.	Profits.
January	5,701	$10 70	$56,298 64	$29,669 72	$26,628 92
February	5,010	9 49	45,513 84	27,431 75	18,082 09
March	6,263	11 60	70,077 84	30,712 89	39,364 94
April	5,326	10 55	54,683 93	29,427 82	25,256 31
May	5,636	10 64	57,778 52	26,711 00	31,067 52
June	6,027	10 13	58,200 96	28,042 22	30,158 74
July	6,110	9 97	58,750 33	27,801 91	30,948 42
August	5,900	12 11	66,720 19	28,627 97	38,092 22
September	6,108	16 38	96,055 85	31,054 73	65,001 12
October	6,101	11 69	66,637 58	28,399 49	38,238 10
November	6,003	11 57	64,487 36	35,654 20	28,833 16
December	6,270	9 07	52,928 10	38,719 65	14,208 45
Totals	70,455	$11 19	$748,133 14	$362,253 14	*$385,880 00

*Including $9,834.69 interest earned on funds of the company during 1912.

PERSONAL AND GENERAL

Mr. A. W. Allen, secretary of the Lucky Jim Zinc Mines, Ltd., proceeded from Victoria, B.C., to Kalso, Kootenay Lake, at the end of April, to attend the annual meeting of the company called for May 1 at the latter place.

Mr. Melbourne Bailey, for years actively engaged in placer-gold mining on a large scale in Cariboo, British Columbia, has arranged to return to that district for the ensuing hydraulicking season, after having spent the winter at his home in Tacoma, Washington.

Mr. T. Walter Beam, of Denver, Colorado, has bonded a number of mineral claims situated in Hedley camp, Similkameen, B.C., and has arranged to extensively prospect the ground with diamond-drills. The exploration work will be done under the immediate supervision of Mr. Gomer P. Jones, of Hedley, general superintendent for the Hedley Gold Mining Co.

Mr. E. V. Buckley, manager of the Queen gold mine, in Sheep Creek camp, Nelson Mining division, British Columbia, has informed the Nelson Daily News that sufficient miners have returned to work at the Queen mine to admit of operations being resumed at the Queen stamp mill. The men are reported to have stated that they were induced to strike by representations that have not since been found correct, so they have returned to work at the old rate of wages.

Mr. W. A. Cameron, superintendent of the Consolidated and Mining and Smelting Co's Richmond-Eureka mine, has returned to Sandon, Slocan, from a trip to the British Columbia coast, and, now that the danger from snowslides has past, has resumed work at that mine.

Mr. M. S. Davys, managing director for the Silverton Mines, Ltd., and Mr. G. Stilwell, the company's superintendent, have succeeded in overcoming the obstacles that since the destruction of the lower terminal of the aerial tramway and the Wakefield mill by fire last June had prevented a continuence of ore production. The new concentration plant, which includes provision for the Minerals Separation flotation process, is now being operated.

Mr. W. J. Elmendorf, of Victoria, B.C., manager for the Portland Canal Tunnels, Ltd., has made a progress report to the directors of the company on the work of driving a 2,200 ft. cross-cut adit the company undertook and which was commenced last September. By April 1, ultimo, the face of the tunnel was 823 ft. from the portal, and it was estimated that the 1,000 ft. mark would be passed by May 1. This exploratory work is the most important yet undertaken in Portland Canal mining division, for it will prove ground to a depth of 2,200 ft. below the level of the workings of the Portland Canal Mining Co., from which about 8,000 tons of ore has been mined.

Mr. Jay P. Graves, vice-president and general manager of the Granby Consolidated Mining, Smelting and Power Co., Ltd., has returned to his headquarters in Spokane, Washington, after having spent the winter in southern California.

Mr. S. W. Hall, of Butte, Montana, who is superintending the development of a part of the holdings in that camp of the Butte-Duluth company, which has come into some prominence lately in connection with the claim that nearly pure metallic copper is being

produced by a leaching and electrolytic refining process in use by that company and the Bullwhacker, operating in the same district, was formerly managing mines at Rossland, B.C. He is a son of the late Mr. W. E. Hall, at one time manager of the Le Roi mine, Rossland, who came to his death in January, 1898, by falling down one of the shafts of the mine.

Mr. J. M. Harris, of Sandon, Slocan, B.C., well known as one of the principles in the long-drawn-out litigation between the Star and Byron White companies, involving extra-lateral rights, has lately been visiting the Panama canal.

Mr. R. A. A. Johnston, mineralogist of the Geological Survey of Canada, who has been on, a vacation spent a few days in Victoria, B.C., in the course of his holiday wanderings.

Mr. Oscar Lachmund, general manager for the British Columbia Copper Co., last month visited Princess and Voigt's camps, Copper Mountain, Similkameen, B.C. He was accompanied by Mr. Frederic Keffer, the company's engineer and geologist.

Mr. Douglas C. Livingstone (B.Sc.,McGill, 1906), associate professor of mining engineering at the University of Idaho, Moscow, Idaho, has been examining the Center Star property, Elk City, Idaho, which is under bond to Pittsburgh, Pa., capitalists.

Mr. T. J. Lloyd, underground superintendent at the Van-Roi mine, Slocan, has given the Consolidated Mining and smelting Co., a bond on a group of mineral claims situated near Four-mile Creek, Slocan lake district, B.C.

Mr. C. H. McDougall (B.S.c., McGill, 1905), superintendent of the Consolidated Mining and Smelting Co's St. Eugene and Sullivan Group mines in East Kootenay, was lately convalescent after having been ill in the Kootenay Lake hospital at Nelson.

Mr. Alfred McMillan has returned to Northport, Washington, from a stay at the Halcyon Hot Springs, Arrow Lake, B.C. He is in charge of the smelting works at Northport, and other property of the Le Roi Mining Co., in liquidation.

Mr. I. M. Merrill, president of the Hedley Gold Mining Co., recently paid a visit to that company's mine and stamp mill in Hedley camp, Similkameen, B.C.

Mr. W. H. Nichols, of New York, president of the Granby Consolidated M.S. and P.C., has gone to Europe on a two months' vacation.

Mr. Fred S. Peters, superintendent of the Le Roi mine, Rossland, B.C. has been in the hospital in that city for treatment during illness.

Mr. M. E. Purcell, superintendent of the Centre Star-War Eagle group of mines, in Rossland camp, is making arrangements for the reception there of visitors who will attend the Fifteenth General Meeting of the Western Branch of the Canadian Mining Institute, to be opened in Rossland on the evening of May 22. As the meeting will be a joint meeting with the Spokane Local Section of the American Institute of Mining Engineers, it is expected the attendance will include a number of visitors from the State of Washington and several from Idaho, as well as others from the Kootenay and boundry districts of British Columbia. The provisional programme is May 22, evening meeting; May 23, visit to local mines in daytime, and evening meeting; May 24, visit to Consolidated and M. and S. Co's smeltery and refinery, at Trail, and amusement evening.

Mr. E. C. Semmens, who has had a lengthy gold mill experience in Western Australia and West Africa, has been apointed to charge of the 10-stamp mill, on Cadwallader creek, Lillooet district, British Columbia, of the Coronation Gold Mines, Ltd. The company two years ago aquired the Ben d'Or gold mine and mill and other mining property in the vicinity, and since then has done much underground development with promising results, so with sufficient ore developed for stoping the mill is to be operated this season.

Mr. R. J. Spry, is superintendent of the Eureka mine, near Nelson, B.C., which property is being developed by the British Columbia Copper Co., under option of purchase.

Mr. Thos. R. Stokett is being heartily congratulated on the satisfactory results achieved at the New Reserve Shaft Mine, near Nanaimo, Vancouver Island, which mine is being opened under his direction (see Canadian Mining Journal for April 1, p. 212). Coal has been entered at a depth of 1046 ft., and the seam is reported to be 10 ft. in width of coal of excellent quality.

Mr W. J. Sutton, of Victoria, B.C., has been nominated as chairman of the Western Branch of the Canadian Mining Institute for the ensuing year, to May, 1914. It would be particularly appropriate for the branch to have its chairman at the time of the visit to British Columbia of excursion parties of the International Geological Congress, a geologist so well known in the province as is Mr. Sutton, so his election by acclamation may be expected.

Mr. E. E. Ward, of Ainsworth, B.C., superintendent of the Silver Hoard mine, had an unpleasant experience recently. He was going up from Kootenay lake in one of the buckets on the No. 1 mine aerial tramway when something went wrong and the cable stopped running. Hung up during a snowstrom, he was in a predicament until a miner climbed one of the towers and threw him a rope, by means of which he lowered himself to the ground.

Mr. W. P. White, of Spokane, who, some years ago, was superintendent of the St. Eugene lead mine in East Kootenay, during its period of greatest production, was lately in Boundary district of British Columbia.

Mr. W. R. Wilson, of Fernie, B.C., general manager for the Crow's Nest Pass Coal Co., was in Toronto last month attending the annual general meeting of the company.

Prof. Chas. E. Van Barneveld, recently appointed chief of the Mining Department of the Panama-Pacific Exposition, is Professor of Mining Engineering at the University of Minnesota, Minneapolis, Minn. He is a McGill University graduate (B.A.Sc.,1895). The Engineering and Mining Journal says: Professor Van Barneveld is the Dean of the School of Mines of the University of Minnesota. He is preparing to take up the exposition work immediately. He held a position in the University of Minnesota for fourteen years, and during that period travelled extensively in behalf of the University. For six years prior to that period he was engaged in practical mining, in the south-western States and in Mexico. He is the author of "Iron Mining in Minnesota." He was formerly a resident of California and is a land-owner in the Sacramento and San Joaquin valley. The mining building to be erected at the exposition will occupy an area of 350,000 square feet. It is proposed to make the exhibit greater than that of any previous exposition.

PLATINUM IN BRITISH COLUMBIA

The following is an excerpt from the chapter on "Platinum and Allied Metals," by Mr. Waldemar Lindgren, in the United States Geological Survey's valuable report, entitled "Mineral Resources of the United States, 1911." (Part I. pp. 1000-1001.)

"British Columbia.—The presence of platinum metals in British Columbia has been known since 1887. The upper branches of Similkameen river are known to contain platinum, especially the North Fork, usually referred to as the Tulameen river. A considerable black production was at one time maintained from these gold and platinum-bearing deposits. (See Camsell, Chas.; Platinum Mining in the Tulameen District; Journal Canadian Mining Institute. Vol. XIII., 1910.) Camsell estimates the total production of crude platinum from this district at 9880 ounces. The richest platinum ground was found on Tulameen river between the mouths of Slate and Champion creeks. On Tulameen river no platinum was found above the mouth of Champion creek, and below Slate creek the grains became finer and the quantity gradually decreased. The platinum in some cases was present in a ratio of 1 to 3 by weight, as compared to gold. During 1911, active prospecting has been carried on, and it is stated that workable ground has been discovered. Dredging is the process which it is intended to apply to the deposit. During the last few years the annual production of platinum from some of these placers has amounted to only a few ounces. Statements in the press are to the effect that the depth of bedrock averages 12 feet. A company organized in Vancouver has leased some 20 miles of Similkameen and Tulameen rivers from the Government. The production for 1911 is estimated at 30 ounces. Much of the gold and platinum in this district is coarse and the nuggets have not travelled far from the original source. Much of the gold is still embedded in quartz, while the platinum is often associated with chromite, olivine and pyroxene. Kemp mentions platinum intergrown with olivine and octahedral chromite from the district. One of these specimens shows the contemporaneous development of the three minerals very clearly. The rock from which the platinum was derived is probably a belt of basic intrusives, mainly peridotite, having a flanking border of pyroxenit. Kemp concluded that the original sources of the platinum was in both the peridotite and the pyroxenite, and this conclusion is corroborated by Camsell. The heavy minerals associated with platinum, beside those mentioned, are magnetite and native copper. An analysis of the crude platinum gave, according to G. C. Hoffman, quoted by Camsell, the following results:—

Platinum	72.07
Palladium	0.19
Rhodium	2.57
Iridium	1.14
Osmium	....
Copper	3.39
Iron	8.59
Osmiridium	10.51
Gangue	1.69
	100.15

"Kemp assayed a number of specimens of platinum-bearing rocks, such as serpentine, chromite, pyroxenite, and peridotite, from this district and found in most of them traces of platinum. Some of the selected chromite gave half on ounce of platinum per ton. Other samples contained from 0.1 to 0.3 per cent.. of the metal. It is exceedingly improbable, however, that valuable deposits of platinum will be found in the parent rock.

"Reports were current during 1911 of a discovery of platinum metals at and near the Granite-Poorman mining property, a few miles from Nelson. A well-defined dike bearing these metals is said to have been traced for several miles in the general direction of Forty-Nine-mile creek and Kootenay river. A statement is made by E. Jacobs in the Canadian Mining Journal of September 1, 1911, that the rock containing the platinum metals is serpentine and probably an altered peridotite. The predominent metal is said to be palldium, though platinum and other allied metals are also said to occur. Whether the find is of economic importance is not certain. The existence of a new metal named canadium has been reported in this serpentine rock, but the discovery has not been confirmed."

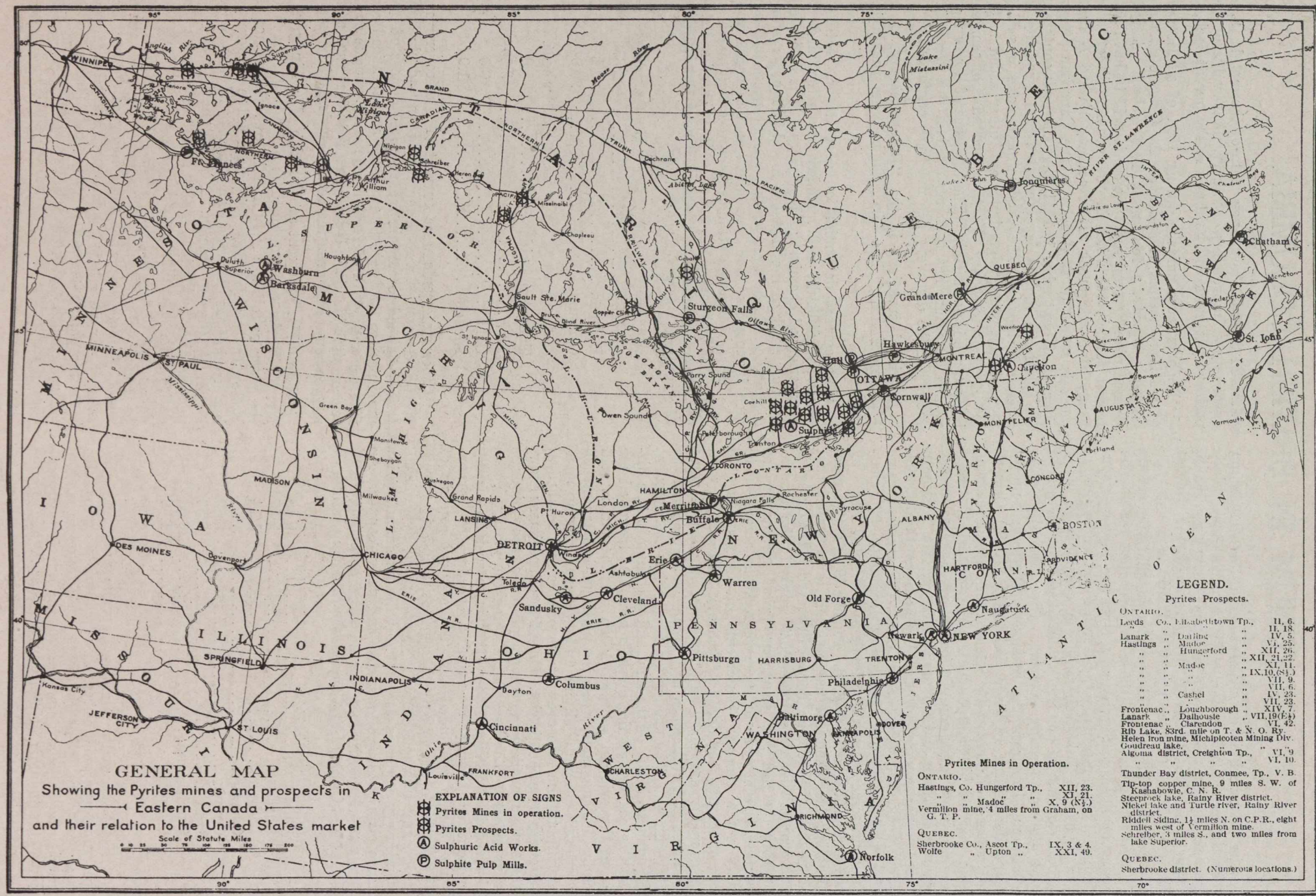
In his observations in the "Determination of the Platinum Metals," Mr. Lindgren includes the following:—

"The correct determination of platinum metals is somewhat difficult, and mistakes are often made by inexperienced chemists and assayers. It is difficult to say how much of the mistakes found in reports of new discoveries of platinum in the current press is due to such inexperience and how much to deliberate fraud. The most ridiculous statements are often made. A statement was made, for instance, in 1911, of a discovery of an 'immense bed of Osmium near Boise, Idaho.' The analysis was given as follows:—

	Oz. per ton.
Gold	2.3
Iridium	0.1
Osmium	20.0
	Per cent.
Tungsten oxide	5.0
Tin	0.25
Cobalt	0.5
Nickel	1.0

"Other statements were current of a discovery near Merlin, Oregon, of a rock containing tin and platinum. It was claimed to contain from 1 to 65 ounces of platinum per ton, and said to occur 'in a mineralized zone 600 feet wide, with 15 feet of spherulitic gangue and 8 feet of pitch-blende.' It is unfortunate that such statements should find even temporary credence."

(Note.—The statement attributed b yMr. Lindgren to Mr. E. Jacobs was contained in a quotation made by the latter, as follows: "E. R. Widdowson informed the Nelson Daily News that 'palladium is the predominating metal of the platinum group discovered near Nelson by Mr. A. Gordon French. It is obtained from a serpentine dike, which is probably an alteration of a peridotite dike. The dike material varies in colour from a dark green to a dark yellow, and is so soft that it can be mined with a pick. The metal is a hard, silvery white substance, but is not visible in any of the ore I have assayed. In all I have made some 50 or 60 determinations for palladium, and the other rare metals, for my various clients, and I am well able to confirm the presence of the metals discovered by Mr. French.' ")



Refer to page 308.

THE TRANSMISSION OF POWER BY COTTON ROPES

By E. EDWARD HART, M.A.

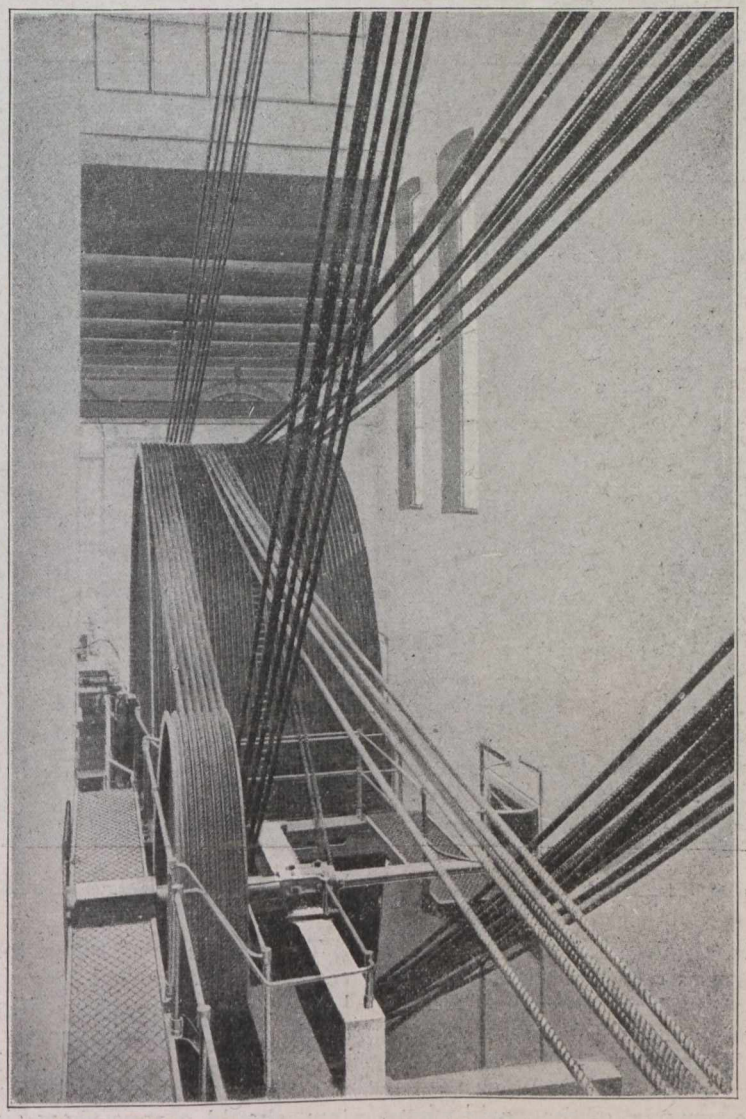
A Paper Read Before the Association of Engineers-in-Charge

The method of transmitting power from one pulley to another by means of ropes is generally termed rope driving. The rims of the pulleys are specially grooved to receive the ropes, and the power is transmitted by means of the frictional resistance between the rope and the pulley groove.

There are two systems in use: (1) The American or continuous system, where one long rope is wound continuously around both driving and driven pulleys, the last wrap being carried across the width of the pulleys back to the first groove by a carrier pulley set at the required angle. This is extensively used in America, but rarely found elsewhere; (2) the English or separate rope system, where each rope on the driving pulley runs straight and true into its corresponding opposite groove on the driven pulley. This is by far the commonest practice, and is the one to which I shall confine my attention.

For main drives, both three and four-strand ropes are used, and usually vary from 1-in. to 2-in. in diameter; but on small fans and fast-running textile machinery, smaller bands and ropes, between ¼-in. and 1-in. diameter, are more suitable. The rope-speeds most frequently employed are from 2,000 to 5,000 feet per minute.

The earliest ropes used for power transmission were probably of leather or hemp, and though there are one or two instances of main drives on record in the early years of the nineteenth century, it was not until about 1860 that Messrs. James Combe & Co., of Belfast, introduced rope driving for large powers. From Ireland the system spread to Scotland, and in a short time it was well known and used by the manufacturers of Lancashire and Yorkshire. Leather ropes were soon discarded owing to their expense and the difficulty of their manufacture and hemp ropes took their place. This was probably due to the fact that hemp was easily



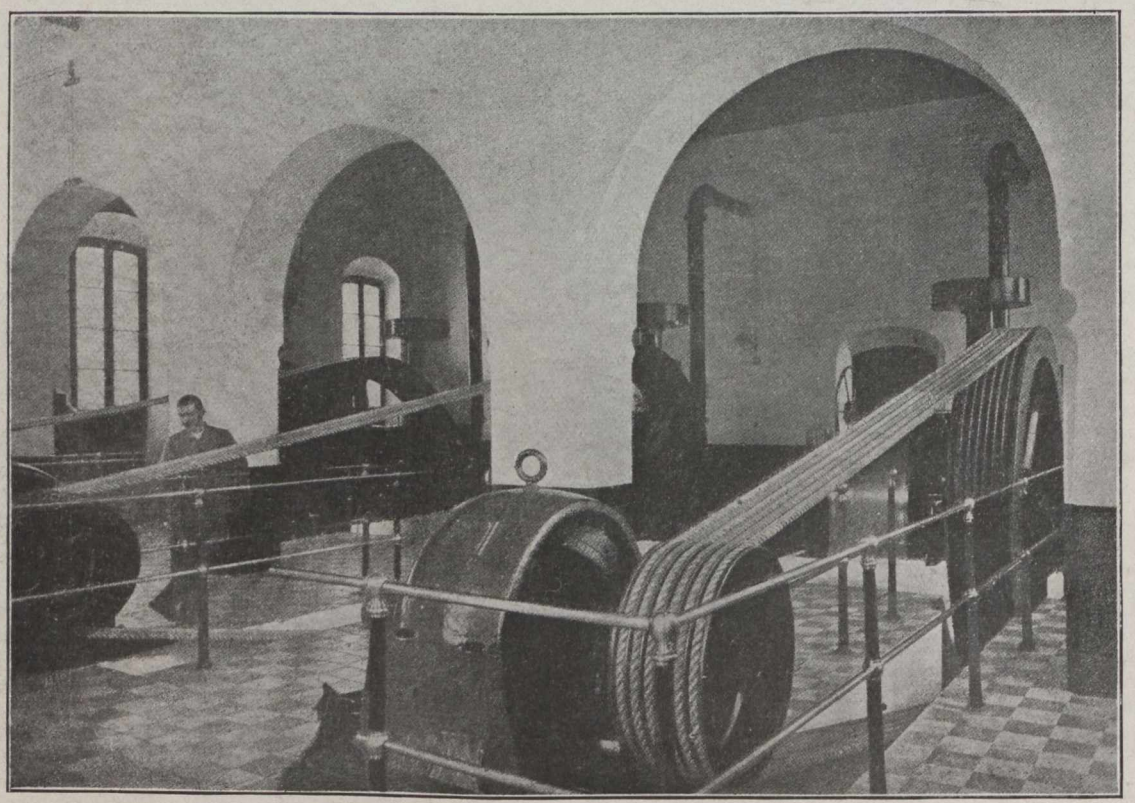
Rope-race in a Modern Mill.

obtainable in Belfast and Dundee, being largely cultivated in those districts.

Although several hemp driven ropes are running to-day, owing to the harsh nature of their fibre it was soon discovered that for power transmission, ropes made from cotton gave far better results. It is probable that from the very first cotton bandings or small plain laid ropes were used for driving the cotton-spinning frames in the Lancashire mills. Certain it is that my grandfather, who died in 1861, had been making them for many years. But the idea of driving a whole mill with ropes by having the engine flywheel grooved for their reception does not seem to have been adopted in Lancashire and Yorkshire until about five or ten years after this date. Even then ropes like the ones used in Belfast and Dundee were used at first, as they were purchased, probably, along with the engine. In the heart of the cotton-spinning district the change from hemp to cotton was not long in coming. And when once cotton ropes had been properly tried, their marked superiority was at once so apparent that they almost immediately displaced hemp ropes for power transmission. And to-day, with one or two notable exceptions, cotton ropes have entirely superseded hemp ropes for transmitting power in every part of the world where rope drives are to be found. And though they were only used at first in textile factories, the superior pliability of the cotton fibre has led to its adoption in mills and works of every description.

As years went on, the advantages of the system were more and more recognized. In connection with steam engines, gas engines, oil engines, and water and steam turbines, it was found that large mills several storeys in height could be easily driven from one prime mover, and that power might be transmitted to shafts over 100 feet away, without the use of long lines of heavy and expensive shafting or gearing.

The stopping of a mill owing to broken gearings is now practically unknown, and it is only necessary for one to have had the experience of working in close proximity to a large geared engine to appreciate the absolute noiselessness of a well-designed rope drive, and its freedom from vibration. As regards first cost and maintenance, a rope installation is very much cheaper than leather belts, or shafting and gearing, and where space is a consideration, it is often possible to put up a successful rope drive where there is literally no room for any other system. Electrical engineers have found it very useful in adjusting velocity ratios of shaftings, as, by using rope drives they are enabled to use higher speed, and consequently lower-priced motors. Besides this, ropes will transmit a large temporary overload without slipping, and it is possible to greatly reduce capital charges by driving a series of machines, or lines of shafting, from one motor.



Three Sets of "Lambeth" Ropes Driving Dynamos from Gas Engines at a Mine in Spain.

The resilience of ropes, too, is found to considerably reduce the wear and tear of machinery, and they are being more and more used in steel rolling mills, cement works, and rubber factories, where sudden and severe overloads are constantly being met with. Another advantage is that, with the English or separate rope system, should a rope show signs of wear, it can be removed during the dinner hour without causing a stoppage of the mill, and can be respliced at any convenient opportunity, say the end of the week, without any excessive strain being put on the rest of the ropes. Rope gearing is also more positive in its transmission than belting, and consequently no allowance need be made for slip.

The Loss of Power in Rope Transmission.

Several experiments have been made from time to time to ascertain the loss of power in driving with belts and ropes, and to compare their efficiencies.

(To be continued.)

SPECIAL CORRESPONDENCE

ONTARIO

PORCUPINE, SWASTIKA AND KIRKLAND LAKE.

Owing to the giving away of the flume at the Sandy Falls plant of the Northern Ontario Light & Power Company, as a consequence of the tremendous floods north of the height of land, the power situation in the camp is more serious. There is for the time being no electrical power in the camp. Most of the companies, however, have their own steam plants, and they will revert to them until the break has been repaired. The operations have outgrown these plants in many instances and production or development will have to be curtailed, but in only rare instances has the failure of electrical power caused a complete shut down. The Hollinger has reverted to their steam plant, which, fortunately, has been considerably augmented since Sandy Falls enabled them to run with the electric current. Progress is being made with the repairs at the Waiwaiten Falls, and the plants obtaining power from this source should soon be able to hook up again.

The floods which have distressed the whole of the country sloping towards Hudson's Bay are phenomenal, and there is no cause to look for a repetition of these disasters.

An organization, unimportant in its inception, but of significance, is the Northern Prospectors' Association, which has been formed at Porcupine. This is purely local at present, but may spread all over the field. It is formed for the ostensible purpose of promoting the interests of prospectors, particularly in relation to legislation. It is an organization which certainly has no forerunner in Ontario.

In the first month's run at the McEaeney mine the mill heads ran $30 to the ton. The mill at this time was treating on an average of fifty tons per day.

The outstanding feature of the Kirkland Lake camp is the fact that one company has shipped $32,737.44 in gold from an open cut and a shaft 115 feet deep. As there was but 73.85 tons of it, it works out at approximately $448 to the ton. This is a conservative estimate, as the gold is reckoned at $20 to the ton only. It is also remarkable that the silver contents pay for freight and treatment and leave only haulage to Swastika station and mining to be deducted. The figures are so remarkable that they are given in full:

Tons.	Gold ozs. per ton.	Gold contents.	Value at $20 per-oz.
1.85	$18.60	$34.41	$688.20
19.90	22.50	447.75	8,855.00
21.60	19.75	422.72	8,454.24
30.50	24.00	732.00	14,640.00
73.85		1,636.87	$32,737.44

Silver Contents.

Tons.	Silver. per ton.	Silver per oz.	Silver at 60c. an oz.
1.85	22.70	41.99	$24.19
19.90	23.40	465.66	279.39
21.60	33.56	724.89	434.93
30.50	35.00	1.067.60	640.20
73.85		2.300.04	$1,378.78

The first shipment of 1.85 tons was a sample lot from the outcrop of five veins including No. 2, or the main vein, which furnished all the remainder of the shipments to date. All of the above ore with the exception of the last shipment came from an open cut on the No. 2 vein. This open cut had an average width of 32 feet and it was put down 24 feet before the incline shaft was commenced. The last shipment was made from the incline shaft, put down to a depth of 115 feet on the vein. The shaft has made 125 dollars per foot net profit. The main high grade vein which alone has been shipped will average from ten to twelve inches in width. The management claims that the milling ore on the foot wall and hanging wall has a total width of twenty feet and will run $20 per ton.

The No. 2 vein from which all the ore has been taken has been stripped for 390 feet till it dips under a heavy overburden at the east end.

The high grade streak is not more than two or three inches wide on the surface and was so little impressive that most of the consulting engineers of the big companies turned it down even at the small price that was asked for it a year ago. Where the vein has been mined is entirely in coarse conglomerate, but it appears to fuse with the gray porphyry at the east end. The first ore was mined on Nov. 18th. There are several other promising veins on the property, No. 3 has been stripped for 700 feet and promises to make a good body of milling ore. It is entirely in the porphyry.

The first unit of the mill should be running by the middle of the month, and there are 2,000 tons of milling ore out of development already broken. This little plant will handle at least fifteen tons per day.

Since the first of December 900 claims have been staked and filed near Swastika. Apart from the Foster no real mining has been attempted. Two shafts have been put down to the fifty-foot level, but that is all. The camp is quite in the making, but it may be said that so far as development has proceeded it has yielded quite satisfactory results. Another point in the favour of capital here is that the prospector is sweet reasonableness itself in comparison with his attitude either in Porcupine or Cobalt, Gowganda or Elk Lake. The Foster was secured on a working option for a few thousand dollars, and though prices have necessarily advanced since then they are comparatively modest. The Hughes Teck has a shaft down to the fifty-foot level and it is said that it has stood up well under careful sampling. Harry Oakes, one of the pioneers of the camp, also has some promising claims and good finds have been made on the Orr, now the Wettlaufer properties, the Hunton and some others.

The six miles long wagon road from Swastika to Gull Lake which promises to be the centre of operations is not in good shape just now, but can easily be made reasonable with the expenditure of a little money. The Government with commendable promtitude has made a grant of $10,000 for the road and Mr. Whitson already is making his plans.

At Swastika, the Lucky Cross mill is now running and is said to be making a satisfactory recovery. The cutting of the No. 16 vein at the 200-foot level has greatly improved the prospects of this mine. At one spot where a blind vein makes junction there is ten feet of milling ore and the vein has a normal width of three feet of ore that is decidedly of better grade than at the upper level.

Stamps are also dropping at the Swastika mill, and the first clean up of approximately $3,000 has been made as the result of 26 days' run.

Most of the members of the Lucky Scott party that adventured to Labrador last year are going to the east coast of Hudson's Bay.

Sam Itisse, of the Otisse mine, Elk Lake, is heading the first party towards placer fields. They have gone to Cochrane, whence they will strike with six months' provisions up to the Bell to Ruperts House and then probably to the East Main. Two other parties will also be equipped this year for much the same journey, one from Ottawa and one from Toronto.

The Gold Fields, Limited, at Larder Lake, is very materially raising the capacity of its plant by adding four tube mills and a cyanide plant. The mill is now treating about 75 tons per day of low grade ore. The d'Or Huronian mine, about eight miles from them are putting in a plant to work an ore body with a promising outcrop. The Dane Mining Company, about eight miles from Dane Station, is also busy again so that the whole section is quite active.

COBALT, GOWGANDA AND SOUTH LORRAIN.

Permission to drain Kerr Lake and keep it drained for seven years was given in Toronto to the Kerr Lake and Crown Reserve Mining Companies by Mining Commissioner T. E. Godson. The terms of the order are to be fixed after the notice to the other mines has been served. This is the first application of its kind made to the Mining Commissioner under his increased powers granted under the Mining Act. At the hearing the Penn Canadian mines, the Bailey-Cobalt and the Kerr Lake Maestic Mining Company were the only companies represented from among those continguous to the lake. It is expected that the work of pumping out and draining Kerr Lake will be commenced about July 15th by the two mining companies.

If the Cobalt Lake Mining Company obtains consent to pump out Cobalt Lake the company promises through its Cobalt manager to spend thousands of dollars to make the bottom of the lake an amusement park. Permission will be asked of the Mining Commissioner to allow the lake to be drained at his next sitting, probably the first week in June. If the permission is granted work will be started immediately. Two large centrifugal pumps, each with a capacity of 3,000 gallons per minute, will be placed on scows and commence operations. It is the intention to pump into the old outlet which runs round by the Right of Way and La Rose mines, and it is expected that in five months the entire 5,000,000 gallons of water now contained in the lake will be pumped into Lake Temiskaming. The cost of pumping the water from the lake will be in the vicinity of $50,000, while it will release several million ounces.

While the Hudson Bay Mining Company is seeking to consolidate its holdings in the north by developing new fields, it is not neglecting the central property. On two levels ore is being broken from stopes thirty feet wide. The average width of the stopes is from twelve to fourteen feet. There is no definite area of enrichment. Sampling alone determines how wide the rock can be mined at a profit. Stoping this width an average mill head of 22 ounces can be obtained, exclusive of the high grade which is still hand-picked. This ore is being mined for $2.25 per ton, and the twenty-stamp mill is treating on an average of 70 tons per day. The duty per ton last month was 3.67 tons per stamp.

After lying idle for more than eleven months, the first round of holes fired in the north face of the main drift at the 150-foot level of the Bellellen mine, of South Lorrain, showed high grade ore. This was four to six inches wide. Where the drills were started the vein, while it showed native silver, was not classed as high grade. But with the first round of shots last week real bonanza ore as it is reckoned in Cobalt was shown.

The fear of a strike which has been in the air for the past two or three months has been cleared by the decision of the union not even to take a vote on the matter. There was an attempt of the Socialists who have infested the Porcupine camp to force a declaration on the operation of the eight-hour bill, but the good sense of the majority of the members voted them down. The strike leaders from Porcupine descended on the Cobalt camp some weeks before the matter came to a head and succeeded in capturing the organization. They imported some agitators and endeavoured to foment a strike. But the majority of of the miners even in the union were not in favour of industrial disturbance. This is the second time this year that the Cobalt union has declared against a strike in the silver camp.

BRITISH COLUMBIA

There is little change in the labour situation at British Columbia mines, except that an attempt was being made at the close of April to induce the miners employed by the Western Fuel Co. at its several coal mines in the vicinity of Nanaimo, and those of the Pacific Coast Mines, Ltd., at South Wellington, all on Vancouver Island, to strike. On May 1 the Victoria Times published the following:

"A manifesto has been issued by Robert Foster, president of the United Mine Workers of America, District 28, declaring the commencement to-day of a strike at all the coal mines on Vancouver Island, and requesting all miners to cease work until the companies for which they work concede them an advance in wages.

"This manifesto is the result of orders issued by the Seattle (Washington) representative of the International Union of United Mine Workers, Frank Farrington, who, in issuing instructions for the strike manifesto to Mr. Foster, declared that this was the result of the lack of interest taken by mine-owners on Vancouver island in the invitation to atttend a conference on the subject some months ago.

"The instructions issued call for a strike of all men employed in and around the mines at Nanaimo, South Wellington, and Jingle Pot, the strike to continue until a joint working agreement between the United Mine Workers of District 28 and the mine-owners on the island shall have been secured. The men ask for increased prices for labour and improved conditions of employment.

No Unlawful Tactics.—The manifesto, while calling the men out of the mines, asks that every effort be made to prevent unlawful or abusive tactics by the men. The names of all who refuse to respond to the strike call will be blacklisted and published throughout Canada, Great Britain and the United States. A force of men sufficient to protect mining property will be permitted to work so long as the companies shall not attemut to ship coal, but all men not engaged in this way are urged by the manifesto to join the strike, the International Union having promised all the men involved, whether union or non-union, financial support so long as the strike shall last.

"Should all the men at the mines affected by the manifesto go out it will mean that something like 2,000 men will be involved in the strike, although the local

agents have not up to the present been apprised of any definite action with respect to the affair."

Miners Resent Order.—A despatch from Nanaimo, published in this evening's "Times" (May 2), is as follows: "Mr. Foster's action in calling a general strike was taken without first submitting the question to a vote of the miners concerned. Of the 1,500 employed in the Nanaimo mines, only 200 are members of the organization which has called the strike in the local mines and a large majority of the men resent the action taken by this small minority. A mass meeting of all employees will be held to-night, when a secret ballot will be taken on the question as to whether Nanaimo miners will recognize a strike order of the United Mine Workers. It is said that there will be an overwhelming majority in favor of continuing work, as the men are working under an agreement with the Western Fuel Company, which has still at least five months to run and which they feel in duty bound as honourable men to respect."

It may be added that some time ago the Nanaimo miners refused to go out on strike in sympathy with those at the Cumberland and Extension mines of the Canadian Collieries (Dunsmuir) Limited, and at which non-union labour has since been employed, with an increasingly large number of men working at Cumberland and a commencement made with some 200 men at Extension. Published figures show that during three months ended March 31 the output of coal from the Cumberland mines was 96,818 tons, as follows:—January, 29,541 tons; February, 30,036 tons; March, 37,241 tons. For the week up to April the latest figures at hand, the output was 9,191 tons, or better than 1,500 tons a day.

PRINCIPLES OF MINE VALUATION*

By JAMES R. FINLAY

I have always supposed, and I think that nearly all mining engineers agree with me, that there are three or four fundamental factors about a mining prope.. which determine its value. These are:

1. The average cost of securing the products of that mine.
2. The average price at which those products can be sold.
3. The rate of production of the mine.
4. The time for which that output can be maintained.

I do not intend to go into detail as to any of these factors, but to point out some things which I think are worth considering, in the hope that later you will think about them and learn the details for yourselves.

In regard to the average cost: In the case of going concerns, that average cost can be obtained empirically by simple reference to the books—to what has actually been done on the property. That seems and sounds exceedingly simple. As a matter of fact it is not easy. I made the mistake once of thinking that it was. I bought a mine in Joplin, Mo., to be specific, on a record of its cost for six months. The reason I did not go further back was that older records were not to be had, and also because during this particular six months the property had reached a substantial basis. I figured that the concentrates from that mine could be produced perty should produce so much ore and that the price would be a certain figure. It happened that developments proved that I was right about the price and the quantity of ore on the property, but they also proved that I was wrong on the question of costs. It cost us nearly 75 per cent. more to produce concentrates from that ore than the record of the property showed. There were times when we produced concentrates for $15 a ton, but that was not representative of the while period of working the mine. I think you will find today that a great many of the cost statements given out by different companies for fixing the value of their stocks are only temporary or occasional costs, and will not stand analysis, and cannot be maintained during the whole life of the property.

Then there is another factor in which people deceive themselves, unconsciously, but in the simplest and most obvious ways imaginable. They keep on doing it, always have done it, and I suppose always will do it. That is, by failing to see the relation between expenditures that are for plant and those for keeping it going. In keeping books it is very easy to say that the construction of a building, the remodeling of a mine, or the building of a new mill, is something that will not happen again, that it belongs to the property and not to the operation; to a certain extent that is true, but it is a fact, which I have verified by looking up a great number of mines, that the so-called operating costs are ordinarily not more than 60 to 80 per cent. of the total cost. Until a mine is shut down, there is always some expenditure to be undertaken which a bookkeeper may think will not be repeated, that it belongs to the plant, but these things keep occurring so constantly that one who is figuring on costs must count on them. That is, to form an estimate that is correct or approximately correct will require a good deal of judgment and experience.

Another thing I believe to be true is that any estimate of cost, or valuation, or anything relating to the future, is a good deal of a guess. One who thinks he can estimate a cost, whether of a going concern or a concern to be started, to a fraction of a cent, or to any fixed amount is simply mistaken. All you can do is to put a round figure which seems to be pretty near the facts. Of course, the difficulty of estimating costs at a mine which is not yet opened is considerably greater than at a mine that is going, for very obvious reasons.

The next fundamental factor in forming an idea of the value of a mine is the average price of its product. I will go so far as to say that this is the most important factor to be considered. The literature on this subject, I think, has not done justice to the importance of prices because apparently a good deal of the best thought given to the subpect of valuations has been by English engineers who had in mind principally gold mines. Gold, of course, is the only product of mines the value of which is fixed; consequently most of the discussions on mine valuation among engineers have been devoted to the third factor, which I will come to later, viz., the uncertainties in amount of ore in a mine and the part that deveolped ore plays in the estimate of a total valuation.

*An address delivered at The Columbia School of Mines.

As an example of the tremendous importance of the price of a product in mine valuation, I will cite from my report on the Michigan mines. At the time of that report, the price of copper was 12¼c. per pound. A group of copper mines in Michigan were producing, and had been producing 200,000,000 lb. of copper per year at a cost of 10c. per pound, in round figures. I valued the mines on the assumption that the average price of copper would be 14c. per pound as against the current price of 12¼c., and I put a valuation of about $70,000,000 on that basis. Roughly, at 14c. a pound, the earnings would be $8,000,000 a year, and the total value of the group would be nine times that, or $70,000,000. You will find it is a difficult thing in commercial transactions to figure steadfastly on a price that is different from the present price. When I talked about copper averaging 14c. a pound, many said, "That is not the present price, it is 12¼c." Some thought the price might go even lower instead of higher. I think if I had not been prepared by several years' study of that very subject, I would certainly have used a lower figure than 14c. a pound for the average price of copper. At any rate, the value I put on them was nine times their annual income at 14c. If I had used the current price of 12¼c., their annual income would have been only $4,500,000. As a matter of fact, within less than 12 months after the report was made the price of copper had gone up to 17¾c., and the usual proportion of people thought that the price would go still higher, and that this might be the average. If it had been the average, the earnings of these mines would have been nearly $15,500,000 at that price of copper.

Now let us look at what these figures mean in terms of the life of a mine. If I had figured that the mines were worth $70,000,000 at a price of 12¼c. per pound, I would have had to believe that the mines, on the average, were good for 40 years' life, instead of about 13 years. If, on the other hand, I had assumed that the price would be 17¾c., in order to make the mines worth the price I put on them they would have to last only five or six years. Therefore the fluctuations of price in less than a year corresponded to an extension in the life of those mines from five or six years to 35 or 40 years. Here again I am dealing in a mere approximation. I suppose these mines produce about 20 lb. of copper per ton; therefore to get 200,000,000 lb. of copper per year you would have to mine 10,000,000 tons. Therefore, the figures that I actually used meant that I believed there was 130,000,000 tons of copper ore which could be depended on. That is an enormous amount of ore. Figured roughly, that would mean a lode of solid ore five miles long, of the average width of 12 ft., and 5,000 ft. deep; it was actually obtained by projecting the production of the mines and the development of the mines far below their present position. Now if I had to estimate on 12¼c. copper, I would have had to figure on 40 years' life, or I would have had to believe that there were 270,000,000 more tons there than I thought I was justified in believing. On the other hand, if we put the value at 17¾c., I should have had to figure on only 50,000,000 or 60,000,000 tons of ore. Therefore, I say, as affecting the values of mines, the actual fluctuations of price within one year were equal to an uncertainty in the ore production in those mines of more than 300,000,000 tons. An engineer is not likely to make a mistake like that with mines so fully developed as these Michigan properties, many of which are worked to a great depth, are well managed, and have their outlines very well shown. He could, however, easily make just as important a mistake as that in figuring on his average price of copper.

As a matter of fact, I do not think the 14c. price I used was an accurate figure. I have believed that copper would average more than 15c. per pound, taking into view the development of the business, but 14c. was as far as I thought I could go. I do know that mines have been valued within the last five years on prices estimated all the way from 12c. to 20c. Just imagine what a difference that makes in the estimated value of those mines! I know a very important mine in Mexico, the organizers of which believed that copper would not average less than 20c. per pound. I know of mines, on the other hand, that are being valued on an expectation of 12½c. per pound. The same uncertainty applies to all kinds of metals.

I ran against the same difficulty with another group of mines during that same Michigan study. In the iron mines I assumed a price for iron which happened to be almost the same as the price for the year 1911, which was a dull year in the iron business. In this case, however, the price, instead of going up, as the price of copper did, went down about 50c. a ton the next year. Now the margin of profit for those iron mines, during the period that I figured on, was just about $1 a ton, so that if you take off 50c. a ton you cut the profits in two. Of course, during all this last year, I have been exposed to a good deal of criticism by the iron miners, because they say I assumed a wrong price. While it may have been wrong for the year 1912, I notice that prices for the year 1913 have been fixed lately and at a figure very close to my average, in fact, almost identical with it if certain reductions in freight rates be considered.

In both the iron and copper calculations, I have been asked a great many questions as to how I arrived at the prices I assumed. Here there are certain evidences which can be used as guides, and are well worth studying. One general fact about the prices of all mining products is that they vary in cycles or in waves, irregularly of course. If, after a period of high prices, you find that prices are definitely going down and reach a new level, it is pretty safe to believe that the lower level of prices will continue several years. On the other hand, after a period of low prices, when once the metal rises markedly, it is pretty safe to assume that it will stay at a higher level for several years. Those fluctuations are things very well worth studying. It is a matter on which you cannot form opinions right away. You will find in a year from now that you will be justified in holding a different idea from the one you may have at present.

The valuation of a mine, while in the long run it depends on the average, is influenced a good deal by the present price. If you have a copper mine that is going to last ten years, and you expect 18-c. copper for three years out of those ten, it is a matter of considerable consequence to your property whether that 18-c. price comes during the first three years or during the last three years of the life of your mine. If it comes in the first three years you will get your profits and may invest them, perhaps in other directions, and the interest on that money for the following years will be worth a great deal to you. I must confess, in regard to the question of profits, that I was wrong when I wrote my book on the "Cost of Mining" in laying too much stress on average price. I now believe the public is right when it puts a higher value on properties during periods of high prices for metals. That is merely an assertion which I offer you to think about.

(To be continued.)

STATISTICS AND RETURNS

BRITISH COLUMBIA ORE SHIPMENTS.

For Week Ending May 3rd.

Rossland.

	Week.	Year.
Le Roi No. 2, milled	350	6,300
Centre Star	3,064	50,880
Le Roi	1,050	21,559
Le Roi No. 2	608	7,798
Other mines	...	102
Total	5,072	86,639

East Kootenay.

Sullivan	864	13,468
Other mines	...	488
Total	684	13,956

Nelson.

Mother Lode, milled	500	9,000
Second Relief, milled	200	3,600
Queen, milled	350	3,675
Other mines	...	7,601
Total	1,050	23,876

Lardeau.

Other mines	...	137

Slocan and Ainsworth.

Standard, milled	500	9,000
Van Roi, milled	1,100	19,900
Bluebell, milled	1,200	21,400
Kilo, milled	100	1,800
Rambler-Cariboo, milled	300	5,400
Standard	368	5,387
Rambler-Cariboo	33	1,055
Florence	16	469
Other mines	...	4,638
Total	3,617	69,049

Boundary.

Nickle Plate, milled	1,500	27.000
Granby	25,968	419,918
Mother Lode	7,130	117,330
Rawhide	4,835	91,152
Napoleon	756	13,552
Unnamed	106	9,608
Knob Hill	54	1,021
Ben Hur	275	3,243
United Copper	32	1,565
No. 7	132	2,282
Hope	51	357
Other mnies	...	4,278
Total	40,839	717,406

B. C. Copper Co.'s Receipts.

Greenwood, B.C.

Mother Lode	7,130	117,330
Rawhide	4,835	91,152
Napoleon	756	13,552
Queen Victoria	409	9,608
Unnamed	106	9,608
Total	13,236	233,633

Consolidated Co.'s Receipts.

Trail, B.C.

Centre Star	3,064	50,880
Le Roi	1,050	21,559
Le Roi No. 2	608	7,798
Sullivan	864	13,468
Standard	368	5,387
Rambler-Cariboo	33	1,055
Florence	16	469
Knob Hill	54	1,021
Ben Hur	275	3,243
United Copper	32	1,565
No. 7	132	2,282
Hope	51	357
Other mines	...	15,610
Total	6,547	150,894

COBALT ORE SHIPMENTS.

Cobalt, May 10.—The feature of the week is the discovery at the Cochrane, which will indirectly mean a considerable amount of prospecting activity in southeast Coleman again.

The shipments for the week in pounds are:—

Mine.	High.	Low.	Pounds.
Coniagas	3	..	201,615
Trethewey	1	..	49,550
Nipissing	..	1	52,691
Dom. Red	1	..	87,311
Hudson Bay	1	..	63,225
Cobalt Townsite	2	..	104,540
McKinley-Darragh	1	..	60,210
Kerr Lake	1	..	60,210
	10	1	683,501

The shipments from the Cobalt mines to date are:

Mine.	High.	Low.	Tons.
Coniagas	21	..	682.20
Trethewey	5	5	277.77
Nipissing	2	21	764.63
Dom. Red	7	..	225.81
Hudson Bay	7	..	231.83
Cobalt Townsite	22	..	795.06
MKinley-Darragh	24	..	822.94
Kerr Lake	8	..	295.14
Beaver	5	..	135.98
La Rose	24	..	1,005.24
Peterson Lake (Seneca-Sup.)	3	3	220.40
Temiskaming	8	1	278.61
Crown Reserve	5	..	249.95
Chambers-Ferland	1	4	159.20
Colonial	1	..	21.56
Cobalt Lake	8	..	140.52
Penn. Canadian	1	..	32.06
Drummond	8	..	219.59
General Mines		..	8.80
O'Brien	4	..	156.75
Silver Queen	..	..	60.34
Bailey	3	1	182.15
Casey Cobalt	3	..	109.72
Right of Way	..	2	62.19
City of Cobalt	3	..	109.50
Silver Bar	1	..	20.00
	170	48	11,017.82

The bullion shippers this week were:—

Mine.	Bars.	Ounces.	Value.
Nipissing	94	114,663.83	$68,798.30
Buffalo	46	45,897.91	28,000.00
Crown Reserve	34	37,600.00	22,660.00
Dom. Red	28	30,933.00	18,559.00
Townsite	6	4,139.00	2,438.00
Miscellaneous	3	1,622.00	873.00
	211	234,855.74	$141,429.10

STOCK MARKETS.

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

May 8th, 1913.

New York Curb.

	Bid.	Ask.
British Copper	2.87½	3.00
Chino Copper	29.37½	29.50
El Paso	3.62½	3.87½
Goldfield Con.	1.87½	2.00
Giroux Copper	2.12½	2.37½
Miami Copepr	22.50	23.00
Ray Con. Copper	18.00	18.50
Nevada Con. Copper	16.75	17.00
nited Cigars Stores	89.25	89.75
Tonopah Mining	5.62½	5.75
Tonopah Belmont	6.42½	6.25
Greene Can.	6.62½	6.87½
American Marconi.	5.25	5.75
Canadian Marconi	3.00	3.25
Houston Oil	18.50	20.50
Houston Oil Pfd.	58.00	63.00
Standard Oil of New Jersey	350.00	352.00
Standard Oil, Old Stock	1040.00	1100.00
Standard Oil Subs	690.00	800.00

Cobalt Stocks.

	Bid.	Ask.
Bailey	.09⅛	.09½
Beaver	.36	.36½
Buffalo	1.90	2.30
Canadian G. & S.	.20	.22
City of Cobalt	.45	.46
Cobalt Lake	.64	.67
Chambers-Ferland	.21½	.23
Coniagas	7.70	8.20
Crown Reserve	3.70	4.00
Foster	.08½	.09½
Gifford.	.05	.06
Great Northern.	.12½	.13
Gould Cons.	.02	.02¼
Green Meehan.	.00¾	.01
Hargraves.	.05	.06
Hudson Bay.	65.00	70.00
Kerr Lake	3.20	3.30
La Rose.	2.45	2.60
Little Nip.	.00⅞	.01
McKinley-Darragh-Savage.	1.94	1.95
Nipissing.	8.70	8.90
Ophir.	.03½	.05
Otisse.	.01¾	.02
Peterson Lake	.21½	.22
Rochester.	.02½	.03½
Right of Way	.05	.06
Silver Leaf.	.03	.03½
Silver Queen	.04½	.05½
Temiskaming.	.33½	.34
Trethewey.	.33	.36
Wettlaufer.	.14	.15

Porcupine Stocks.

	Bid.	Ask.
Apex.	.02	.02½
Crown Chartered	.00¾	.01
Dome Extension	.08½	.09
Dome Lake	2.25	2.30
Foley-O'Brien	.27	.29
Hollinger.	17.00	17.40
Jupiter.	.49	.50
McIntyre.	3.00	3.25
Moneta.	.06½	.08
Porcupine Gold	.18	.19
Porcupine Imperial	.03	.03¼
Porcupine Tisdale	.02	.02¼
Preston East Dome	.03½	.04
Rea Mines.	.29	.40
Swastika.	.08	.08½
West Dome	.20	.24
North Dome	.30	.60

Sundry.

	Bid.	Ask.
Island Smelters.	.01	.01⅛
Cochrane.	1.60	1.80

TORONTO MARKETS.

May 12th—(Quotations from Canada Metal Co., Toronto).
Spelter, 6¼ cents per pound.
Lead, 5¼ cents per pound.
Tim, 52 cents per pound.
Antimony, 10 cents per pound.
Copper, casting, 16 cents per pound.
Electrolytic, 16 cents per pound.
Ingot brass, 11 to 15 cents per pound.

May 12th—Pig Iron (Quotations from Drummond, McCall & Co., Toronto).
Summerlee No. 1, $26.00 (f.o.b. Toronto).
Summerlee No. 2, $25.00 (f.o.b. Toronto).
Midland No. 1, $20.50 to $21.00 (f.o.b. Toronto).
Midland No. 2, $20.50 to $21.00 (f.o.b. Toronto).

GENERAL MARKETS.

Coal, anthracite, $5.50 to $6.75 per ton.
Coal, bituminous, $3.50 to $4.50 per 1¼-inch lump.

Coke.

May 9th—Connellsville Coke (f.o.b. ovens).
Furnace coke, prompt, $2 to $2.25 per ton.
Foundry coke, prompt, $3 to $3.50 per ton.

May 9th—Tin, straits, 50.25 cents.
Copper, Prime Lake, $50.25.
Electrolytic Copper, $15.60 to $15.70.
Copper wire, $16.75 to $17.
Lead, $4.35 to $4.40.
Spelter, $5.50 to $5.60.
Sheet zinc (f.o.b. smelter), $7.75.
Antimony, Cookson's, $8.80.
Aluminium, $26.50 to $26.62½.
Nickel, $40 to $45.
Platinum, ordinary, $46 per ounce.
Platinum, hard, $51 per ounce.
Bismuth, $1.75 to $2 per pound.
Quicksilver, $39 per 75-lb. flask.

SILVER PRICES.

		New York cents.	London pence.
April	26	60⅜	27 13/16
"	28	60⅞	28 1/16
"	29	60⅝	27 15/16
"	30	60⅝	27 15/16
May	1	60	27 11/16
"	2	60⅛	27 11/16
"	3	60¼	27¾
"	5	60	27⅝
"	6	60	27⅝
"	7	60⅛	27 11/16
"	8	60	27 11/16
"	9	60¼	27 13/16