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CIRCULATION.

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GOVERNMENT ASSISTANCE FOR NOVA SCOTIAN GOLD MINES.

In the last hours of the recent session of the Legislature of Nova Scotia an important measure became law. The 25th day of April, 1909, should henceforth be memorable, for on that date an Act was passed authorizing the Governor-in-Council to assist in further development of gold mines, and to give aid towards the development of water power in order to reduce the cost of gold mining in the Province.

The Act, officially entitled "An Act for the further assisting of the Gold Mining Industry," consists of five short sections. The first of these sections empowers the Governor-in-Council to give reasonable assistance in the operations of cross-cutting at such depths and for such distances as may be approved by the Inspector of Mines or an engineer selected by the Department of Mines.

The second section authorizes the Governor-in-Council to utilize such water-powers as may reduce the cost of gold mining in Nova Scotia. This is subject to the approval of the Inspector of Mines, or of an engineer selected by the Department of Mines.

The third section empowers the Governor-in-Council to refer the location of shafts, winzes, cross-cuts and levels to the approval of the Inspector of Mines, or to the approval of an engineer selected by the Department of Mines.

The fourth section intimates that payments are to be made on the monthly progress reports made by the Inspector of Mines, or by an engineer selected by the Department of Mines.

The fifth, and last, section provides that any individual, company, or association, receiving assistance under this Act shall pay the Government a royalty on all gold ore from the property or mines upon it in respect to which Government money has been expended, the sum of three per cent. on the gross amount of such gold so won, and such royalty shall continue to be paid by such individual, company or association, until the full amount advanced by the Government has been repaid. All such loans made, or assistance given, shall not be a charge against the property, company, individual, or association, but against the gold won from such property receiving assistance under this Act.

This, then, is the tenor of the Act that is designed to revivify gold mining in Nova Scotia. Its provisions, undoubtedly, are broad and wise. The Act itself is succinct and definite. But the miner who takes advantage of its provisions will find himself at the mercy of those who must interpret the Act. Even at the worst, there is ample encouragement left for the prospector and the casual miner. In its constructive phases the

new Act is a wonderful and almost unique encouragement to outside investors. All Canada will rejoice if Nova Scotia progresses in proportion to her resources.

CONCENTRATING AND SMELTING COBALT ORES.

The annual report of Mr. A. A. Cole, mining engineer to the Temiskaming and Northern Ontario Railway Commission, has just been received. An abstract of this instructive pamphlet appears elsewhere in this issue. It will be noticed that detailed information concerning smelting rates has been gathered by Mr. Cole. One or two points call for notice.

During the year 1908, ten reduction companies treated ores from Cobalt. Four of these were Canadian concerns. To these four smelters 7,401.14 tons of high-grade ore were shipped. This quantity was equivalent to 29.18 per cent. of the total tonnage of the camp. In value the ore treated in Canada largely exceeded that of all the ore shipped out of the country. The great bulk of foreign shipments were low-grade.

Comparison of Canadian with foreign tariff rates does not reflect unfavorably upon the former. The most liberal smelting tariff is that of a Canadian enterprise. Apparently the metallurgical methods (carefully guarded secrets) of our own smelters are quite as effective as those of other countries.

This is all very satisfactory. But is there any just and sufficient reason why all the ore that comes from Cobalt should not be smelted in Canada?

Six concentrating mills are now in operation in Cobalt. Four more are under construction and will be running before the end of the current year. The flow-sheets of the mills that are now working indicate that the methods of comminution and preliminary concentration are becoming standardized. In three of these plants crushers, rolls, trommels, and jigs constitute the first four units. In five plants jigs are installed. In three mills (not including the McKinley-Darragh, which is nearing completion) stamps follow the jigs. Only one flow-sheet includes the Chilian mill.

It would appear that the probable arrangement of units in mills yet to be designed will conform to the following scheme: Crushers, rolls, trommels, jigs, stamps. The treatment of the stamp products after classification will always vary within certain limits. The choice of tables for sands and slimes depends largely upon the experience and predilections of the mill superintendent.

Two tube mills and one cyanide plant are in use. The future will see a large increase in these units.

THE EIGHT HOURS DAY.

English, Welsh, and Scotch colliery operators are looking forward with misgivings to July 1st, the day on which the coal miners' Eight Hours Act becomes operative. The operators believe that an immediate reduction in output will be the first effect of this limitation of working hours below ground. They contend that this reduction will amount to at least 10 per cent. and, in many instances, 20 per cent. The argument advanced by the supporters of the Act, to the effect that shorter hours will inspire the miners to keener and more continuous effort, is met by the assertion that in a vast majority of the collieries a maximum of work is already obtained and that, in any case, the miners' expenditure of energy cannot be intensified by an Act of Parliament.

The extent to which existing plants will require to be modified in order to meet the demand for speedier haulage, winding, and coal-winning, is a serious question. It appears probable that not a few mines, especially those whose equipment is antiquated, will not survive the change.

One clause of the Act is to be a storm centre. Section 3, clause 1, permits an addition of one hour to the working day on sixty days of the year. The questions as to how these nine-hour days are to be distributed, and as to whether the extra hour will be considered as overtime or not, have yet to be discussed.

Meanwhile the Miners' Federation has declared itself ready to fight to the last ditch against any reduction in wages.

As July 1 approaches, new difficulties crop up with disturbing rapidity. The most encouraging feature of the situation is the fact that the leaders of the Miners' Federation are capable and earnest men, not mere demagogues. Moreover, in Great Britain, as in most other parts of the British Empire, arbitration is becoming a habit.

We shall venture upon no propheey. But we shall await, not without trepidation, the introduction of the eight hours day.

PETROLEUM AND OILS.

Mr. Eugene Coste has constituted himself champion of the inorganic origin of petroleum. This implies not a small amount of moral courage. But Mr. Coste is courageous if nothing else.

Somehow we are led to believe that there may be a faint adumbration of truth in what Mr. Coste tells us. This is rank heresy; we only talk it in confidence. But it is obvious to the amateur that all advocates of the organic origin of petroleums must be apologists. Mr. Coste is not an apologist. He is an out and out enthusiast. His facts and arguments are set forth in battle array. He is afeard of no man.

GOLD MINING IN RHODESIA IN 1908.

Fourteen years ago, Rhodesia contributed nothing to the world's production of gold. Now it ranks sixth amongst gold-producing countries. Last year its gold yield was 606,962 fine ounces, valued at £2,526,007. This exceeded the yield for 1907 by 15.4 per cent. The

tonnage of ore crushed was 1,819,230 tons, giving an average of 27.77 shillings per ton. Up to the end of 1908, Rhodesia's total output of gold amounted to 3,208,789 ounces, valued at £11,831,526.

This, in bald figures, is the history of Rhodesia's remarkable progress. Its growth has not been unmarked by difficulties, reverses and discouragements. At present, however, Rhodesian gold mining appears to be established beyond a peradventure.

During the year 1908 the producers contributing to the output numbered 446, as compared with 275 in 1907. Of this total, 28 companies produced more than half the gold reported. One hundred and one tributors and 293 small workers were responsible for the rest. Upon the last class devolved almost all the prospecting done during the year.

NEW QUEBEC MINING BILL.

A new mining bill was introduced into the Quebec Legislature on Saturday, May 8th. It consisted mainly of amendments to the present Mining Act. The chief amendments are easily outlined. One was disigned to extend the time within which an exploitation permit must be taken out. Another increases the penalty for pulling up stakes placed around concessions applied for. This penalty is increased from $10 to $25, with an alternative of one month's imprisonment. The third provision restricts the powers of the Governor-in-Council in connection with mining concessions. It withdraws his prerogative to fix and increase the price of mining concessions.

The bill is healthy in tone. It met the approval of both the Government supporters and the Opposition.

COBALT IN 1908.

Abstract of Report of Arthur A. Cole, Mining Engineer for Cobalt District, for Calendar Year 1908.

The approximate production of the world, the United States and Cobalt for the year 1908 is as follows:—

World's production of silver for 1908, 194,000,000 ozs.

United States production of silver for 1908, 51,798,053 ozs.

Cobalt's production of silver for 1908, 18,000,000 ozs.

It will thus be seen that Cobalt supplied over 9 per cent. of the world's production during 1908.

The following tabulation illustrates the advance that Canada has made as a silver producing country, the advance in great part being due to the Cobalt production.

Country.	1906	1907	1908
Mexico	68,500,000 ozs.	65,600,000 ozs.	69,000,000 ozs.
United States	56,517,900 ozs.	58,850,615 ozs.	51,798,053 ozs.
Australasia	13,519,410 ozs.	17,516,433 ozs.	..... ozs.
Germany	11,649,160 ozs.	12,439,896 ozs.	..... ozs.
Canada	8,568,685 ozs.	12,750,004 ozs.	21,000,000 ozs.
World's prod'cn	184,552,343 ozs.	193,542,381 ozs.	194,000,000 ozs.

The above figures for 1906 and 1907 were obtained from the Mineral Industry, while those for 1908 are estimated.

Canada thus takes fifth place in 1906, fourth place in 1907, and probably third place in 1908.

The following values are given by the Ontario Bureau of Mines for the shipments from the Cobalt district for 1904, 1905, 1906 and 1907. The value for 1908 is estimated.

1904	$ 136,217 00
1905	1,485,570 00
1906	3,573,908 00
1907	6,155,391 00
1908 (estimated	9,000,000 00
Total	$20,351,086 00

The outputs for 1907 and 1908 were distributed for treatment as follows:—

Country	1907 Tons	1907 %	1908 Tons	1908 %
Canada	2,585,05	17.40	7,401.14	29.18
Great Britain	167.13	1.13	222.08	88
Germany	.....	.....	229 46	1.18
United States	12,098.95	81.47	17,439.42	68.76
Total	14,851.34	100.00	23,362.10	100 00

Almost all the ore treated in Canada was high grade, so that while the tonnage was less than one-third of the total, the value was greater than that of all the ore shipped out of the country.

Silver.

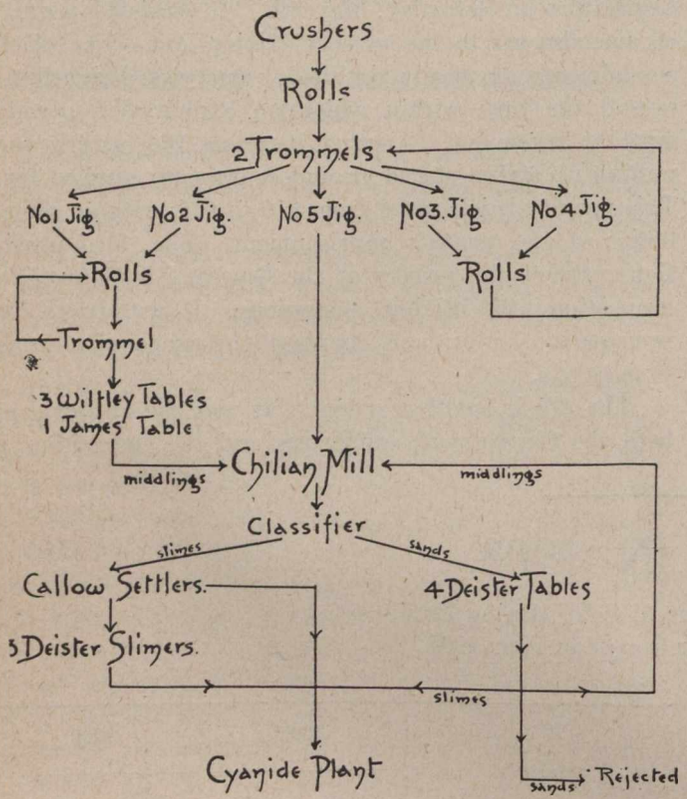
A disappointing feature of the year from the silver-mining standpoint has been the continued depression in the price of silver. Towards the close of 1907 the price of silver fell rapidly and 1908 was marked by an almost continued decline. The maximum price was that of 7th of January, 58⅜ cents, the minimum being 47⅝ cents, on the 2nd December. The average price for the year was 52.864, or nearly 12½ cents below the average price for 1907.

The average price by months in cents per fine ounce, at New York, was as follows:—

January	55,678	July	53.115
February	56,000	August	51.683
March	55,365	September	51.720
April	54.565	October	51.431
May	52.795	November	49.647
June	53.663	December	48.769

The causes for the low price of silver were varied. The almost universal business depression caused a large falling off in the demand for silver in the arts. Another powerful factor was the unrest in the market of

Flow Sheet, Buffalo Concentrator.



the far east, China and India, at times, offering silver while they are usually consistently heavy buyers.

The production of silver in the United States is made in connection with that of lead, copper and other metals. Silver is thus a by-product, and as such its production is not likely to be affected materially by the low price of silver. In Mexico it costs 40 cents per ounce to produce refined silver, so that at the present price the margin of profit is very small. This accounts for the closing down of some of the Mexican mines lately.

In Cobalt the cost of production in the principal mines is under 20 cents per ounce. This is one of the reasons why Cobalt's output has continued to rise even in the face of a falling market.

Cobalt.

Cobalt is seldom seen in the metallic state as it is marketed exclusively in the form of oxide. Throughout 1907 the oxide sold for $2.50 per pound. In March of 1908 a violent rate war caused the price to be cut at frequent intervals until on April 1st it was $1.45 per pound, a reduction of $1.05 in a few weeks.

The world's annual consumption of cobalt is about 300 tons. On account of the restricted market and the large production in the Cobalt district, the marketing of Cobalt ores for the cobalt contents has been difficult. The Anglo-French Nickel Co., of Swansea, Wales, came in to the market for a carload of ore from time to time as the demand warranted it.

In the early part of 1908 this company paid the following prices for cobalt:—

8 to 10 per cent. cobalt, 35c per pound, Cobalt.
10 to 12 per cent. cobalt, 40c per pound, Cobalt.
12.1 to 14 per cent. cobalt, 45c per pound, Cobalt.
14.1 to 16 per cent. cobalt, 50c per pound, Cobalt.
16 per cent. or over, cobalt, 55c per pound, Cobalt.

After April the prices offered were 10 cents per pound lower than above, and at the end of the year they were out of the market entirely. There is every likelihood that the next price offered will be still lower.

The Canadian Copper Co. and the Deloro Mining and Reduction Company each pays for cobalt in ore when it goes 6 per cent. or over, providing that the nickel contents are lower than the cobalt contents.

Arsenic.

For a time one smelting company did pay a small amount for arsenic, but this has been cut out of the latest schedule, so that no arsenic is now paid for though several smelting companies save, refine and market as a by-product in the form of white arsenic.

Nickel.

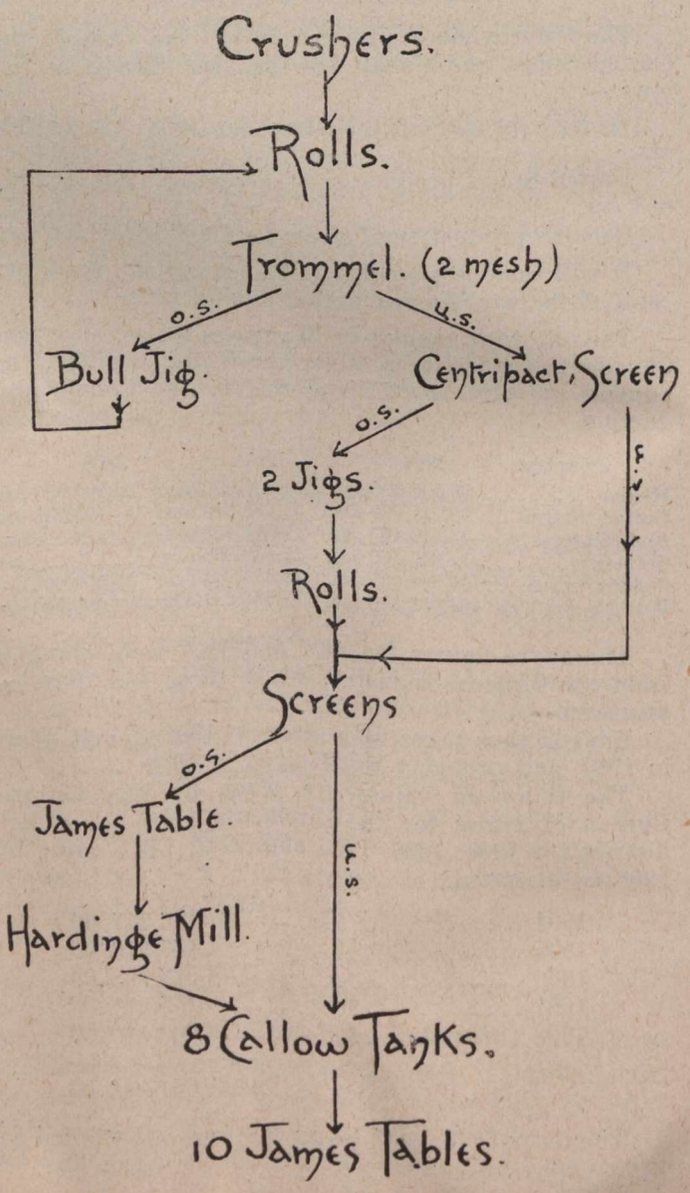
Up to the present nickel contents of ores from Cobalt have been considered more of a detriment than otherwise.

Smelting.

The following smelting companies have received and treated ore from Cobalt during 1908.

1. Anglo-French Nickel Company, Swansea, Wales.
2. American Smelting & Refining Co., Perth Amboy, N.J., Denver, Col.

Flow Sheet, Cobalt Central Concentrator.



3. Balbach Smelting & Refining Co., Newark, N.J.
4. Beer, Sondheimer Co., Hamburg, Germany.
5. Canadian Copper Co., Copper Cliff, Ont.
6. Coniagas Reduction Company of Canada, Thorold, Ont.
7. Consolidated Mining & Smelting Co., Trail, B.C.
8. Deloro Mining & Reduction Co., Deloro, Ont.
9. Pennsylvania Smelting Company, Carnegie, Pa.
10. The United States Metal & Refining Co., Chrome, N.J.

1. Anglo-French Nickel Company, Swansea, Wales.

The prices paid by this company for cobalt ores are given under the heading "Cobalt." Payment was made for the cobalt contents and no allowance was made for the silver values in the ore purchased.

2. American Smelting & Refining Co., New York.

This company received ores from Cobalt at its plants at Perth Amboy, N.J., and Denver, Col. The schedule offered was as follows:—

Payment.—Forty-five days after date of sampling.

If a mine is willing to contract for a total year's output or 1,000 tons, the following schedule is offered:

For Ores Under 1,500 Ounces and Over 60 Ounces.

Silver.—Pay for 95% of the silver contents at the New York quotations.

Treatment Charge.—$7.00 per ton of 2,000 pounds, dry weight; in case of cash settlement the treatment charge is $7.50 per ton.

No payment for cobalt or nickel.

No penalties for insoluble.

Arsenic.—An addition to the working charge will be made at the rate of 25 cents per dry ton for each per cent. of arsenic in excess of 5 per cent.

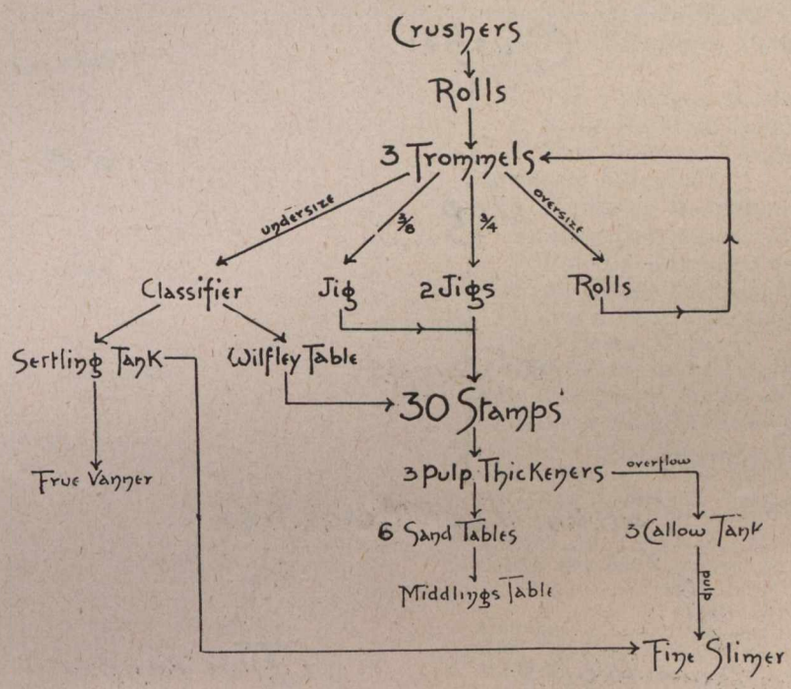
Payment.—Payment forty-five days after agreement of assays.

The freight from Cobalt to Perth Amboy, N.J.

3. Balbach Smelting & Refining Co., Newark, N.J.

This company only entered the market occasionally,

Flow Sheet, Coniagas Concentrator.



For Ores Assaying 1,500 Ounces or Over per Ton.

Silver.—Pay for 94% of the silver contents at the New York quotations.

Treatment Charge.—10.00 per ton of 2,000 pounds, dry weight, plus one-half cent on each ounce of silver contained.

Arsenic.—An addition to the working charge will be made at the rate of 25 cents per dry ton for each per cent. of arsenic in excess of 5 per cent. Sampling free.

Payment.—Thirty days after agreement of assays.

For Ores Under 1,500 Ounces and Over 60 Ounces per Ton.

Silver.—Payment for 93% of the silver contents at the New York quotations.

Treatment Charge.—$9.00 per ton of 2,000 pounds, dry weight, plus one-half cent on each ounce of silver contained.

Arsenic.—An addition to the working charge will be made at the rate of 25 cents per dry ton, for each per cent. of arsenic in excess of 5 per cent.

and had no standing schedule. The ore purchased was high grade.

4. Beer, Sondheimer Co., of Hamburg, Germany.

This German company purchased high-grade ore in the Cobalt camp on the following schedule:—

Silver.—Pay for 94% of silver assay.

Treatment Charge.—$44.00 smelting charge per dry ton.

Freight.—$10.00 freight guarantee per gross ton. Beer, Sondheimer to supply barrels free of charge, suitable for transporting the ores.

Payment.—70% paid immediately against Ledoux & Co.'s assays. 30% paid three days after settlement of assays of Dr. Fred Claudet, of the Bank of England. Interest at 6 per cent. (6%) till due date. Dr. Claudet's expenses to be paid by Beer, Sondheimer & Co.

Canadian Copper Co., Copper Cliff, Ontario.

All purchases of Cobalt ores are made through the Orford Copper Co., of New York. The purchasing schedule was as follows:—

Purchaser to make payment for:—

75	%	silver	per ton ore	when	same assays	100 oz.	ag. and over.
84	%	"	"	"	200	"	"
86	%	"	"	"	300	"	"
87	%	"	"	"	400	"	"
89	%	"	"	"	500	"	"
90	%	"	"	"	600	"	"
92	%	"	"	"	800	"	"
93	%	"	"	"	1,000	"	"
93¼	%	"	"	"	1,300	"	"
93½	%	"	"	"	1,600	"	"
94½	%	"	"	"	2,000	"	"
94¾	%	"	"	"	3,000	"	"

$10	per ton of ore	when	same contains	6%	cobalt	and over.
$20	per ton of ore	when	same contains	8%	cobalt	and over.
$30	per ton of ore	when	same contains	12%	cobalt	and over.

No payment will be made for cobalt in ores containing less than 6% cobalt, nor in which the nickel contents are greater than the cobalt contents. Further, purchaser reserves the right to return, at shipper's expense, any such oes (i.e., nickel contents higher than cobalt contents) received at Copper Cliff.

Ore to be delivered by seller to the Canadian Copper Co., f.o.b. cars, Copper Cliff, Ont. Ore to be at shipper's risk until sampling is undertaken, as purchaser can assume no responsibility for the ore until same has been taken into its sampler.

Purchaser to sample at its expense, purchaser's and seller's representatives to be present. Assays to be made by Ledoux & Co., of New York, at seller's expense, which assays are to govern in settlement.

Payment of 70% of the silver returnable to the seller, as per the above scale, to be made at the New York official price for silver on the first settlement date, which shall be 35 days after the date on which sampling of the ore is completed, and the balance, 30 per cent., on the second settlement date, on the New York official price of silver on that day, which shall be 90 days after sampling of the ore is completed. The purchaser, however, reserves the right to deliver upon either or both of the settlement dates above specified, in lieu of cash, at its option, such silver bullion (commercial bar silver) as is due the seller in settlement upon these dates, such delivery to be made in New York City.

Payment for cobalt will be made as per the above scale when the cobalt content of the ore comes within the specifications mentioned, settlement for same to be made on the first due date for silver, namely, in 35 days after completion of sampling of ore.

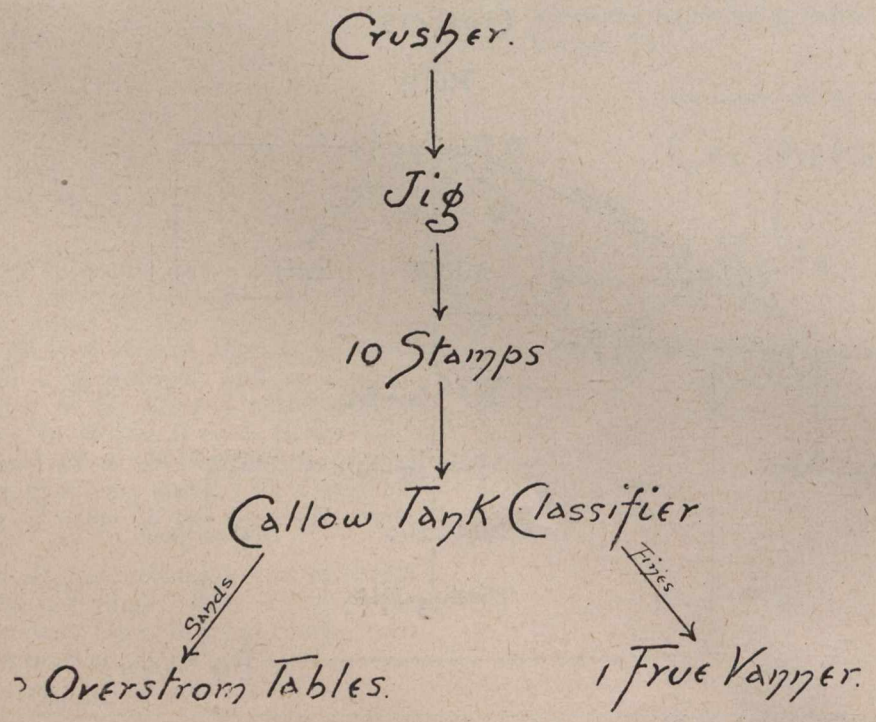
Purchaser has named a rate of 75% silver return to the shipper on ore running from 100 to 200 ounces per ton of 2,000 pounds. This is to be considered as a penalty clause, and to apply in such cases where ores under 200 ounces have been shipped by mistake. Purchaser does not agree to accept regular shipments of ore which run less than 200 ounces of silver per ton of 2,000 pounds.

All purchases of these ores are made strictly subject to the following force majeure agrement:—

"If, by reason of the acts of God, strikes or other causes beyond control of either parties hereto, which may legally be called force majeure, either of them shall be unable to carry out the conditions of this agreement as to shipment, receipt or treatment of consignments, this agreement shall be suspended as long as this condition shall continue and the term of this agreement shall then be extended for such a period as shall be equivalent to the time of delay or interruption."

Further, this clause shall also cover unavoidable or extraordinary delays should they occur when the speiss or silver bullion resultant from the smelting and treatment of these ores is in transit between Copper Cliff and Camden plants of the purchaser and between either of the above plants and the silver refinery of the Balbach Smelting Co., Newark, N.J.

Flow Sheet, King Edward Concentrator.



6. Coniagas Reduction Co., Limited, of Thorold, Ont.

Up to the present time the only ore treated by this smelter came from the Coniagas mine. It is likely, however, that custom smelting will be started during 1909.

The following is an extract from the 1908 report of the Coniagas Mines, Limited:—

"The works at Thorold are now handling the product of your mine (the Coniagas), and are running commercially as regards the production of refined silver and refined white arsenic, and we expect to place refined cobalt, oxide, and nickel oxide on the market very shortly, thus refining and marketing all the valuable constituents of your ores by a process which is confidently expected to yield a substantial profit."

7. The Consolidated Mining & Smelting Co., of Canada, Trail, B.C.

This smelting company has so far only purchased several test carload lots.

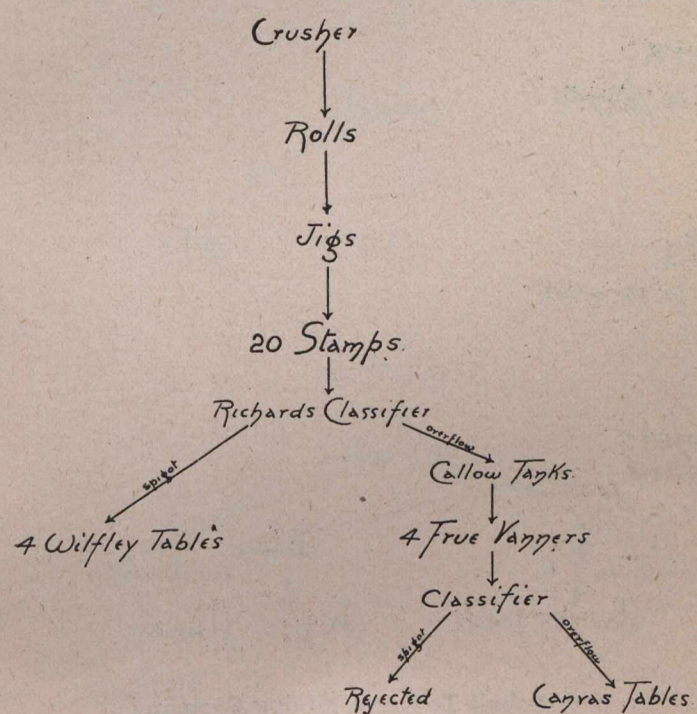
8. Deloro Mining & Reduction Co., Deloro, Ont.

Tariff on Cobalt Silver Ores and Concentrates.

Silver.—Pay for 98% of silver contents.

Treatment Charge.—$20.00 per ton of ore and a refining charge of one cent per ounce of silver contained.

Flow Sheet, Northern Customs Concentrator.



Terms of Payment.—75% of net proceeds at New York quotation 30 days after completion of sampling. 25% of net proceeds at New York quotation 90 days after completion of sampling.

Cobalt.—On ore containing 6% and over, 10 cents per pound for cobalt contained. No payment will be made for cobalt in ores containing more nickel than cobalt. Payment for cobalt to be made with the second payment of silver. Ledoux & Co.'s assays accepted with the usual provisions as to umpire assays in case of unusual differences. Above assays to be made at shipper's expense. No charge for sampling. Ore to be delivered in carload lots f.o.b., Marmora Station, C. O. R. This tariff is subject to change without notice.

9. Pennsylvania Smelting Co., Pittsburg, Pa., Works at Carnegie, Pa.

Ores from Cobalt ranging from 50 ounces to 500 ounces per ton are purchased by the Pennsylvania Smelting Co. on the following schedules:—

Silver.—Pay for 95% silver, less one cent per ounce.

Treatment Charge.—$9.00 per ton. Settling price, average for 20 days following date of arrival. No payment for cobalt or nickel. The freight rate from Cobalt to Carnegie, Pa., is $8.80 per ton.

10. United States Metal and Refining Co., Chrome, N.J.

This company only bought an occasional carload of high-grade ore on special quotations.

Concentration.

Concentration now takes a very important position in the district's development. Undoubtedly in some instances the shipments to the smelters are smaller than formerly, due to the reduction of tonnage by concentration, nevertheless in most cases the tonnage is increased by the amount of the concentrates, as the ore treated is of such a low grade that it could not stand the freight and treatment charges without concentration.

Six mills are now in successful operation in the camp, and four more are under construction.

They belong to the following companies:—

1. The Buffalo Mines Company, Limited.
2. The Standard Cobalt Mines, Limited (Cobalt Central).
3. The Coniagas Mines, Limited.
4. King Edward Cobalt Silver Mines.
5. The Northern Customs Concentrators, Limited (formerly Muggley).
6. Nipissing Reduction Company.

Under construction:—

7. Colonial Mining Company.
8. McKinley-Darragh-Savage Mines of Cobalt, Ltd.
9. Nova Scotia Mining Company.
10. O'Brien Mine.

The following table gives the tonnage of ore milled, the concentrates made, and the concentration ratio for the mills during 1908:—

Concentration in Cobalt for 1908.

Mill.	Mines	Ore milled Tons	Concentrates Tons	Concentration Tons
1. Buffalo	Buffalo	10,200	251.00	40—1
2. Cobalt Central	Bailey	4,246	97.15	44—1
	Big Pete	9,163	143.90	64—1
	Crown Reserve	669	15.22	44—1
3. Coniagas	Coniagas	13,605	304.00	45—1
4. King Edward	King Edward	1,043	21.35	38—1
5. McKinley-Darragh (Old Mill)	McKinley - Darragh	450	20.00	28—1
6. Northern Customs Concentrator	City of Cobalt	2,194	50.61	43—1
	Cobalt Townsite	1,000	31.03	32—1
	Right of Way	1,500	36.46	41—1
	Silver Queen	3,253	70.63	46—1
7. Nipissing Red. Co.	Foster	85	10.00	9—1
	King Edward	40	1.50	27—1
	Kipissing	1,950	40.00	49—1
	Silver Lead	35	1.00	35—1
	Totals	49,424	1,093.85	45—1

At the mines without mills the grade of ore is raised by cobbing, washing and handpicking. The ore is usually first passed over a grizzley or coarse screen, as the screenings generally carry enough values to be of shipping grade without further treatment. At the Crown Reserve and Trethewey mines jigs are used in addition to the hand-picking.

With the smelter schedules and freight rates at present in force an ore must run about 45 ounces per ton to pay charges outside of the cost of mining. All ores below this point must therefore be concentrated if they

are to be shipped. The point at which the combined concentration and smelting rates meet the direct smelting rates is about 90 ounces. If, however, a mine owns its own mill the grade of ore that can be concentrated more profitably before shipping to the smelter direct is much higher. In the future, if present conditions hold, it will be natural to expect that very little ore will be shipped from the camp that will assay less than 100 ounces per ton.

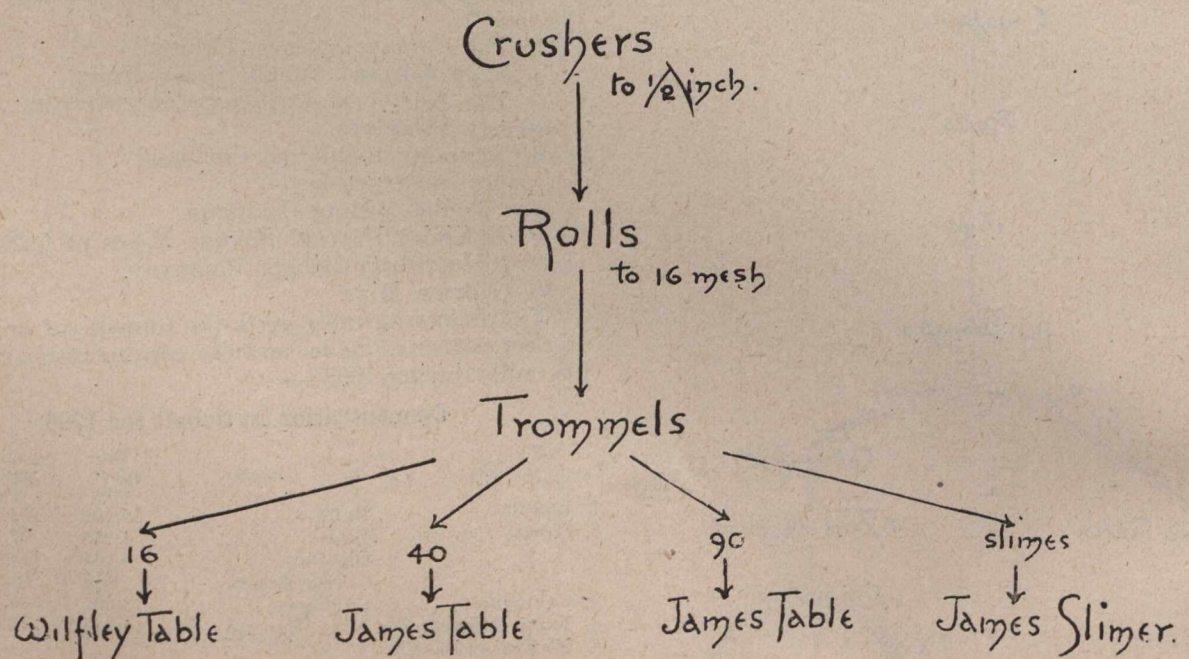
In the following mill flow sheets all the smaller details have been cut out, leaving only the main working features.

The flow sheet of the Colonial Mill is to be similar to that of the King Edward.

The Northern Customs Concentrators, Limited, (formerly the Muggley Concentrator) and the Nipissing Reduction Company are custom mills, while the Cobalt Central Mill accepts some custom work, as well as the treatment of ores from the Cobalt Central mines.

The Northern Customs Concentrators, Limited, is now treating ores on the following contract schedule:—

Flow Sheet, Nipissing Reduction Co. Concentrator.



On ore yielding less than 20 ounces silver per ton crushed, retain 10 ounces and return balance with 50 per cent. of other metals that can be sold.

20 to 40 ounces silver pay 55 per cent.
40 to 60 ounces silver pay 60 per cent.
60 to 80 ounces silver pay 65 per cent.
80 to 100 ounces silver pay 70 per cent.

The Nipissing Reduction Company will treat ores on a flat rate of $3.00 per ton or on the following percentage basis.

For ores assaying when received at the mill,

20 to 40 ounces silver pay 50 per cent. silver values.
40 to 60 ounces silver pay 55 per cent. silver values.
60 to 80 ounces silver pay 60 per cent. silver values.
80 to 100 ounces silver pay 65 per cent. silver values.
100 to 150 ounces silver pay 68 per cent. silver values.

Leases.

During 1908 the following mining companies operated on a royalty basis on mineral lands owned and leased by the Temiskaming and Northern Ontario Railway Commission:—

1. City of Cobalt Mining Company.
2. Cobalt Townsite Mining Company.
3. Nancy Helen Mines, Limited.
4. Railway Reserve Mines, Limited.
5. Right of Way Mining Company.
6. Wright Mining Company.
7. Jack Pot Silver Mining Company.
8. Cobalt Station Grounds Mining Company.
9. Ontario Development and Mining Co., Limited.

1. City of Cobalt Mining Company.

The following was the underground development work done by this company during 1908:

Sinking	136 feet
Drifting and crosscutting	1,935 feet.
Stoping	77,850 feet

During the summer a new compressor plant was installed.

2. Cobalt Townsite Mining Company.

The development for 1908 consisted of:—

Sinking	158 feet
Crosscutting	249 feet
Drifting	712 feet
Raising	104 feet
Stoping	5,021 cubic feet

3. Nancy Helen Mines, Limited.

The total underground development work on this property at the end of the year 1908 consisted of:—

Drifting	357 feet.
Crosscutting	274 feet.
Shaft	155 feet

and considerable stoping.

4. Railway Reserve Mines, Limited.

The development work on this property consisted of some trenching and shallow shaft sinking.

Right of Way Mining Company, Limited.

At the end of 1908 the total underground develop-

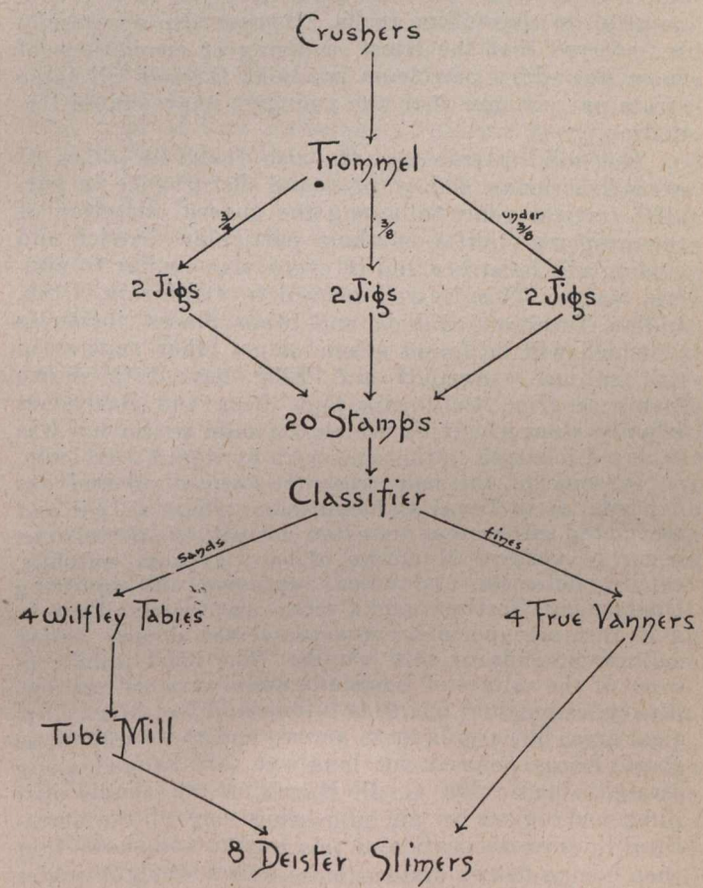
ment work of this company exclusive of stopes of the following:—

	Drifting	Cross Cutting	Sinking
No. 1	.....	.....	75
No. 2	1,094	1,890	563
No. 3	103	309.5	95
Total to end of 1908	1,197	2,199.5	733
Total to end of 1907	274	151	216
Total for 1908	923	2,048.5	517

6. Wright Mining Company.

The work done on this property during 1908 consisted of the most part of surface trenching. In all

Flow Sheet, McKinley-Darragh Concentrator.
(Under Construction.)



4,328 feet of trenches were dug, in many places being a depth of 10 to 12 feet. The only underground work was 56 feet of drifting.

7. Jack Pot Silver Mining Company, Limited.

This property has been idle all year.

8. Cobalt Station Grounds Mining Company.

The lease for this property was signed late in the year and the company only had time to do some surface prospecting.

9. Ontario Development and Mining Co., Ltd.

This lot has been prospected by surface trenching and is now being tested by diamond drilling.

Progress During the Year 1908.

A rapid, but healthful advance marks the progress of the Cobalt District. The shipments in 1908 were greater than the combined shipments of the four previous years. A point that appeals particularly to the investing public is the fact that more than 50 per cent. of the value of the total output of the camp has been paid back to shareholders in dividends.

In the early work of the mines, while rich ore could be dug out on the surface, mining costs did not receive very serious attention. As development proceeds, however, production costs are being lowered, by such economies as the installation of large and more efficient machinery. Possibly the feature of the year in underground work has been the large introduction of air hammer drills for stope work.

Two power plants are being installed on the Montreal River and it is expected that before the end of 1909 power will be delivered in Cobalt by them, in one case in the form of compressed air, and in the other, electricity. The introduction of this power is likely to cut down the present cost by at least 50 per cent.

There are now about 3,500 men employed in the mines at Cobalt and in the immediate vicinity.

The horse power capacity of the camp is as follows:

At the End of	Boiler H. P.
1904	Zero
1905	150
1906	3,406
1907	7,918
1908	9,700

There are now 61 compressors which have a maximum capacity of 39,336 cubic feet of free air per minute.

Colored wrappers for dynamite cartridges have been suggested. This would facilitate the detection of unexploded cartridges lying in broken rock underground. Necessarily the wrappers should be of a color that is in sharp contrast to the ore and rock that is being worked. Another suggestion is that the wrappers should carry some striking design that would render detection easier.

Under the revised company law of the Transvaal the Attorney-General is provided with power to appoint inspectors to investigate the affairs of any company and to report on their conduct when he has been requisitioned to do so by members of a company having a share capital, such members holding not less than one-tenth of the issued shares between them, and also on the application of one-fifth of the number of persons on the register of a company not having a share capital.

Auriferous smaltite, impregnating quartzite, is being worked on a small scale north of Middleburg, on Kruis River, Transvaal.

According to the opinion of Mr. Lionel Phillips, retiring president of the Transvaal Chamber of Mines, it is the belief of many metallurgists that amalgamation plates can be dispensed with, and the whole of the free gold recovered by direct cyanide treatment. If experiments in this direction prove successful the opportunities for gold stealing by employees would be much reduced and smaller plants would serve the purpose.

PETROLEUMS AND COALS.

Compared in Their Nature, Mode of Occurrence and Origin.

By Eugene Coste, E.M., Toronto.

(Printed as an advance paper of the Canadian Mining Institute.)

(*Continued from last issue.*)

The total thickness of the formations more or less impregnated with the oil is about 25,600 feet. Although we have here three geological unconformities, meaning long lapses of time and erosion between the deposition of the different formations, yet the oil is in all of them through a thickness of over 25,000 feet of strata from and including crystalline rocks to the most recent gravels, but only along great faulted lines and zones of disturbances. There are three conclusions to be drawn from this, which are plain: 1st. The movements of the oil were vertical, not lateral. 2nd. Some of these movements at least were of recent date, namely, Post-Quaternary. 3rd. It cannot reasonably be supposed, as some geologists have, that this oil originated in any one of these formations (such as the Monterey, which is often cited by Arnold as the source of the oil) as this would entirely fail to explain the oil in the formations below the Monterey, and also the oil in unconformable formations above the Monterey. Oil formed from decomposition of organic remains in the Monterey, as supposed by Arnold, would either have remained in that formation, if the Monterey shales were impervious enough to prevent its escape into the atmosphere, or, if they were not, would have exhausted out into the atmosphere long before the Fernando and Quaternary strata were deposited unconformably over it. There is only one possible explanation, namely, solfataric volcanic emanations of hydrocarbons coming up from below the crystalline gneisses along the fault lines and in the zones of disturbances at repeated periods of dynamic movements of the Coast Range, and some of these movements must have been very recent to explain the oil in the gravels of the Quaternary. Even in the Monterey shales, as in all the so-called "bituminous shales" it is plain that the petroleum is a secondary product of impregnation subsequent to the forming of the shales, as evidenced by the facts that these shales are bituminous only along the zones of disturbances, and in local and irregular pools; in these it is not in any way spread over uniformly in one or more beds, but it is distributed in the shape of branching streaks, veins, patches, and in the joints and cracks; in fact, the portions impregnated with bitumen often look like a regular breccia, indicating plainly the injected nature of the bitumen.[1]

In one of my other papers[2] on this subject before this Institute I have emphasized by other examples this well-established geological fact with regard to the occurrences of petroleum, illustrated grandly by the California example just cited above, namely, that the petroleum deposits belong to no special horizon of the geological scale, but that they are found in any and all of them, including the crystalline rocks, and, as we have seen, also in volcanic emanations, in volcanic and igneous rocks, in metalliferous veins and in meteorites. When to this consideration we add the further one that these petroleum deposits are found in great abundance in certain districts in the porous reservoir-rocks of thousands of feet of the geological scale, but only when these are aligned in narrow long belts along certain structural lines, while neighboring districts outside of these lines, but with the same geological sequence of formations are absolutely barren, we see that we must necessarily consider petroleums as secondary products of impregnation and replacement coming up along these structural channels from a source below the last formation in which it is found, namely, the crystalline rocks. It must also necessarily be inferred that the latest incoming or emanations of these secondary petroleum products through all these strata are younger than the youngest impregnated formation.

The solid petroleums are also found in zones of great fracturing and of profound disturbance in parallel vertical veins following the general direction of the orogenic uplifts of their particular district and cutting all the strata and in every way similar to mineral veins. This is well proven in California, Utah, Indian Territory, Galicia and other places, instances of which will be found in one of my other papers[1] on this subject. Arnold[3] and Ells[3] have both shown instances from California and from the Barbadoes Islands, respectively, in which the solid petroleum was replaced in depth in the same vein by liquid petroleum.

In some of the more recently formed oil and gas deposits, as in Texas and Louisiana, where the oil and associated salt waters are often hot yet, the petroleums occur in vertical chimneys of salt, gypsum, sulphur, calcite, dolomite, and silica, replacing and uplifting Quaternary, Tertiary and Cretaceous clays and sands, and forming peculiar qua-qua-versal domes called salines, mounds or salt islands. The local uplifts in some of the salines of Louisiana and Texas are extraordinary, as much as one to two thousand feet in an elliptical area, but a mile or so across, and these salines, as Capt. Lucas pointed out long ago, are ranged along straight lines. Mr. G. D. Harris, in an article just published,[1] gives us an interesting map of the structural lines of dislocation of this region, and shows that they belong to two systems more or less at right angles one to the other, and parallel to the great Balcones fault for the northeast system, and to the Red River and Alabama Landing fault for the northwest system. He also shows that the salines are all located along these lines of weakness, and he claims at the intersection of two of these lines where a still weaker point was determined "admitting the upward passage of fluids or gas under pressure from below;" but Mr. Harris is still under a similar impression, as Mr. Robt. T. Hill was,[2]

[1]Bulletin U.S. Geol. Surv., No. 317, pp. 29-41.
[2]Journ. Can. Min. Inst., Vol. VI, pp. 109-113.

[1]Journ. Can. Min. Inst., Vol. VI, pp. 104-108.
[2]Bulletin No. 309 and 317, U.S. Geol. Survey.
[3]The Geology and Mineral Resources of Trinidad and Barbadoes Islands.
[1]Economic Geology, Vol. IV, No. 1, Jan.-Feb., 1909, p. 12.
[2]Trans. Am. Inst. Min. Eng., XXXIII, 363.

namely, that these gaseous and liquid substances are carried to these salines by artesian waters entering the pervious layers of the Mesozoic, or Paleozoic, far up country and going down to greater and greater depths as the latitude of the Gulf border is approached to ascend under hydrostatic pressure at the above mentioned points of weakness. As I have pointed out twice before,[3] several years ago, the pressure to which the fluids under the salines are subjected is not hydrostatic and it is also impossible for meteoric waters to gather and carry down from sediments the diversified products of these salines, especially insoluble liquid hydrocarbons and such gases as natural gas and hydrogen sulphide. Permit me to recall here the explanation of the nature of these salines, which I gave before this Institute six years ago[1]: "But, on this continent, in the newly-discovered oil fields of Texas and Louisiana, we have many no less direct evidences of vulcanism, though they do not appear to have been understood in their true light. These are the salt islands and the mounds of the Coast Prairie, such as the famous 'Spindletop,' near Beaumont, which are clearly nothing else but 'suffionis,' or 'salses,' hardly extinct yet, grouped along fractured lines and marking in that region the dying out of vulcanicity, that is to say, the dying, distant echo of that tremendous volcanic energy which, a little further south, in Mexico, Central America, and in the islands and along the south coast of the Caribbean Sea, is to this day so powerfully active. When these occurrences of petroleum in the Texas-Louisiana salines are considered in the light of what is now being found a little further south along the Gulf-Coast plain in the new oil fields of Mexico, where, as noticed above, the oil is found around many volcanic necks, it can be seen that the view which I took six years ago that these salines were regular solfataric volcanic vents, was the right one. In the Mexican oil fields the volcanic action has been a little more intense, and instead of only the hot gases, vapors and waters piercing up more or less through the horizontal strata to form the salines, as in Texas and Louisiana, we see the volcanic lava cones themselves piercing up boldly through the plains. There is, no doubt, that these lava cores in Mexico, surrounded with petroleum and other solfataric emanations, are one and the same volcanic phenomenon as the vertical chimney of salt, hot water and hot petroleum of the Texas-Louisiana salines.

Origin.—The opposite chemical nature of the members of the two series of natural carbon compounds, namely, oxidized complex carbon compounds for the coals and a mixture of reducing hydrocarbons for the pertoleum, gives us the first hint of the surface or external origin of the coals, and of the internal origin of the petroleum. Beneath the earth's surface, as is well known, there is a deficit of oxygen, and hence we find none in the natural hydrocarbons from the interior, except in the solid varieties, which are the oxygenated and sulphureted residue of the other petroleums in places where they came near enough the surface. The coals on the contrary obtained their oxygen from the atmosphere at first in their original state of vegetation, and have retained part of it during the carbonizing process to which they have been subjected.

Coal Series.—The origin of the members of the coal series from the natural decomposition of vegetable matter, either in place or drifted, is abundantly proven, and is now generally acknowledged and admitted among geologists.

Petroleum Series.—It is, however, very different in the case of the petroleums, the origin of which is still admitted by many, as a matter of fact requiring no demonstration, to be due to some unseen and unexplained decomposition of organic matter. Other geologists have discussed the subject at length, and have tried to prove the organic origin of the petroleum, but not one has ever been able to point out to a single case where a petroleum production process coeval with the kingdoms of life could be witnessed in Nature to-day. Some other geologists are discouraged and proclaim the origin of petroleums as a profound mystery not yet solved by science.

As I have long contended, I, for one, cannot understand how it is that the solfataric volcanic origin of the petroleums should be considered as any more doubtful and less proven than is the organic origin of the coals. It seems to me that the geological facts proving the one are just as clearly established scientifically today as are the facts proving the other. They are simple facts, the A B C, so to say, of geology, and yet strange to say, they are every day ignored and set aside.

There can be only two kinds of organic matter in nature to which the derivation of petroleums might be attributed, namely:—

First—The soft tissues of animals.
Second—Vegetation.

1st.—But the soft tissues of animals always decompose, decay completely and disappear entirely before their entombment in the sedimentary strata can possibly take place. It leaves us, therefore, only the vegetation to deal with in the consideration of this problem. That the soft tissues of dead animals entirely disappear before the entombment of their hard part, even in the comparatively rare cases where the entombment of the latter takes place, is one of the best known and best proven facts in geology—water, carbon dioxide and ammoniacal salts, are the chief products of the decomposition,[1] no petroleum is formed. If it had been otherwise we would not find, as we do, even in late Quaternary dposits, many beds composed entirely of ostreas, corals, marls and shells of all kinds, such, for instance, as the "coquina" beds of Florida, absolutely devoid of some carbon compound to represent the supposed entombed soft tissues of the animals, while in the fossils, shells and other hard parts of the animal life, which we have collected in great abundance in our paleontological museums, from strata of every geological age, we would surely often see at least a modicum of some carbon-compound. But we may examine millions of these fossils and see nothing of the kind, even when these fossils have been collected in impervious shales from which the decomposed products of the soft tissues of the animals, if they had been entombed and had decomposed there, could not possibly have escaped. In very rare cases we do find portions of strata with shells or other fossils filled up with liquid petroleum, but in these cases we also find the seams, joints and other open or porous parts of these strata impregnated with the same fluid, showing plainly that it is a secondary product of infiltration and replacement. Many other substances have thus filtered through the strata and petrified or mineralized the

[3]Jour. Can. Min. Inst., Vol. VI, p 93, and Trans. Am. Inst. Min. Eng., Vol. XXXV, pp. 292, 293.
[1]Jour. Can. Min. Inst., Vol. VI, p. 89.

[1]Bulletin U.S. Geol. Surv., No. 330, p. 116.
[3]Bulletin, U.S. Geol. Surv., No. 330, p. 635.

fossis, such as calcite, silica, pyrites and a great many others, including such metals as copper and mercury. In all such cases there can be no implication of a community of origin between the infiltrated products and the organism. Yet many geologists often quote some of these rare occurrences of petroleum in hard parts of organisms, and use them as evidence bearing in favor of the derivation of it from these organisms, whether fish, mollusc, or other organisms. For instance, in a recent memoir on the natural hydrocarbons by Frank Wigglesworth Clarke,[1] I find the following: "Dieulafait observed that the copper shales of Mansfield are strongly impregnated with bitumen, and also rich in fossil fish. The petroleum of Galicia is always associated with menilitic schists, in which fish remains are peculiarly abundant. . . . G. A. Bertels, on the other hand ,attributes the Caucausian petroleum to the decomposition of molluscs. In the Kuban district, the oil, accompanied by salt water, exudes directly from beds of molluscan remains, which occur in enormous quantities." I wish to point out in answer: that in the great majority of cases even traces of fossils of any kind are impossible to find in the prolific oil and gas sands of the United States, and of the other parts of the world at large, and, therefore, that one is arguing the rule from the exception when he relies on such rare cases, as cited above, for his proofs of the organic origin of the petroleums; also in the copper shales of Mansfield, there is as much reason to attribute an organic origin to the copper as to the petroleum; also that in Galicia the petroleum is found in much greater quantities than it is in the menilitic schists, in sands without any fossil fish, and that it is found also in very large quantities, as ozokerite, in parallel, and branching veins cutting lower strata than the menilitic schists; and, finally, that the salt water which exudes with the oil from the mollusks in the Kuban district must also have its origin in the decomposition of the mollusks, according to the reasoning used.

There are a few instances cited in geology of partially decomposed and preserved remains of animal bodies having been found, but these are most exceptional cases, such as a few remains preserved in the antiseptic waters of the peat bogs, or a few frozen remains of Elephas. These exceptions, of course, only confirm the rule, which is, that when there is anything left of animal life in the strata it is the shells or bones, or their moulds or casts, but there is no trace of the flesh or soft tissues to be found, as none of it was entombed.

All that has been written, therefore, about petroleums being derived by distillation or otherwise from the soft remains of animal organisms, whether macroscopic or microscopic, entombed in the strata, cannot possibly have taken place in the natural geological processes, since no such remains were ever entombed in the strata. C. Engler, C. M. Warren, F. H. Storer, S. P. Sadtler and others[1] have experimented and produced hydrocarbons by destructive distillation of organic animal matter, and these syntheses are often quoted by some geologists as very strong proofs in explaining the origin of the natural hydrocarbons in a similar way, but as has been shown above it is impossible to suppose that there could be any similar normal process in nature, since not only the soft parts of the animal organisms were never entombed in the strata, but the sediments in the oil fields were also never subjected to the high temperatures required for the destructive distillation in such experiments, namely, between 300° and 400°.

2nd.—Now as to the vegetation: Is it not also absolutely and most abundantly proven that vegetation decomposes naturally into the coal series of carbon-compounds, and are not all the members of this coal series found in the sedimentary strata? Nothing more can be asked from vegetation. Are not all the stages, the beginning, the middle and the end of its gradual carbonizing process into peat, lignite, soft coal, semi-anthracite and anthracite right there before us ever since the very beginning of vegetation in Silurian or Cambrian times? Are we to disbelieve what we see to have taken place by the billions of tons during all ages since these most ancient periods, namely, that vegetation carbonized into the coals, and are we to imagine instead that some other unobserved, unseen and mysterious transformation of vegetation into something else, namely, petroleums, took place? This would be to lay aside an abundance of proven facts in order to adopt a mere supposition. The normal process of decomposition of vegetation into coals in nature is in active operation in the world to-day as it has always been, and it is the only one that we can see. It is also the only one of which we have any record in the long history of the geological ages.

As to the other argument that by destructive distillation the petroleums can be obtained from the coals, that would be all very well if nature had distilled the sedimentary strata and the coals or other vegetation in it, but, as a matter of absolute fact, it has not; therefore this line of argument also falls to the ground at once and can be dismissed. If the sedimentary strata had been distilled and petroleum thus produced, there would be no coals anywhere on the globe; we would have nothing but coke beds.

The beliefs in the organic origin of the petroleums leads also to chaos in the understanding of other geological facts and physical laws brought out clearly in the study of many petroleum occurrences or deposits, and no wonder that some geologists who are inclined to believe in this organic origin exclaim, therefore, that the genesis of petroleum is a profound mystery not yet solved by science. For instance:—

1.—It cannot possibly explain the large petroleum fields below the Carboniferous.

2nd.—Neither can it explain the petroleums in the volcanic emanations of to-day.

3rd.—Nor in the volcanic or igneous rocks in all parts of the world.

4th.—Nor in crystalline rocks; in California and New Brunswick, for instance.

5th.—Nor in meteorites.

6th.—Nor in metalliferous veins.

7th.—It is also at a loss to explain why the petroleum fields in every district are found grouped along certain lines, and why the petroleums are found there in many horizons, while outside of the lines in just the same strata, and over much larger areas, all the horizons are barren.

8th.—It cannot explain either how the petroleums can possibly travel out of their supposed organic-remain source in some impervious clay or shale to accumulate in a few porous receptacles far distant laterally and some times hundreds and thousands of feet above, or even below as some assert, and this all through most impervious rocks and without any impelling force behind, or any cracks, joints or fissures to follow since the decomposed products of the organisms must naturally

[1]Bulletin U.S. Geol. Surv., No. 330, pp. 629, 630.

[1]Trans. Am. Inst. Min. Eng., Vol. XXXV, pp. 290, 294.

be supposed to come from the whole mass of the strata through which the organisms were and there could not be fissures, cracks and joints to all parts of the strata.

9th.—It cannot possibly explain why the petroleum, although found to-day in their reservoir rock under strong pressures, cannot by means of that pressure, return and disperse back to their original sources; they should be able to return the way they came, nothing is to prevent them, and there is plenty of pressure for the return voyage if one admits the first voyage from the organic source.

10th.—It cannot possibly explain how the petroleums from the organic remains in the Monterey formation, for instance, in California, got out into the unconformable series above, such as the Fernando formation and the Quaternary, and why these petroleums did not all get out into the air during the long lapses of time marked by the unconformities, and how they were able to get into the lower Eocene and the still lower crystalline rocks, thus working their way against the pressure of their own natural gas, which always increases with the depth.

11th.—It cannot possibly explain again, if the petroleums can travel so freely through the strata as to be able to accumulate under an anticline from organic remains deposited far and wide laterally (at least a mile or two or much more in order to allow for the quantities obtained in many fields), why they did not escape out into the free air only a few hundred, or a few thousand feet away at most; the shales above the sands are not any more impervious than the shales below the sands, which, on that theory, are supposed to be the source of the petroleums, and if they can travel freely through the shales, which are the most impervious rocks of the sedimentary series, I repeat, what is to prevent them from getting out into the atmosphere?

12th.—It cannot account for the continual absence of petroleum in the hard parts of organisms preserved in the sedimentary strata.

13th.—It cannot explain the evident non-connection of petroleum deposits with coal beds.

14th.—It cannot account for the continual association of petroleum with strong salt and sulphur waters. The origin of the petroleums, therefore, is not organic; that it is volcanic is absolutely proven by:

1st.—The fact that volcanic emanations of hydrocarbons are the only natural geological process of petroleum production of to-day, abundantly verified and witnessed in actual operation in volcanic eruptions and phenomena all over the world.

2nd.—By the presence of petroleums in volcanic rocks, igneous rocks, metalliferous veins and meteorites.

3rd.—By the rock pressure of the natural gas in the petroleum deposits. This pressure always increases with depth in each field; it has been well proven that it is not an artesian water pressure from above, and it cannot be explained in any other way than as a remnant or spark of the volcanic energy forcing the petroleum through the crystalline rocks and all the sedimentary strata from below.

4th.—By the products associated with the petroleums in their reservoirs, principally salt, sulphur, hydrogen sulphide, gypsum, calcite, dolomite and silica, which are also the products associated with hydrocarbons in the volcanic emanations of to-day. This association is the unmistakable solfataric volcanic seal which I pointed out before.[1]

5th.—By the hot oils, gases and waters in some of the more recently formed petroleum fields.

6th.—By the fact that the petroleum deposits are located along the faulted and fissured zones of the crust of the earth, parallel to the great tectonic orogenic and volcanic dislocations and in "petroliferous provinces" analogous to the metallogenetic provinces of De Launay, Lindgren, Spurr and other writers. These petroleum deposits could not be inseparably and intimately connected with the tectonic structure of each particular region unless their source was as deep-seated as the forces which have caused these profound dislocations of the crust. We have gradually come to this conclusion in geology in regard to ore deposits similarly connected with tectonic disturbances and hydrocarbon gases and vapors must be added to this class of solfataric metalliferous emanations and receive their proper place in geology as solfataric "petroliferous" emanations. These "petroliferous" emanations have played a most important part in the deposition of ore bodies.

7th.—By this fact that petroleums are never indigenous to the strata in which they are found, and are clearly secondary products impregnating porous rocks of all ages. In all fields there is always a lower horizon in which the petroleum is found, until finally the crystalline rocks are reached, and they are even found in these. This adventitious nature of the petroleum deposits is further illustrated by the deposits of solid petroleum which cut through all rocks in veins exactly similar to mineral veins.

8th.—By the fact that petroleums are found in such abundance in certain small localities, while neighboring localities are found entirely barren; this forces one to the conclusion that they must originate from the vulcanic tank below which is the only one adequate to furnish these enormous quantities to narrow, long belts or to small isolated spots, such, for instance, as the one hundred acres of the Spindletop Mound, near Beaumont, Texas, which has already produced about 38 million barrels of oil; such as the one billion barrels produced from a small area in the famous oil field of the volcanic peninsula of Apoheron, near Bakou, Russia; and such as the millions of barrels produced in many other fields from very narrow long belts, while areas, many scores of times larger, next to the producing strips are barren. This cannot be held to be an accumulation in the producing fields from vast surrounding areas of sediments, as if this was supposed one could not explain why the petroleums did not escape to the surface instead of travelling so far laterally.

9th.—By the fact that the sedimentary strata of the oil fields are so highly impervious that the volcanic fracturing and fissuring and the volcanic force of the natural gas alone can explain how so many small porous receptacles at different horizons between these impervious strata, have been filled with petroleums, salt and sulphur waters, and how these small detached petroleum reservoirs are found to-day under a gas pressure which increases with depth in each district, but is, nevertheless, a stored energy which will dissipate gradually in the utilization of the oil field, the volcanic energy which brought it there at one time being now dead and inactive.

Before concluding, permit me to insist on the fact that the recognition of the solfataric volcanic origin of the petroleums not only removes every difficulty in the way of a full comprehension of all the chemical and geological facts established to-day with regard to the nature and mode of occurrence of these products, but it fully harmonizes also with the physical laws governing the circulation of gases and liquids through great

thicknesses of very impervious strata before being able to reach to and accumulate in a few small separated receptacles in the midst of these. The volcanic origin of the petroleums forms, therefore, a complete chain of evidence, with none of the links weak or missing. The very reverse is the case, as I have shown above, when one attempts to explain the origin of the petroleums by means of organic sources; in doing so, well known chemical and geological facts are set aside and ignored and physical laws are distorted and abused. The geologists who still hold these views should seriously reflect on this, and I am confident that if they do they will soon abandon and relegate to the past the old unsupported notion of the derivation of petroleum from organisms, and that they will come to the conclusion that this idea is now unworthy of the progress made by the geological science of to-day.

When one considers that there were produced in the United States alone last year 184 million barrels of oil and fifty-three million dollars worth of natural gas, he can fully appreciate the great economical importance which petroleums have attained. It is essential, therefore, even leaving aside the purely scientific aspect of the question, that the origin of these products should be understood in order to afford a basis or guide for the intelligent exploration of the many new fields yet undiscovered, and which are to supply the world with even vaster qualities of petroleums in the future. The correct undertsanding of the volcanic origin of the petroleums furnishes us at once, as a matter of fact, with the solution of this problem of how and where to look for new fields; we must follow, as I have pointed out before, the structural or tectonic lines of disturbances and fissuring or the fractured belts along which the solfataric hydrocarbon emanations come up from the interior. The outward manifestation of these tectonic disturbances may be a fissured anticline, as it often is, but the fissuring may also have occurred at any other part of the structural folding of the strata whether in the syncline, at a monocline, along a slope or terrace or any other part of any form of structure. The so-called anticlinal theory, as heretofore explained and understood, namely, as a favorable place of accumulation under an arch of the supposed products of decomposition or distillation of organisms, is absolutely untenable and without any meaning. That such products cannot and do not travel through impervious strata is well demonstrated by the fire damp and choke damp of the coal mines which are always found to-day right in the beds of coal from which they originated. If hydrocarbon gases and fluids could travel through the shales below the producing sands which in this organic theory are supposed to be their source, these hydrocarbon fluids would also travel just as freely through the shales and other strata above the sands and, therefore, would have escaped out into the atmosphere long ago instead of stopping under the anticlines. There is absolutely no difference between the degree of perviousness of the strata above or below the sands, in fact very often a shale which is above a producing sand is also below another producing sand. All these strata are highly impervious, including even the "sands" which are porous only in occasional comparatively small spots. It has been impossible, therefore, for gases and fluids to travel through the strata except when they were fissured by profound dynamic disturbances, which permitted the tremendous volcanic pressure from below to exert itself, and even then the enormously pent up gases and vapors from the interior reached to or near the surface with great difficulty as exemplified by the great differences in pressures of the natural gas in different sands at various levels in a given field, by the fact that pressures of 500 to 600 lbs. to the square inch are often obtained quite near the surface at depths of only 800 to 1,000 feet, yet the gas did not escape; and, by the further fact that oil and gas fields are such small detached pools, never extending but short distances away from the dynamic disturbances which form their original channels. It is only as a part of this broader conception of the occurrence of the petroleum-fields along the profound structural disturbances that the so-called anticlinal theory has any merit. This conception alone explains why some fissured anticlines are "petroliferous" or petroleum-bearing in several of their sands at different horizons, while the great majority of anticlines are absolutely barren of hydrocarbons at all their horizons because they are not fissured folds in "petroliferous provinces."

MINERAL DEPOSITS OF THE SERPENTINE BELT OF SOUTHERN QUEBEC.

By John A. Dresser, McGill University, Montreal.

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I. General.

For the past few years practically one-half of the mineral output of the Province of Quebec has been obtained from the area in the Eastern Townships known as the serpentine belt. This is a complex of igneous and metamorphic rocks consisting of peridotite, pyroxenite, diabase and granite, with serpentine and talc schists. It is rather because of the greater economic importance of the serpentine and the fact that it is a rock more easily recognized, than on account of its relative area, that the name serpentine is commonly applied to the group.

These rocks form part of a series which extends, with some interruptions, in a line parallel to the Atlantic coast from Georgia to Newfoundland. In the Province of Quebec they are almost continuous from the international boundary line near Lake Memphremagog to Thetford Mines. Beyond this to the northeastward they appear frequently for a distance of eighty miles in the counties of Beauce, Dorchester, Bellechasse, Montmagny and L'Islet,, and after an interval of some 120 miles they reappear with a large development in the Shickshock Mountains of Gaspe. They are best known in the counties of Megantic,

Wolfe, Richmond, Sherbrooke, Shefford and Brome.

The present output of asbestos comes from the counties of Megantic and Richmond; of chromic iron from Megantic and Wolfe. In each case the County of Megantic furnishes the principal production.

II. Geology.

The geological relations of the serpentines and associated rocks are not yet very completely known. They are, however, an intrusive series, the latest of which cut sedimentary strata of middle Ordovician age. Some portions seem to be laccolites uncovered by denudation, while others are probably extrusive masses with plutonic rocks in the central portions which pass into diabase towards the sides and top, and have since been deeply eroded. The whole series has been much folded and deformed by regional metamorphism.

The peridotite and pyroxenite are parts of one original mass, which have been differentiated from each other. The serpentine in the Thetford-Black Lake and Danville districts has originated from the alteration of the peridotite. That of the East Broughton and related occurrence has apparently been derived from a and fifteen in width, underying a great part of the very similar rock, but is in a much more advanced stage of alteration and doubtless is much older. Isolated outcrops of this older serpentine appear at various places in the counties of Wolfe, Megantic and Lotbiniere, and are probably portions of a partially uncovered large mass, or bathylith, at least fifty miles long dome-shaped hilly country between the Quebec Central and the Grand Trunk Railways in this district. This serpentine is probably of pre-Cambrian age.

The diabase forms a marginal or outer facies of the peridotites and pyroxenites in some parts of the district, but in others it cuts serpentine that is thought to belong to the later of the two classes of that rock that have been mentioned. Further field work is necessary to define the precise relations of these rocks. The diabase occupies much the greater portion of the entire belt, and also forms all the higher hills, such as Broughton, Adstock, Ham, Orford and Owls Head Mountains.

A peculiar hornblende granite cuts these rocks with numerous dykes and is otherwise intimately associated with them.

Mineral deposits of importance are found in this district in each of the above-mentioned rocks, except the last. Asbestos occurs in the serpentine; chromic iron in serpentine and peridotite; talc in the pyroxenite; and associated with the diabase there are copper, antimony and nickel.

III. Asbestos.

Although asbestos was known in the Eastern Townships as early as 1847, it was not until thirty years later that it became commercially important. Work was begun in 1877 at Thetford, and almost at the same time at Black Lake and Danville, and has steadily advanced ever since. The mineral, which is the chrysotile variety of asbestos, fibrous serpentine, requires no description. It has the same chemical composition as the rock which contains it. It is valuable for the property of being incombustible, and that it is a most successful non-conductor of heat and electricity, and well resists most acids. It is used for an increasingly large number of purposes every year, such as stage curtains, fire screens, boiler covering, fireproof roofing and covering, insulating material, etc. The product has hitherto been manufactured in the United States and in Europe, but at present large works for the manufacture of asbestos are being installed in Canada.

1. Production.—Asbestos mining is now the most important mineral industry in the Province of Quebec. During the last thirty years, that is, since asbestos

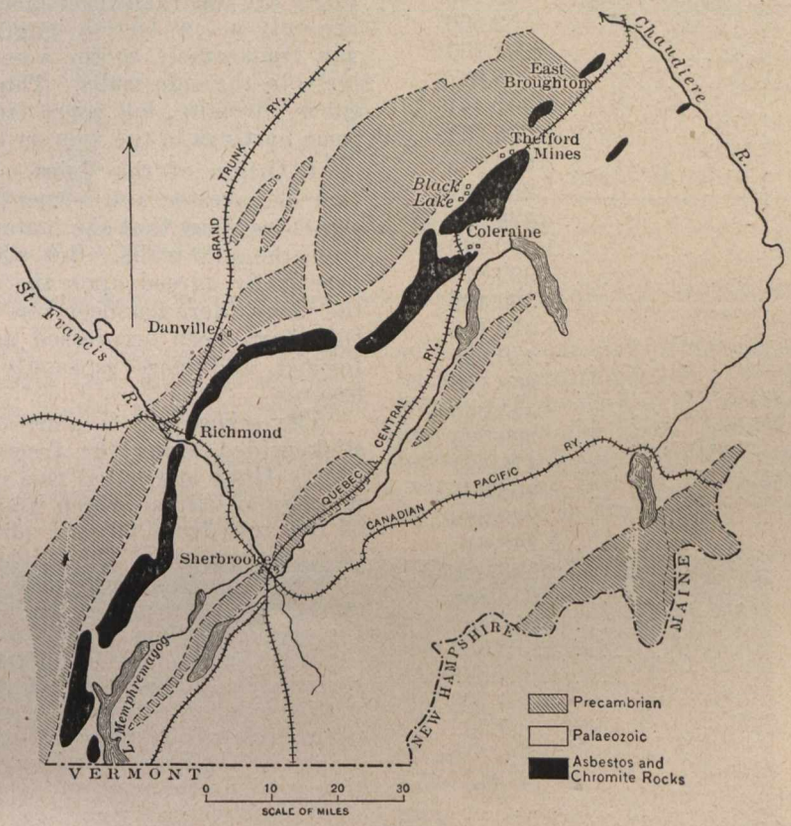


FIG. I.

mining began, the aggregate production has had a value of more than twenty million dollars, and at the present time the Province of Quebec produces between 85 and 90 per cent. of the world's supply. This entire amount, in value two and a half million dollars, is obtained from the counties of Megantic and Richmond, much the greater part coming from the former. The following returns of production indicate the growth of the industry. The production of low-grade material was greatly increased by the introduction of mechanical concentration in 1892-3-4, and the effect is well shown in the statistics which are taken from the returns of the Geological Survey of Canada:—

	Production.		Value.
1878—	50	tons.....	$
1879—	300	"	19,500
1880—	380	"	24,700
1881—	540	"	35,100
1882—	810	"	52,650
1883—	955	"	68,750
1884—	1,141	"	75,097
1885—	2,440	"	142,441
1886—	3,458	"	206,251
1887—	4,619	"	226,976
1888—	4,404	"	255,007
1889—	6,113	"	426,554
1890—	9,860	"	1,260,240
1891—	9,279	"	999,878
1892—	6,082	"	390,462
1893—	6,331	"	310,156
1894—	7,630	"	420,825
1895—	8,756	"	368,178
1896—	10,892	"	423,066
1897—	13,202	"	399,528
1898—	16,124	"	475,131
1899—	17,790	"	468,635
1900—	21,621	"	729,886
1901—	32,892	"	1,248,645
1902—	30,219	"	1,126,688
1903—	31,129	"	915,888
1904—	35,611	"	1,213,502
1905—	50,669	"	1,486,359
1906—	60,761	"	2,036,428
1907—	62,241	"	2,484,768
1908—	65,534	"	2,547,507

2. Distribution of the Deposits.—In the Thetford and Danville areas workable asbestos has as yet been found only in the northwestern parts. The areas of serpentine in these two localities are not connected at the surface, but being lithologically similar and both intrusive, it is probable that they are portions of one general mass, and so are connected at no great depth beneath the surface. The rocks of each of these localities ranges from peridotite, rich in olivine, to pyroxenite, in which little olivine occurs. There is also much diabase in both areas. The peridotite is largely altered to serpentine, but it is in the latter only that asbestos occurs. In the cooling of the peridotite-pyroxenite magma there appears to have been a segregation of olivine towards the northwestern edge of the mass, and of pyroxene towards the southeast side.

The greater part of the entire rock mass is most suitably called serpentine, but much of it carries from 10 to 20 per cent. of pyroxene, generally bronzite, and forms a hard rock, which the miners call "dry" or "bastard" serpentine, or "hornblende rock." The "heads" or masses of hard rock often met with in the asbestos mines are of the same character. On the other hand the more pure serpentine which produces asbestos is distinguished by a softness of feel and a more uniformly light colour. The original rock in this case was richer in olivine and poorer in pyroxene, and probably contained less chromite, which is disseminated more or less freely through all of this rock mass.

The distribution of the asbestos-bearing portions of the serpentine, therefore, seems to depend on differentiation in the primary rock, by which a relatively small proportion of it became rich enough in olivine to form a comparatively pure serpentine. While the productive portions are small in proportion to the entire body of serpentine, they nevertheless form asbestos deposits that are practically inexhaustible.

3. Character of the Veins.—The asbestos occurs in gash veins, which rarely reach three inches in width or exceed two hundred feet in length. The great majority are less than three-quarters of an inch wide, and are only a few feet in length. The fibres of asbestos run transversely to the veins, and hence perpendicularly to the side walls. Thin films of iron ore, sometimes chromite, but more frequently magnetite, often form partings in the vein, or coat the ends of the fibres.

4. Origin of the Veins.—The identity in composition of asbestos and serpentine and the evident vein structure show that the material of the veins has come from the side walls. But while all investigators have practically agreed upon the source of the material of the veins, there has been less unanimity in the opinions that have been expressed as to how the veins were formed, and more especially as to the origin of the fissures.

The serpentine is generally much fractured and slickensided along the fracture planes. The late T. Sterry Hunt attributed this in a great measure to the increase of volume which would accompany the change of the anhydrous silicate, olivine, to the hydrous silicate, serpentine. The slickensided fracture planes, however, are less frequently walls of asbestos veins, and consequently this observation does not apply to the origin of these veins.

J. H. Pratt (U.S.G.S., 1904) says that "the original rock in cooling would solidify first along its contact with any included masses of the country rock, that had been broken off during the intrusion of the molten magma. The outer portions of the molten rock would thus cool much more suddenly than the interior portions, and there would be a tendency for them to develop cracks and parting planes. In the alteration of these primary rocks to serpentine, through the agency of aqueous solutions, vapours, etc., there would be perhaps, to some extent at least, a widening of these cracks, but in the end they would be filled with serpentine deposited from aqueous solutions from their walls, and the resulting fibrous structure of the serpentine filling these seams represents the nearest approach to a true crystallization that the mineral serpentine assumes, except when it is found as pseudomorph after another mineral."

G. P. Merrill, Smithsonian Institution, Washington, D.C., (Mining World, 1905), attributes the fracturing to shrinkage due to the partial dehydration of the serpentine, and also to loss of silica, as has been suggested by J. F. Kemp (N. Y. Acad. Sci., 1901), comparing the veins to the shrinkage cracks in serpentine nodules. He considers the asbestos fibres to have grown from one or both sides of the vein, according as it is an undivided or a divided vein.

R. W. Ells (Bulletin on Asbestos, 1903, Geological Survey of Canada) says of asbestos veins: "In whatever way the fissures were caused, and it is very probable that they have been formed by the great processes of metamorphism to which the rocks were exposed in the change from dioritic matter to serpentine, the vein asbestos appears more naturally to have been produced by a process of segregation of serpentinous matter from the sides of the fissures very much as ordinary quartz in mineral veins is known to have been produced."

F. Cirkel ("Asbestos, its Occurrence, Exploitation and Uses," Department of Mines, Ottawa, 1905) agrees in part with Messrs. Merrill and Kemp, but considers a part of the fracturing to have been caused by the intrusion of granite dykes, which are numerous in the district. He also considers the veins to have been successively filled from the side walls.

A. P. Low (Geological Survey of Canada, 1906, The Chibougamou Mining Region) says: "The cracks were probably formed by shrinkage of the mass, and perhaps in part the crushing action of the same pressure which lengthened and flattened the serpentine areas, and at the same time made the associated rocks schistose. The asbestos appears to the writer to have been deposited in the cracks under great pressure from superheated waters which, penetrating the rock, absorbed the material of the serpentine until the solution became a saturated one. With cooling, the mineral would be deposited in the cracks. . . . In the Thetford and Black Lake areas, masses and dykes of granite have been intruded into the serpentine, and these probably account for the necessary pressure and heated waters to form the asbestos there."

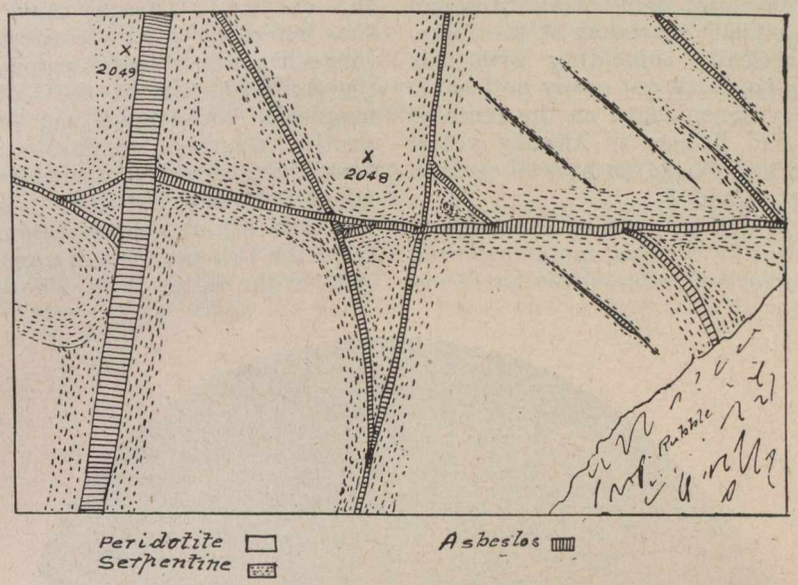


FIG. II.—Diagram showing asbestos and serpentine in periodotite. The largest vein is two inches wide.

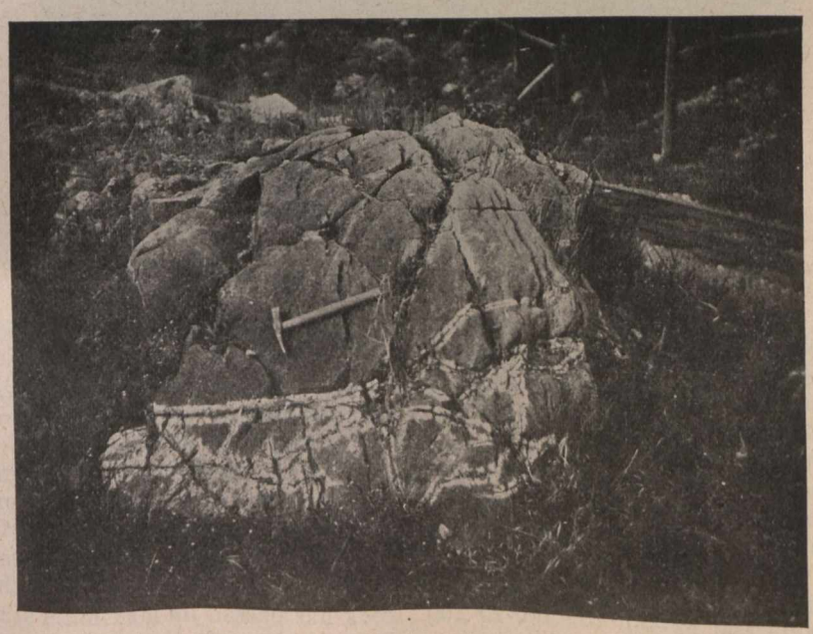


FIG. III.—Showing veins of asbestos within band of serpentine on weathered surface of peridotite.

An important feature of asbestos veins that seems to have been generally overlooked is that the wall rock adjacent to the vein is always completely reduced to serpentine, while the general mass of the country rock is usually not so far altered. In all the deposits, except those of the East Broughton type, the asbestos-bearing

rock is only partially altered to serpentine, except along the asbestos veins, and here the alteration appears to be invariably complete. A band of pure serpentine extends on each side of the asbestos vein to a width generally about three times that of the vein. Measurements were taken on forty-nine veins in the Bell and Johnson mines, and the average ratio width of the asbestos vein to the total band of asbestos and bordering serpentine was 1:6.6, seventeen of the forty-nine measurements practically coinciding with this average. The serpentine border is not easily noticeable in fresh rock, but is very conspicuous on the faces of workings which have had fifteen or twenty years' exposure to the weather, and can often be well seen on unworked surfaces (Figs. 2 and 3).

The veins occur in the joint planes of the original rock, in fractures produced by regional metamorphism, and often in the crevices formed when shells are being cast off rectangular blocks as in weathering. All three types of fissures are indicated by the veins in Fig. 2, which is a drawing of a wall of a pit near the Standard mine. At the junction of two veins, one, usually the wider, sometimes cuts the other distinctly, but more frequently they coalesce with a short line of division between them, masked by a film of iron.

While the veins run in all directions through the rock, the larger veins are usually those along joint planes. Of these the horizontal series, which are sometimes over two inches wide and extend for 100 to 200 feet, could never have been open fissures, nor is it conceivable that small areas of rich ground occasionally found where there may be 12 or 14 per cent. of asbestos could ever have had as many open fissures as they now have filled veins. It therefore seems most probable that a process of replacement of the wall rock has gone on contemporaneously with the deposition of the asbestos. The film of iron ore, or the parting so common in the veins, would thus be the beginning of the vein, and chrysotile crystals by growing outward on either side would thus have formed the wider veins as the serpentinization of the wall rock advanced. The asbestos can only have been formed after the serpentinization of adjacent parts of the rock.

Pratt (op. cit.) observed that "It is probable that this chrysotile asbestos may have been formed some time before the complete alteration of the primary rock into serpentine. This is emphasized by the fact that in the southern part of the United States, where these magnesian rocks have been but partly altered to serpentine, seams of chrysotile asbestos are occasionally found almost entirely enclosed by a peridotite rock which is altered but little to serpentine." In the case shown in Fig. 2, a microscopic examination of the rock from the two portions marked No. 2048 and No. 2049, showed the latter to be wholly serpentine, the former a fairly fresh peridotite. Figs. 4 and 5 show microphotographs of these sections.

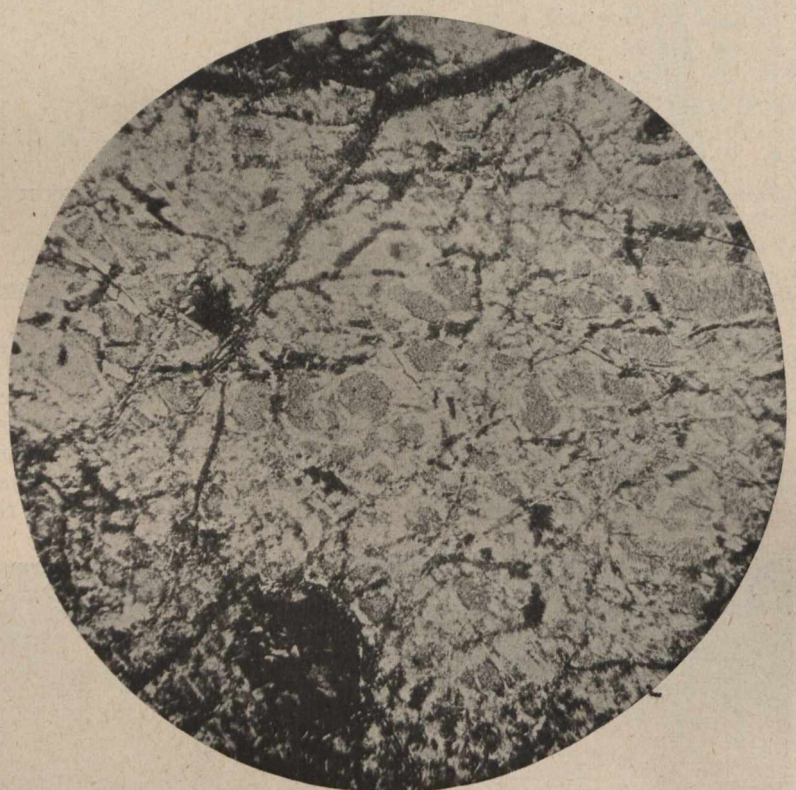


FIG. IV.—Photomicrograph of specimen 2048. Rock about 90 per cent. olivine. Olivine grains surrounded by narrow rims of serpentine, a vein of asbestos, and a crystal of pyroxene.

At East Broughton and other localities on the older serpentine, the entire rock is of the character of the vein borders at Thetford.

The entire rock being serpentinized, the proportion of veins is large. Asbestos seems to have reached its maximum development which from the measurements made at Thetford would represent nearly one-seventh or upwards of 15 per cent. of the serpentine. But this rock has passed its maximum stage of productive value, for an alteration of the larger veins has begun, by which the fibres of asbestos are partially replaced by calcite. Their flexibility and tensile strength being gone, they are no longer products of value. The best asbestos of this locality seems to be in the smaller veins. The rock is exceedingly soft, and the proportion of vein matter is so great that practically all of the rock mined goes to the mill. The fact that the asbestos

is of better quality in the narrow veins than in the larger ones appears to corroborate the view that the asbestos veins are gradually formed. Beginning along the joint planes, they extend to all parts of the rock as fracturing from any cause opens it to the action of metamorphosing agencies, principally water. These have reduced it first to serpentine; second, to asbestos, and lastly, forming a sort of ophicalcite.

Mr. W. S. Johnson states that veins of asbestos partially replaced by calcite are occasionally found at Coleraine. In that case, the Thetford area may be regarded as having reached the maximum productive value for asbestos.

According to the measurements mentioned above, this should be nearly 15 per cent. While this is in excess of the actual production of the rock as a whole, small very productive parts probably reach 12 to 14 per cent. occasionally, which, allowing for loss in recovery, accords fairly well with the results of the limited number of measurements on which this estimate of possible proportion of asbestos to serpentine is based.

5. The Granite.—The presence of granite in dykes or other forms has been considered by many to be favourable, if not necessary, to the occurrence of rich asbestos ground. Yet in the older serpentine at East Broughton the recent development of numerous areas now rich and formerly much richer, has not, so far as the writer is aware, disclosed any granite in that district. It would not, therefore, appear to be necessary to the existence of asbestos.

Where the granite is intrusive, as in parts of the Thetford and Danville districts, the effect in fracturing the serpentine is highly probable, and the influence of heated waters accompanying the intrusion, as suggested by Dr. Low, is likely to have hastened the process of serpentinization and the consequent formation of asbestos. But much of the granite appears to be nearly, if not quite, contemporaneous with the parent rock of the serpentine. It forms isolated masses of even grain, is separated from the serpentine by intermediate rock matter and seems, from such evidence as is available, to be an extreme differentiation product complementary to the very basic peridotite. This view, which is as yet only tentatively advanced owing to lack of sufficient field study, seems also to be corroborated by the fact that the granite is less frequently found in parts of the rock rich in pyroxene than in those having much olivine.

(To be continued.)

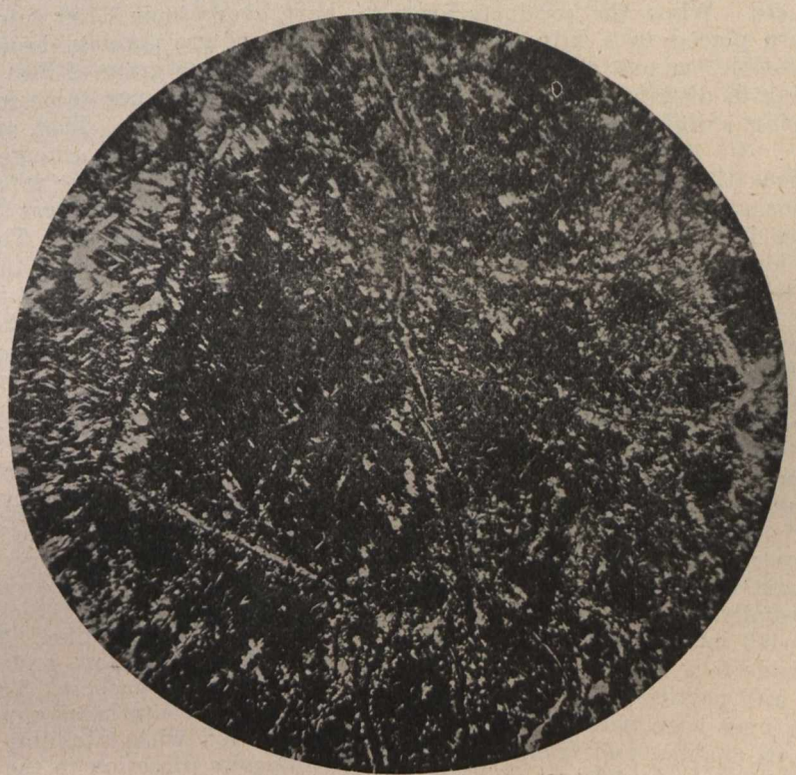


FIG. V.—Photomicrograph of specimen 2049. Serpentine and a few grains of chromite.

OUR SUBSTITUTE FOR TIMBER.

Abstracted from article by Prof. M. B. Baker, in Queen's Quarterly.

Notwithstanding the fact that our supplies of building timber are rapidly disappearing, little provision is being made to supply a substitute. However, the demand for timber is not likely to increase so rapidly in the future as people think. Timber was formerly the chief structural material of all buildings, but is rapidly being replaced by steel, concrete, and clay products.

Stone and concrete are almost always used in the foundations of large buildings. The superstructures are either steel bridgework or reinforced concrete. The uprights, girders, joists, etc., are built to carry all the load, and some light fireproof material is used to fill in the spaces between the more substantial structures. In Canada the material used is usually clay, of which we have an endless supply.

The manufacture of clay products is probably the oldest industry on earth, but new developments are constantly being made nevertheless. One of the most recent of these is the manufacture of "clay-lumber," or "terra-cotta lumber," as it is often called. It is so-

made that nails, screws, bolts, etc., can be driven into it with ease, and it may therefore be put to many of the uses to which timber is now suited.

When clay is heated to a temperature of about 1.800 degrees it begins to fuse, and the particles weld or knit together, and the clinker when coiled assumes a hard rocklike consistency. In the manufacture of clay lumber the raw clay is mixed with some combustible substance, usually sawdust, and sufficient water to make a stiff mud. This mixture is then put through an auger machine, which consists of a hollow steel barrel about the shape of a cannon, within which an auger is turning, thus constantly forcing the clay towards the muzzle of the machine. Dies of any desired shape are bolted onto the muzzle of the machine, and as the clay is forced out it must of necessity take the shape desired. The clay issues as a long column, which can be cut off into blocks of proper size by means of fine wires set on a frame. By changing the dies to suit the architect's plans, any shape of block may be made suitable for domes, arches, ceilings, etc. When the products are sufficiently dried they are placed in a kiln, and the sawdust or other combustible, mixed with the clay, will burn out, thus helping to distribute the heat, and at the same time producing a light, porous, and fireproof block.

For walls and partitions this clay-lumber is made in the form of hollow blocks, which have many other advantages, besides being light in weight. The air space within the blocks keeps the building cooler in summer and warmer in winter, and also deadens the noise from surroundings. Owing to the porous character of the blocks, one can plaster and finish walls and ceilings without first lathing them; but if one wishes to finish with lumber of any particular kind he can nail into this clay-lumber almost as easily as into timber.

Another class of hollow blocks differs from the porous, in that they are made entirely of clay, with no addition of sawdust or other combustible material. They are in reality hollow rectangular tile, and being free from pores are stronger, and able to carry a much greater load. They are usually made 8 inches deep by 10 inches wide, and 12 to 16 inches long. They have two or three partitions inside to give greater strength, the material of the walls and partitions being an inch thick. These blocks have long been used for foundations of frame houses, barns, stables, and frame structures in general. They build up a wall very quickly, and, being hollow, they offer a warm, dry, cheap form of masonry for foundations of frame buildings.

Enquiry among men from all Canada who would be most likely to know, failed to bring forth a single case where lightning has struck a building placed on these blocks.

Porcelain, which is used largely as an insulator, is simply a burned clay, as are the blocks described above. It is therefore possible that those hollow porcelain-like blocks do actually insulate a building from the earth, and thus leave it out of a possible electric circuit.

WASHING BLAST FURNACE GAS.

On this subject the "Allgemeine Ingenieur Zietung" has an interesting article, which, in view of the rapid introduction of large gas motors in connection with blast furnaces in America as well as in other countries, should prove of interest to a large circle of readers.

The purification of the gas before it enters the working cylinder of the motor is one of the main conditions necessary to secure reliable working of the plant. Before the gas motor was brought into use blast furnace engineers paid little attention to washing the gas, as this seemed hardly necessary for its employment in the Cowper regenerators. A few dust catchers in the pipes seemed enough to do away with the necessity of frequent cleaning out of the regenerators. This is, however, not the case with motors where those parts that are subject to the action of the gas are exposed to considerable friction when at work at high temperatures. The great heat of explosion bakes the solid impurities on to the cylinder walls, etc.; the dust particles form with the lubricating oil a specially adhesive gummy mass, which is driven out with the combustion gases. But at the edges of the exhaust orifice there remains a great part of these substances, because it cannot keep up with the velocity of the gases. If we consider a gas motor of 500 h.p. using hourly 3.5 cubic metres, or say 123 cubic feet of gas, per horsepower, we have every hour 1,750 cubic metres, or say 61,250 cubic feet of gas passing through the machine; and if there is only one gram of dust per cubic metre, or say rouhgly 0.3 grains per cubic foot, we have every hour 1.75 kg., or 3.85 lbs. That at least one-fifth to one-fourth of this remains attached to the exhaust opening, can be seen by anyone who has to do with a motor working with unpurified gas, as every few hours he must remove this deposit. This latter closes the exhaust opening, and as a part thereof is sucked back by the piston into the cylinder, it injures the working surfaces. This shows that purification must be carried out to a degree which will leave less than one gram per cubic metre, or 0.3 grains per cubic foot; and in delivering motors the makers generally specify that the gas shall not contain more than 0.05 to 0.07 gram per cubic meter, or 0.015 to 0.021 grains per cubic foot.

The gas washers most in use can be classified in two groups. In the older of the two the gas is driven through a series of filtering vessels, containing for convenience a number of drawers, which may be taken out for emptying. The filtering material is usually coke, sawdust, or the like. The second class is of more recent construction, and well known under the name of rotary gas washers. The gas is passed through the jacket of a centrifugal apparatus, while the inner wall is covered with trickling water. The gas flows in the opposite direction to the latter, so that there is friction between the finely divided water and the whirling gas current.

The high degree of purification which can be carried out to a few milligrams of dust per cubic metre is due to the fact that the water forms a nebula which surrounds the finest grains of dust, and by increasing their weight, makes them more subject to the centrifugal action. Water and dust are thrown out together by the machine. To attain the highest possible degree of perfection by this method it is advisable to set the rotary gas-washer near the blast furnace, and even to insulate the pipe between the furnace and the washer, so that the gas shall not lose any of the heat necessary to evaporate the water.

The essential difference between the first-named class of purifiers and the rotary washers is that the first cost nothing, except for the material to fill the drawers and the labor to remove them, whereas the latter, exerting a suction action, call for considerable power to drive them. Further, they demand more

labor and are more expensive to keep up, so that very often it is found that the dry process is much cheaper than the washing. Outside of this, they need no provision for the removal of the water.

In the case of coke furnaces, and in general everywhere where the gas contains considerable water, only the dry process can be employed, as these very thoroughly remove this material from the gas. Of course, where the gas is not rich in tar, this makes no difference.

To get the advantage of both methods of purification, it is recommended so to construct the dry purifiers that they shall produce the same effect as that carried out in the rotary washers. This is done by building above the cylindrical purifiers a hopper-shaped reservoir, in which the gas current is led, and after the latter has attained at the lower end a certain velocity, steam is driven through it. In the lower end of the hopper of funnel there is a spiral such as is found in grain cleaners and in some steam-drying apparatus. In this spiral the steam will have the same result as in the rotary washers.

It is to be remarked in this connection that to overcome the resistance in the spiral, neither increase of blast pressure nor the use of an exhaust fan is necessary. The steam, which is mixed with the gas at the end of the funnel, acts by its expansion like an injector —or rather ejector—and gives the gas the necessary increased velocity to enable it to flow through the spiral. After leaving the latter, the steam, mixed with the dust, is led into a condenser cooled by air, whence it is discharged as water. R. G.

BOOK REVIEWS.

Principles of Mining: Valuation, Organization, and Administration; Copper, Gold, Lead, Silver, Tin, and Zinc. By Herbert C. Hoover. 199 pages. Illustrated.. Price $2.50 net.. Hill Publishing Company, 505 Pearl Street, New York.

Few individual phases of mining have not been touched upon in the writings of modern technologists. Specific problems have been debated and settled and reopened. From power economy to slime treatment, every step in the winning and reduction of gold ore has served as a crystallizing point for numberless expositions. Only less expounded are the mining processes of copper, lead, silver, tin and zinc.

But underlying these commercial processes are certain principles common to all. The proper understanding of these is a pre-essential to intelligent mining engineering. Mr. Hoover's book is written with the object of defining and illustrating these principles.

Before expressing an opinion on Mr. Hoover's method of handling his wide subject, let us glance at the general anatomy of the book itself.

The twenty chapters that make up the volume may be grouped thus: Six are given to "Mine Valuation"; three to "Development of Mines"; one to "Stoping"; one to "Methods of Supporting Excavation"; three to "Mechanical Equipment"; one to "Ratio of Output to the Mine"; three to "Administration"; one to "The Amount of Risk in Mining Investments," and a concluding chapter to "The Character, Training and Obligations of the Mining Engineering Profession."

Strict logic might demand that the last chapter be given first place. Otherwise there is no fault to be found with Mr. Hoover's arrangement of subject.

The author excludes from his consideration alluvial deposits, iron, coal, and all other mines except those in which the ores of the metals mentioned in the title are won. This differentiation strikes us as being arbitrary. For instance, on page 1, the following principles are given as forming the basis of the value of a metal mine:

(a) The profit that may be won from ore exposed.

(b) The prospective profit to be derived from extension of the ore beyond exposures.

(c) The effect of a higher or lower price of metal (except in gold mines).

(d) The efficiency of the management during realization.

These principles need no modification to become applicable to all types of mines and only slight changes will adapt them to the exploitation of alluvial deposits. We regret, then, that Mr. Hoover has not made his book more complete by including the vitally important coal and iron branches of mining. This by the way.

Comment upon a few typical passages, chosen more or less at random from successive chapters, will serve to convey a rough impression of the character and style of "Principles of Mining."

On the the first pages some truths that will always stand iteration are emphasized. " . . . it is utterly impossible accurately to value any mine, owing to the many speculative factors involved. The best that can be done is to state that the value lies between certain limits, and that various stages above the minimum given represent various degrees of risk" This is true. But it is also true that the fact that a mining risk is different from ordinary commercial risks does not mean that the former is necesarily higher. Speculative factors abound in everything from religion to street cleaning. Life insurance is highly organized speculation. The artist speculates in human sensibilities; the novelist, in human sentimentality; the broker, in human frailty. Heretofore it has been the almost invariable custom of writers to refer to mining risks as carrying an essential and not an incidental speculative element. Books like Mr. Hoover's will be most effective in rectifying this error. Nevertheless, Mr. Hoover himself appears to have accepted the current idea.

Mine valuation is abundantly treated. On page 4 it is pointed out that the treatment on a considerable scale of sufficient test parcels of ore is the ideal method. But such a method consumes time, opens many channels for fraud and is often either prohibitively expensive or physically impossible. Sampling and assaying are therefore the usual and accepted methods for determining the value of standing ore.

After developing this idea, Mr. Hoover makes some most sensible remarks on sampling. "The whole theory of sampling is based on the distribution of metals through the ore body with more or less regularity, so that if small portions, that is samples, be taken from a sufficient number of points, their average will represent fairly closely the unit value of the ore. . . . How frequently samples must be taken, the manner of taking them, and the quantity that constitutes a fair sample, are matters that vary with each mine. So much de-

pends upon the proper performance of this task that it is in fact the most critical feature of mine examination. Ten samples properly taken are more valuable than five hundred slovenly ones. . . . Given a good sampling and a proper assay plan, the valuation of a mine is two-thirds accomplished. It should be an inflexible principle in examinations for purchase that every sample must be taken under the personal supervision of the examining engineer or his trusted assistants."

This is a lengthy quotation; we would like to quote as much more. From the above, however, the reader may observe the colour and tone of the chapter. The section on sampling includes many general hints that are the fruit of ripe and right experience. There follow, next, sections and chapters on calculations of averages and of quantities of ores, classification of ore in sight, extension in depth, depth of exhaustion, recoverable percentage, cost of production, redemption of capital and interest, valuation of mines with little or no ore in sight, valuations on second-hand data, general conduct of examinations, and reports. This concludes that part of the book assigned to the general topic, "Mine Valuation."

It is not seemly to do much more than express our warm approval of the crisp, capable and accurate treatment that the author gives this theme. One digression will, we hope, be pardoned. On page 56 there is a paragraph on mining engineers' reports that is temptingly quotable. It gives clear expression to views that should be more generally held and acted upon. It leaves no room for the mere "opinion" of the genuine engineer, nor for the resounding periods of the pretender. Here is part of it:

"Reports are to be read by the layman, and their first qualities should be simplicity of terms and definiteness of conclusions. . . . The essential facts governing the value of a mine can be expressed on one sheet of paper. It is always desirable, however, that the groundwork data and the manner of their determination should be set out with such detail that any other engineer could come to the same conclusion if he accepted the facts as accurately determined. . . . The wise engineer will put before his clients the scale, the weights, and the conclusion arrived at. The shrewd investor will require to know these of his adviser."

Under "Development of Mines," such matters as entry to the mine, tunnels, location of shafts, speed of sinking, crosscuts, drilling, etc., etc., are given practical consideration. Tabulated working costs are given by way of illustration and numerous diagrams are inserted. "Stoping" has a chapter to itself, as also has "Methods of Supporting Excavation." "Mechanical Equipment" is very fully discussed. Administration, volume of output, the amount of risk in mining investments, are concluding subjects. The last chapter, "The Character, Training and Obligations of the Mining Engineering Profession," will be the text for editorial comment at a later date.

Already Mr. Hoover's new book has had a wide sale. This is not the least acceptable form of approval. The title, "Principles of Mining," is inviting. The book itself is not disappointing. It argues well for the author's literary perspective that he has been able to confine himself to a modest two-hundred-page volume. This means that he has skilfully avoided diffuseness, verbosity, and unprofitableness of that kind. Whether he has or has not been guilty of serious sins of omission we are not prepared to say. He has given the reading public a readable book that should have a large influence for good with engineers and investors alike.

EXCHANGES.

The Mining World, May 15, 1909.—"Tin in the Black Hills of South Dakota" is the title of a paper by Jesse Simmons. In the year 1877 Prof. Richard Pearce recognized cassiterite in black sand sent him by a placer miner operating in the Black Hills. Since that time the possibility of discovering tin in workable quantities has never been absent from the thoughts of Black Hills miners. Many abortive attempts were made to exploit the Black Hills deposits. In 1891 the Harney Peak Co. was organized. After squandering several millions of dollars, this company, which was supplied with a large amount of British capital, was placed in the hands of a receiver, Dr. A. R. Ledoux. Dr. Ledoux has gradually weeded out the worthless claims, and patented the more valuable. Under his careful administration the whole enteprise has been reorganized. A sufficient amount of capital for development and equipment of the mines has been placed in Dr. Ledoux's hands, and, under his direction, work has been commenced again.

The tin veins of the Black Hills are of typical granitic character, undoubtedly of eruptive origin, following closely the bedding planes of the enclosing schists. Usually the veins are lens-shaped, successive lenses occurring upon the line of strike. Many of the veins are of a true vein or tabular form, and can be traced for thousands of feet. They vary greatly in width, sometimes a few inches, and from that up to 100 feet or more. The cassiterite occurs irregularly, and is more evenly distributed through the veins from wall to wall; but apparently lies in zones or sheets that do not appear to have any definite relation to either wall.

The veins are composed of typical gneisen, or granite with the feldspar wanting. They nearly always carry considerable percentages of columbite, tourmaline, and mica.

Mining and Scientific Press, May 15, 1909.—D. H. Stovall contributes to this issue a paper on blasting and preparing the shots. In the opening paragraph he refers to a mine superintendent who has made it a practice to question every miner he employs regarding his familiarity with blasting. This preliminary has helped to do away with many accidents.

Economic Geology, April, 1909.—In an article entitled "Some Features of the Alaskan Tin Deposits," Adolph Knoff touches upon some of the difficulties encountered by those who prospect for that metal in Alaska. The American prospector is not familiar with tin ores and tin mining. As tin-bearing rock occurs throughout the region in a great variety of ways, his perplexity is increased. Many locally occurring minerals are easily confounded with cassiterite, which itself is a difficult mineral to identify with certainty. The following species have been mistaken for cassiterite: garnet, black tourmaline, the porphyritic augite

of some quartz porphyry dikes, pyrozene in contact-metamorphosed limestone, smoky quartz, vesuvianite, magnetite, and wolframite. The belief that stannite is a highly desirable ore of tin has occasioned useless prospecting, certain sulphides, principally pyrrhotite, being mistaken for that mineral. Another widely accepted idea is that tourmaline is an infallible indication of tin ore. This belief has arisen because of the occasional resemblance between the two minerals, and also because of their close association in tin deposits in other countries. But the conclusion is unsafe.

The sedimentary rocks of the tin region comprise chiefly limestones and slates, overlain conformably by a great volume of thin-bedded, dense-textured Ordovician limestone, which generally shows no evidence of metamorphism. Four stocks of quartzose, othoclase granites, of coarsely granular porphyritic habit, are intrusive into the limestones. Greenstones of diabasic character are common in the slate area near York, and are, apparently, intruded sills. The youngest igneous rocks are narrow basalt, dikes are found cutting both limestone and granite.

The granites have invaded the various series of limestones and produced an extensive development of lime-silicate rocks, limited as a rule to a narrow zone encircling the granite masses.

Tin ore occurs in both lode and placer form. Cassiterite is the only mineral that is likely to prove of economic value, stannite and the two new magnesian iron-tin borates being probably not worth exploitation. Cassiterite occurs in Seward Peninsula in a variety of ways, only two of which are standard modes of occurrence. These are, first, in tourmalinized margins of granite masses and granitic dikes, and, second, in quartz veins cutting granite and accompanied by impregnation of the wall rock.

Mines and Minerals, May, 1909.—The leading article in this number of Mines and Minerals is a description of the equipment and work of the Technical Branch of the U. S. Geological Survey. The Fuel Division has now been moved to Pittsburgh, where investigation is being conducted in the direction of fuel economy, producer gas, coking, washing, briquetting, and other lines. The inspection of fuels is another important branch. Mine-accident and mine-waste investigations are given special attention. The mine-explosion, research work and rescue-apparatus training are directed by Mr. J. W. Paul. Two or more sets of each kind of rescue apparatus have been purchased and are in use at the Pittsburgh station. The object of this installation is entirely educational. From two to six men are always in training under Mr. Paul. Eight hours per day are devoted to each man's instruction for two weeks. The men are selected by the coal companies, and are sent to the station and maintained there at the expense of the coal companies. After completing their period of training they are expected to return to their places of work and there act as leaders in imparting instruction in rescue-work.

PERSONAL AND GENERAL.

Mr. O. N. Scott has returned to Toronto after an extended professional visit to Cobalt.

Mr. R. Livingstone, late Assistant Mines Inspector of Alberta, has been appointed Chief Inspector in place of Mr. Norman Fraser, resigned.

Mr. F. A. Ross, manager of the Daly Reduction Co., Hedley, B.C., has gone to New York on a business visit.

Mr. Frank Ross, of Quebec, and Mr. W. D. Ross, of Toronto, have been elected directors of the Nova Scotia Steel Company.

Mr. J. W. Astley, of Victoria, B.C., is on a trip to Cobalt and Gowganda, with a view to following professional work there.

Prof. William Nicol, of the School of Mining, Kingston, has offered to give $40,000 for the erection of a new mineralogy building.

Capt. W. H. Jeffrey, of the McKinley-Darragh mine, Cobalt, is taking a two weeks' business trip to Toronto, Cleveland and Cincinnati.

Dr. Milton Hersey, of Montreal, has given $10,000 to the metallurgical department of the faculty of Applied Science of McGill University.

Mr. Norman Fraser, formerly Inspector of Mines of Alberta, has been appointed superintendent of the Crow's Nest Pass Coal Company's Michel colliery.

Mr. J. B. Tyrrell has moved his office from 9 Toronto Street to lighter and more commodious rooms in the Confederation Life Building, Richmond Street East, Toronto.

Mr. Rex Taylor has been appointed manager of the Right of Way mine, succeeding Mr. Joseph Houston, who resigned recently to take charge of the claims owned by Messrs. Sifton and O'Brien.

Mr. A. R. Wilson has resigned as superintendent for the Maple Leaf Coal Company, Frank, Alta., having been appointed a coal mine inspector by the Government of Alberta for the district east of Lundbrek.

Prof. Emmons, of Boston, Mass., one of the most distinguished members of the United States Geological Survey, paid a visit to Cobalt recently, accompanied by Mr. Benj. Lawrence, consulting engineer of the Kerr Lake mine.

Messrs. R. M. Atwater, Jr., Robert Linton and R. de Sallier have been examining the Dominion Copper Company's mining properties in the Boundary district for the protective committee of dissenting stock and bond holders, who are opposed to the reorganization scheme of the majority.

Industrial Notes.

Westinghouse Distributing Transformers. Circular No. 1502, April, 1909. Westinghouse Electric and Manufacturing Company, Pittsburgh, Pa.

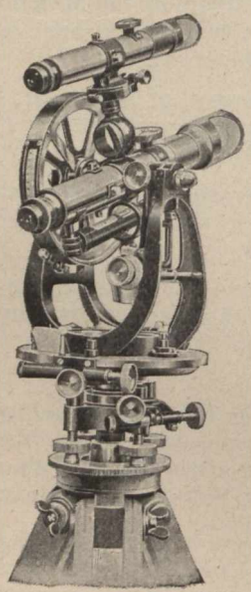
All of the Westinghouse publications are of a high order of merit. This one is no exception.

Electrical energy for light and power service is supplied to the customer at several nominal voltages. Different distributing voltages create a demand for transformers of various transforming ratios. Sometimes customers are found near high voltage feeder lines exceeding 16,500 volts. In such cases it pays to install a single transformer of suitable voltage ratio.

All distributing transformers must operate under very severe conditions. Therefore the design and construction are vital considerations. The catalogue before us throws ample light upon these subjects.

The circular contains much valuable information on alternating current distribution covering transformers, lightning arresters, insulators, cross arms, etc. Considerable space is devoted to underground and overhead construction applicable to congested and scattered districts. There is also given information on potential regulating systems. The circular contains 52 pages of information of value to any central station man or any other connected in any with the distribution of power by alternating current lines.

A NEW MINING THEODOLITE.



Ainsworth's New Theodolite.

Wm. Ainsworth & Sons, Denver, Colorado, U.S.A., have just placed on the market a new theodolite for mountain and mining work, as shown in the illustration herewith.

By the use of the hardest bronze alloys the weight of this instrument has been reduced to a minimum without sacrificing rigidity, and the U or theodolite standard, the merits of which are now well recognized, is so designed as to admit of placing a 2¼ inch compass in the centre, which is sufficient for checking.

It has a 4½ inch limb and vertical circle with edge graduation, 8-inch 20-power main telescrope, 7-inch 18-power auxiliary telescope with counterweight that may be used either as a top or side telescope, 4-inch 30-seconds telescope level, stadia, gradienter, magnetic variation circle, 4-screw leveling head and extension tripod. The instrument only, weighing but nine pounds, complete with all attachments.

The limb verniers are placed at 30 degrees with the line of sight, which together with the edge graduation on the vertical circle enables an operator to read both vertical and horizontal angles from the one position.

The telescope tubes are finished in an improved manner, insuring perfect collimation for all distances. Only the highest grade lenses ground according to the latest formula, are used. The telescope axis has the usual grooved bearings common to all this firm's instruments, the merits of which are now well recognized.

The leveling head is of improved design and accurately constructed so that it cannot be cramped in any position, which greatly reduces the wear on the leveling screws and renders it unnecessary to loosen all of the screws when leveling up. The plumb centre has a movement of half an inch to permit locating plumb bob over point.

The graduations are, with the exception of the compass circle, on solid silver and produced in their new 30-inch automatic dividing engine, which machine, it is claimed, is capable of producing automatically circles accurate to within one second of arc.

The instrument is fully described in their catalogue, BX-16, just issued.

SPECIAL CORRESPONDENCE

NOVA SCOTIA.

Glace Bay.—Now that the shipping season is fairly under way and all the collieries are working steadily, the unrest among the mining population which has been caused by the active propaganda of the U. M. W. A. has largely disappeared. The mines are working full time and obtaining good outputs, although the production remains below that of last year. The Dominion Coal Company's output to the end of May, 1908, was 1,585,364 tons, whereas to the end of May this year it will not exceed 1,260,000 tons, a decrease over the period of approximately 325,000 tons.

It was stated by the U. M. W. A. leaders that President Tom Lewis would visit Cape Breton somewhere around the 24th to review the situation and strengthen the hands of the propagandists, and preparations were being made to impress the public by means of a demonstration and procession of the U. M. W. A. following. It is now stated that Mr. Lewis is not likely to visit Cape Breton in the near future. Indeed, it is quite possible that the P. W. A. may take the aggressive and invade the territory of the U. M. W. A. A good many of the miners in the West are more than a little disgusted with the manner in which their affairs have been run by the ocers of the U. M. W. A., and the miners at Crow's Nest Pass, for example, do not view with overmuch relish the exarordinary levies that are being made upon them to support the useless strike that is being carried on by Mr. Sherman. The question of joining the Western Federation of Labour has been discussed among these men, but a good many of them come from Nova Scotia, and they are wishful to affiliate with the Provincial Workmen's Association, or at least to model their unionism upon this pattern. It would almost seem as if the time were ripe for Canadian miners to follow the national lead and assert their unity as a body of specialized workers forming part of the Canadian nation. As we have stated before, the U. M. W. A. is a body composed largely of reactionaries, and is many years behind the spirit of the times in Canada. The Canadian legislator does not seek the advice of Washington, nor need the Canadian miner seek the leadership of Indianapolis. We think that everything in Canada should partake of the national spirit, and labour unionism is not an exception to the rule.

The New Mines of the Dominion Coal Co.—The Dominion Coal Company are now very actively proceeding with the opening up of their large coalfield in the Lingan-Victoria Basin.

Dominion No. 12 is now to be classed as a producer, and within two months will be putting out between 400 and 500 tons a day. The new bankhead is all completed and the machinery has had several trial spins. All the colliery buildings are complete, and the underground development is well advanced. This mine is to be worked by the "room and pillar" system, the coal being handled to the levels by back-balances, or gravity haulages. The pitch of the seams is greater than on the Glace Bay side, and it is probable that this system will be followed at all the projected mines in the Lingan Basin. One effect will be to lessen the number of horses required.

Dominion No. 14 is now at about the same stage of development that No. 12 was in at this time last year. The construction of the permanent bankhead is proceeding, and it is anticipated that No. 14 will become a producer in the summer of 1910.

The site of No. 15 is now fixed, and the work of developing the slopes will be commenced this month. The temporary plant will shortly be moved from No. 14 to No. 15, and it is expected this mine will be in a position to commence permanent construction in the spring of 1910.

The McGill Summer School of Mining.—About 22 students from the Mining Department of McGill University have visited the Glace Bay mines during the week ending the 15th, under the guidance of Dr. Porter. The young men were distributed around the collieries, and must have greatly profited by what they saw. It is not often that a mining student has the opportunity of seeing an entirely new group of collieries under construction, and there are a good many features of special interest around the Glace Bay mines.

Steel and Coal.—The Dominion Coal Company's accountants are now examining into the unpaid portion of the claim of the Dominion Iron & Steel Company under the recent decision of the Court of Appeal, with a view to the final settlement. Under the arrangement made between the two companies the figures of the claim are subject to confirmation by actual examination of the Steel Company's book and vouchers.

Under the much-invoked contract the price to be paid by the Steel Company to the Coal Company for coal is subject to revision at the end of each five year period. The first revision will fall due on the 1st of July next. The cost of mining, owing to increased wages and the enhanced prices of materials, has very largely increased in recent years, and the effect of the contract provisions will be to make the price of coal to the Steel Company for the ensuing quinquennial period higher than the price which was agreed upon for the first five years of the contract.

The Nova Scotia S. & C. Co.—It is understood the executive officers of the Nova Scotia Steel & Coal Company who have been in London for some time in connection with the raising of new capital, have been successful in their mission, and that the new financial scheme will be placed before the shareholders on the return of these gentlemen from England.

The Department of Labour have not as yet granted the request of the U. M. W. A. for a Board of Conciliation to adjust alleged grievances at the No. 3 Colliery of the N. S. Steel Co. It is understood the department awaited the return of the Steel Company's directors before granting the application. One of the grievances urged by the U. M. W. A. is the introduction of safety lamps without compensation to the miner for their use. It would seem more in order to ask for a commission in lunacy to inquire into the sanity of men who urge the introduction of safety lamps as a grievance. If the U. M. W. A., after much searching, can find no greater injustice on the part of the N. S. Steel Company than the introduction of safety lamps in the place of open lights, it looks as if there was really not very much wrong at Sydney Mines.

The general introduction of safety lamps into Nova Scotian mines is a very pleasing sign of the times. There is now not a single colliery of any importance in Nova Scotia in which the use of naked lights is allowed, and we hope before long to see safety lamps made compulsory in all coal mines in Nova Scotia, no matter what the conditions. It is further to be hoped that naked lights in coal mines will be prohibited throughout the entire Dominion. It is better to be sure than sorry.

QUEBEC.

A plant to test the value of placer gold deposits in the body of the stream near Marbleton is reported about to be installed, and mining experts have been over the ground and further developments are expected.

The D'Israeli Asbestos Mining Company have broken ground and are about erecting a plant a short distance from D'Israeli station, including siding to their works.

Chrome mining at Lakeside, near Black Lake, shows a lull at the present time, and the outlook not as extensive as formerly, but is understood that improved mining operations will be established there soon.

The Robertson Asbestos Company, at Robertson Station, have built their mill, and are now installing plant. The Shawinigan Electric Power Co. will supply the power.

The Shawinigan Electric Power Co. have extended their power to East Broughton and established a distributing station there.

At East Broughton the new mill of the Frontenac Asbestos Co. is nearing completion, and the mines and mills are expected to be in full operation about the middle of the summer.

The Broughton Asbestos Fibre Co. are now working, and the Eastern Townships Co. and Boston Asbestos Co. will commence operations about the first of June.

The Quebec Asbestos Co. have sold their mills and plant to the Ling Asbestos Co. of New York. The property is being refitted with an electric plant, the pits have all been cleaned out, and operations will be commenced in a few days.

Rich deposits of copper ore are reported to have been found on the Chaudiere Valley of the Quebec Central Railway. Mr. Pennington, M.L.A., is president of the company that is organized for the working of this property.

The Quebec Central Railway are now building 30 miles of New line from St. George, Beauce, following the River Famine to the watershed of the St. John River close to the boundary of the State of Maine. It will be remembered that considerable quantities of gold have been taken out of the Famine River in years past, and it may be that further opertaions in placer mining along the Famine Valley will be resumed owing to the greater facilities which will be found by this line.

Reports of asbestos deposits come from the Township of Panet, County of L'Islet. This will be on the proposed further extension of the Quebec Central Chaudiere Valley Line in the direction of the Temiscouata Railway.

ONTARIO.

Cobalt.—One of the most interesting sections of this camp is in the locality of Peterson Lake, where a number of companies are operating claims leased from the Peterson Lake Mining Company. This company's holdings consist of 208 acres, located under Peterson Lake, and having a narrow strip of land, originally about 33 feet in width above high water mark. The subsequent lowering of the waters of the lake materially increased the land area. By the terms of the contract with the holding company, the leases are to run five years, and during that period the company receives 25 per cent. of the gross value of the ore mined. The leases are also conditional upon the proper develop-

ment of the different properties. This insures a systematic exploration for the valuable minerals. Among the most important of the operating companies are the Brydge Syndicate, the Cobalt Leases, the Little Nipissing, the Gould Consolidated and the Kerrey Mining Co. These companies are rapidly developing their holdings in order to get the greatest amount of ore possible before the expiration of the leases, and some of them have large plants in operation.

Negotiations have now been concluded whereby the Argentum Mines Company, Ltd., a flotation of the Nevins interests, which have control of the Cobalt Central, will assist in the development of the Foster, twenty-five thousand dollars having been pledged to carry on the development work on the latter property. Arrangements have also been made for the treatment of the low-grade ores and dump of the Foster in the mill of the Cobalt Central. A flat treatment rate per ton will be charged, and the resulting profits will be equally divided between the Argentum and Foster Companies. The arrangements also include a five-year lease on the Foster.

The Warner property, a 20-acre claim located north of the Kerr Lake, is to commence operations, and in a short time a force of men will start surface prospecting. The property is controlled by a Montreal syndicate, and will be known as the Imperial Crown Mines, Limited.

The Crown Reserve have completed the sinking of a 100-foot winze from the main vein at the 100-foot level, and are now drifting in both directions. This is now the deepest working of the mine, practically all the other workings being at a depth of 100 feet. At the lower level the vein shows good widths and values. The No. 1. cross-cut, in which six high-grade veins were located, has been driven to the other side of the lake, a distance of over 500 feet. The No. 2 cross-cut, which is being driven toward the eastern boundary, is in over 450 feet, and has already cut several veins. On one of these a winze has been sunk 25 feet, and will be continued 75 feet more, at which depth drifts and cross-cuts will be run. A new bunkhouse sufficiently large to accommodate 100 men is being erected. It is generally understood in the camp that a higher output will be maintained by the Crown Reserve in the future. A total force of 155 men is employed on the property.

Mr. H. D. Symmes, of the Hydraulic Power Company, has purchased four more machine drills for the work at Ragged Chutes. Operations will be pushed as rapidly as possible in order than the plant may soon be ready to supply power. The contract for hauling the pipe has been placed, and it is now being distributed over the line, and is being welded.

The directors of the Eastern Townships Mine, which was formerly known as the Old Chap, located near the head of Cross Lake, have decided to resume operations on the property. A small steam plant will be installed to do the preliminary development work. Mr. Brown, of the Silver Cross, has been appointed consulting engineer.

A new vein of high grade ore has recently been located on the Drummond property by the diamond drill. Several holes at different angles have been bored to prove the vein, and in every case high values were encountered. The vein is about six inches wide.

A large number of the mines have resorted to the use of the diamond drill for prospecting, and at the present time there are seventeen drills working in the camp. A total average of about six thousand feet a month is being bored.

A new strike has been made at the King Edward Mine, the ore body being encountered at the seventy-foot level about four hundred feet west of the shaft. The vein matter consists of galena, bornite, calcite and native silver.

The Coniagas have been carrying on work for some time in their smelter at Thorold, perfecting their system of ore treatment, and at last have their process in such a satisfactory working condition that they will soon be in the market for the smelting of Cobalt ores in competition with the other smelters. At the mine everything is in good shape, the only drawback being that the mill is hardly of sufficient capacity to handle the ore that is taken from the various workings. The veins are narrow but rich and the values are scattered over a good width, so much so that in one place they are stoping thirty feet wide. Very little stoping is done, most of the ore coming from development work. Of the various workings of the mine, having a total length of over seven thousand feet, there is only one that is unproductive, and it is thought that if this working is driven a few feet further ore will be encountered. The ore reserves of the Coniagas are very large, being exceeded, perhaps, by only two other mines in the camp. The new two hundred and fifty horsepower gas producer, installed a short time ago, is giving satisfaction.

New discoveries of high grade veins are reported on the Bonsall and Big 6 claims in the Miller Lake district.

While trenching on the Farah property a new vein of cobalt and native silver was discovered. The vein is about one hundred feet from the No. 1 shaft, which is now down in the neighborhood of one hundred feet. A crosscut to tap the ore body at this level will be started almost immediately. About fifty men are employed at the present time and the work is being vigorously pushed.

The Council of the Township of Coleman have voted a large sum of money to be spent in improving the roads during the coming summer. The principal work will consist of grading and putting in shape the road through the Nipissing property on the east side of Cobalt Lake, and as far out as the Savage Mine. Considerable work will also be done on several others of the more travelled roads. It would meet with universal favor if the T. & N. O. Railway or the town of Cobalt would pay some attention to the road around the railway This section is a disgrace, there being easily nine inches of mud, and the immense number of teams hauling freight and ore keep the spot in little better condition than a quagmire.

At the Cobalt Lake development is confined to the workings from the No. 6 shaft, where there are now only two drills at work. A winze is being sunk from the crosscut and when a depth of fifty feet is reached the crosscut will be continued from that level. It is hoped that one of the McKinley-Darragh veins that showed high silver values at the two hundred foot level will be encountered in the working.

The development of the Lawson property by the La Rose is being watched with great interest, and there is much speculation as to whether or not the famous "silver sidewalk" will show corresponding values at depth. The property is being developed from the old shaft sunk by the Silver Leaf and a drift is being run on the vein at the one hundred and ten foot level. Running at right angles to the famous vein and to the south of the roadway a new vein equally rich was discovered while trenching. The new find was traced for some distance and promises to become a good producer.

The Little Nipissing have struck high-grade ore in their main vein on the Peterson Lake Lease, at the one hundred and sixty foot level. Previous to this considerable drafting had been done but the ore encountered was of low grade.

Another deal for properties in South Lorraine has been put through whereby a Haileybury syndicate has purchased four forty-acre lots known as the Finnessey claims. A force of men will be started to work in the course of a few weeks.

A contract has been let by the Cochrane mine to sink the shaft another 75 feet from the 135-foot level. At a depth of 145 feet in the shaft the diabase rock underlying the Keewatin was located.

The development of the veins in the Huronian slates underlying the diabase in the Big Pete mine of the Cobalt Central

gives the most promising showings so far found on the property.

Mr. R. Taylor, formerly of the Kerr Lake, has been appointed manager of the Right of Way, in place of Mr. J. Houston, who has resigned to take charge of the Bonsall claim, owned by O'Brien and Sifton. Mr. Houston will be retained by the Right of Way in an advisory capacity.

The appointment of Mr. Chas. Watson as superintendent of the Chambers-Ferland has been made permanent. Mr. Watson was formerly with the Nipissing, and his duties at that mine will be taken over by Mr. H. McKee.

According to present indications, the river navigation between Elk Lake and Latchford will be open about May 17th. The Upper Ontario Steamboat Company will operate seven passenger boats and also a number of scows to handle the freight. The first trip of the season was made on the 10th, when a boat went as far as Pork Rapids. Later the route was extended to Mountain Chutes. On each trip the boats were crowded with prospectors and their canoes. When the regular service is installed two return trips daily will be made between the two towns.

The shaft on the property of the White Syndicate, formerly known as the Canadian Ores, Limited, is down 145 feet, and from the bottom a drift has been started on a calcite vein carrying silver values. On this vein this drift will be driven a distance of 200 feet, when it is expected that the main vein of the property will be encountered. Four hundred sacks of ore have been taken from an open cut on this vein. A force of 35 men is at work on the property.

The Right of Way has declared a 10 per cent. bonus, to be paid on the 20th of May. Up to the present for this year the mine has produced 700,000 ounces of silver, and from present indications the company will be able to continue their disembursements to the stockholders at the rate of 5 per cent. per month.

On May 5th the first shipment of gold ore from Munroe Township was made by the Guelph Mining Syndicate. The shipment consists of four tons, and was sent to the Kingston School of Mines for a sample run. Recent developments in this district have added greatly to its possibilities of becoming a gold producer. The veins as a whole are small, but carry high values.

Work is under way on the erection of a new concentrating mill at the Colonial Mine.

Mr. John Harris has severed his connection with the Victoria mine.

Following the great rush of the past winter, the mines of Gowganda are settling down to serious work. The most essential need at the present time is a railroad, and until this is built the camp cannot make very great headway. So far the deepest working is on the Boyd Gordon, whose shaft is down fifty feet. One hundred bags of high-grade ore have been taken from the working. Two shafts are being sunk on the Mann claim, one being down about 25 feet, and the other 15 feet. The Bartlett has some of the most promising showings in the new district, but so far their energies have been directed towards the installation of the machinery, which they expect to have in running order about June 15th.

An important strike was made on the 200-foot level of the Beaver Mine on May 15th. A cross-cut was run from the main shaft for a distance of 50 feet, when a large quartz and calcite vein, with no silver, was encountered. The vein was drifted on, with the result that high silver values were found. The quartz in the vein has been replaced by calcite, and there is no smaltite. The vein is said to be nearly ten inches wide. At a distance of 234 feet east of the shaft a diamond drill is working on the 200-foot level. A hole at an angle of 45 degrees is being bored, and it is expected that when in a distance of about 125 feet another vein showing on the surface will be encountered.

BRITISH COLUMBIA.

Rossland.—In Le Roi Mining Company affairs there is nothing definite to be said yet, but it is generally understood that Mr. A. J. McMillan, the managing director, is meeting with some considerable success in London in the arrangement of finances with which to carry out the proposed big plan of development of the company's property. It will certainly be gratifying to see the Le Roi mine undergoing a plan of thorough development from the 1,650-foot level downward, and it is to be hoped that the beginning of the work will not be deferred. There is no good reason why the smelter at Northport cannot be run at a profit, and this plant will undoubtedly be a paying enterprise under the proposed new order of things. The prime requisite, of course, is a supply of ore (self-fluxing, preferably) that will permit of operation at full capacity. Part of the plan now being worked on, along lines followed by most English companies, will be in the direction of acquiring new mines than may be developed to a profit earning point by the time the older mines are worked out. The near future will very likely witness important developments in Le Roi matters.

It is pleasing to note that the ore shipments from this camp are averaging from 4,500 to 5,000 tons per week, even though the Le Roi, which has had to give place to the Centre Star group as "premier mine of the camp," is closed down. The property of the Consolidated Company is shipping over 4,000 tons per week: the Le Roi 2, Ltd., nearly 500 tons, while during the week ending May 8, 1909, the O. K. lessees shipped 10 tons, and the I. X. L. 4 tons of high-grade gold ore. It is expected shipments will be resumed from the Blue Bird in a few weeks. One the Blue Bird a drift, from 35 feet depth in the shaft, has been driven 40 feet west and 20 feet east in galena, the ledge appearing from one to two feet wide and assaying about $100 pr ton. On the Hattie Brown claim, adjoining, the shaft is being rapidly sunk on the main ledge, assays at this time, giving above $20 per ton in silver, gold and lead. The Richmond claim, which is also on this galena vein is being worked by a small force. The Hattie Brown and Richmond have been bonded by New York capitalists, who are prepared to spend a goodly sum on proper development.

The partial success that South Belt mines have enjoyed recently would seem to assist in bearing out the statement of Clarence King and other prominent mining engineers, that the largest and richest mineral deposits in Rossland have not been uncovered yet, and would possibly be found in the valley of Trail Creek or in that section of the camp known as the "South Belt."

The rich ore shoot on the 900-foot level of the War Eagle has now been opened up on the 1,000-foot level, and shows up 400 feet long, and averaging 50 feet in width. Several thousand tons of ore that carried an average of $30 in gold have already been taken from this lode, and it is estimated there is a million dollars' worth of ore yet in the stoping area.

Granby interests have not lost hope in this locality, despite the apparently poor results obtained at the Giant-California, and the Mascot claim has now been secured, and development work will immediately be commenced. If results of initial work warrant, as much as $350,000 is available for development.

The Granby people are not making much fuss about what they are doing in an expansive way, but when one realizes they have interested themselves in promising mines in the Similkameen, Moresby Ielands, Rossland, Washington, etc., and that these mines are mostly big groups of rich copper claims, then it looks as though some of the men "in touch" thought there was a future for the red metal.

Phoenix District.—The continued strike of coal mines in Coleman and other points in Alberta has been the cause of a shutdown of the British Columbia Copper Company's mines and

smelter. Several hundred men are thus thrown out of employment, only a few miners being kept at work on special development. Shutdowns of this kind are expensive affairs for big mining and smelting companies. This one will probably cost the B. C. Copper Co. between $9,000 and $10,000 per month, to cover fixed charges, maintenance, superintendence, etc. This same rule applies to the Dominion Copper Co., Le Roi Mining Co. and other presently inoperative mines, to a more or less degree.

The development work that the B. C. Copper Co. is doing on the Athelstan Fraction and Bay mineral claims is returning very satisfactory results. A fine body of ore is ready for stoping in No. 2 tunnel, and there is a big tonnage of shipping ore in dump that will be sent out as soon as the railway spur is built in.

The Snowshoe is shipping from 2,00 to 2,500 tons per week to the Consolidated smelter at Trail. The strike situation will not affect the Consolidated M. & S. Co. of Canada, as they have several months' coke supply in storage, and get most of their fuel at Fernie, where there is no trouble. This same applies to the Granby Consolidated Company.

Dominion Copper affairs will very likely be precipitated when the property of the company is put up for sale at Vancouver on May 28. Both the Reorganization and Protective Committees claim to have the strongest backing, the former maintaining that $518,000 out of the $800,000 outstanding bonds have been deposited with them.

Winnipeg capitalists have made the first payment under the bond they have on the Bruce mine, near Midway. Development is going ahead with good results, and present indications show the proximity of a big body of gold-copper ore.

Apropos of a change of policy on the part of the Daly Reduction Co., the Nickel Plate and Sunnyside properties have been undergoing a thorough sampling, the breaking of ore at times requiring a force of eighteen or twenty men. Two diamond drills are also at work. Walter Bean, of Denver, and G. P. Merrill are superintending the work in the interests of their principals.

The shaft at the Golden Zone is going down about 12 feet per week. It is now down 95 feet, and some of the best ore ever found on the property has been taken out at this depth.

Vancouver.—The Japanese operators of the Ikeda mine, on Moresby Island, have made a strike of 25 feet of copper ore in one of the deep tunnels. Recent assays show the ore to carry 13 oz. copper, silver 7 oz., gold $8.50. The Japanese are, in this instance, proving themselves mining men of no mean ability, but one can expect this from men who work low-grade copper deposits in their native land by methods now considered crude, and they make even these mines pay.

As hinted at above, Granby interests have bonded the Contact group on Tasso Harbour, Moresby Island. The property is to be developed as rapidly as possible.

Mining men from Duluth, Minni., have bonded a rich group of copper claims at Tasso Harbour, paying $400,000 for the property. T. Taylor and F. C. Elliott, of Revelstoke, were the sellers. The purchasers, it is said, are men in close touch with the Steel Corporation. Development of the property will commence this season.

GENERAL MINING NEWS.

ONTARIO.

Cobalt.—On the T. & H. B. there are sixty men and six drills working. One of the drills is being operated in Trethewey territory on the third level. One drill is now operating on the first level, but the main activity is on the second level on the Lavel and Rice veins. The Rice drift has an ore shoot of 135 feet, and work is still proceeding on it. The ore shoot on the Lavel is about 165 feet long on the third level. There is at present about 7,000 tons of concentrating ore on the dump.

Drifting has been started from the 200-foot level of the main Crown Reserve vein. The drift is being driven east from the bottom of the old open-cut shaft, and the vein at this depth runs from six to eight inches of ore.

On the Nipissing the drifts on both the Kendall vein and vein 82 have reached the McKinley line. The second level of the Kendall is at a depth of 145 feet, and drifting has been done for 350 feet. The Fourth of July shaft is now down 200 feet, and stations are being cut on it. Shaft 64 has been sunk 200 feet with drifts at the 80 and 175 foot levels.

A new strike was recently made while drifting on the No. 4 vein of the King Edward mine. The new ore body is about four inches wide, containing native silver, with galena and bornite.

On the McDonald vein of the Kerr Lake a winze has been sunk 32 feet from the 150-foot level. The pay chute on No. 7 has been traced a distance of 600 feet, and the ore averages 3,000 ounces to the ton.

The La Rose has begun developments on the Lawson. The old Silver Leaf shaft is down less than 100 feet, and driving has been already started at the 90-foot level on a stringer that is expected to lead to the main Lawson vein. At the La Rose mine raises are being made on the main vein. Good ore is steadily being taken out of No. 2 and 3 raises.

The Pontiac have struck the vein of their 75-foot level, which they found with such high values on the surface. It is about two feet wide at the point exposed in the drift, and though it does not run high in silver values, it looks very promising. The shaft of the Pontiac mine is down 75 feet.

A comparison of the Cobalt shipments by months for the first four months of each of the three years, 1906-7-8, with those of 1909, shows that the output is steadily increasing in a substantial way.

1906—January, 406.52 tons; February, 119.14 tons; March, 378.3O; April, 137.20. Total—1,041.16 tons.

1907—January, 989.13 tons; February, 900.83 tons; March, 1,027.59 tons; April, 583.78 tons. Total, 3,501.33 tons.

1908—January, 1,481.27 tons; February, 1,184.53 tons; March, 1,815.27; April, 1,312.00. Total, 5,792.97 tons.

1909—January, 2,375.13 tons; February, 2,103.85; March, 2,561.78; April, 2,495.78. Total, 9,536.35 tons.

About 240 feet of drifting has been done on the 100-foot and about 120 feet on the 200-foot level of the Badger mine. At the bottom of the shaft the vein shows about four inches wide of calcite and silver, from which some high assays have been taken.

At the 160-foot level of the main vein of the Little Nipissing mine, on the Peterson Lake lease, a 2-inch vein, which has been running fairly lean for some distance, has now come in with high values in native silver.

The new vein of the Lawson mine of the La Rose Consolidated has been stripped for 28 feet. The vein is six inches wide, and shows considerable native silver.

A rich strike was made at the Beaver mine on May 14th. The strike was made at the 200-foot level of the main shaft, 50 feet on the east drift. The vein is from 10 to 12 inches wide, and carries considerable silver values.

The Argentum Mines, Limited, have taken over the Foster mine under a five-year operating contract. The new company has perfected an arrangement with the Cobalt Central Company whereby the Foster ores will be handled at the Cobalt Central mill.

Elk Lake.—The Otisse orehouse is now about filled with ore, and as soon as navigation opens a shipment will be made so as to give room for the ore now being sacked. The ore now coming up from both shafts is being sorted and sacked, and the quantity is accumulating rapidly.

The Moose Horn was closed down for about ten days on account of the sinking of the foundation of one of the boilers, and the consequent breaking of one of the flanges. The damage has been repaired, and the mine is again running. The shaft is now down 125 feet, at which depth an aplite vein six inches wide has been opened up.

The Otisse Currie intends to start sinking another shaft on the northeast corner of their property. The present shaft is to be continued to the 250-foot level, with cross-cuts at the 150 and 250-foot levels.

A corduroy road is being laid from Elk Lake to Gowganda, so there will be no necessity for prospectors to follow the long canoe route if they wish to make a quick and light trip.

ALBERTA.

Coleman.—The striking coal miners have applied for a Board of Arbitration under the Lemieux Act. This step is rather unexpected, as Sherman, the leader of the strikers, has personally condemned the Lemieux Act. The action of the miners is said to be largely due to the attitude of the International officers. Frank Sherman has been named as the representative of the men on the board.

BRITISH COLUMBIA.

Rossland.—There already has been between 2,000 and 3,000 tons of ore extracted from the big ore shoot on the ninth level of the War Eagle. It is about 400 feet long and 50 feet wide, and the ore runs from $20 to $30 per ton. A downward continuation of this ore shoot has been located on the tenth level, but its dimensions have not yet been determined.

Development of the Blue Bird continues to show up considerable ore. Drifts have been run from the shaft at a depth of 35 feet both east and west. The west drift is 40 feet in length, and the east is 20 feet. Both are in galena ore from a foot to two feet in width. Another ledge, 50 feet away from the main lead, has been stripped and opened by shallow shafts. It is from two to four feet wide, and carries galena ore of a good grade.

Greenwood.—The Board of Conciliation and Arbitration to inquire into the differences between the B. C. Copper Co. and its employees is meeting daily. Judge Wilson, of Cranbrook, is chairman of the board. E. G. Warren in representing the company, and Geo. Heatherton the union. The investigation will probably last a couple of weeks.

Phoenix.—It is the intention of the Granby Company to resume shipments from the Gold Drop about the middle of May.

The work of enlarging Nos. 3 and 4 furnaces at the Granby is being rushed, and they are expected to be completed about the middle of May. This will bring the smelting capacity up to 400 tons daily.

Vancouver.—The properties of the Dominion Copper Company, in liquidation, will be disposed of by public auction in Vancouver on the 28th of May, subject to reserve bids fixed by the judge in chambers, in two lots. Lot "A" will consist of all the company's property, real and personal, except that included in lot "B." Lot "B" will consist chiefly of supplies on hand for the mines and smelter and the benefit of a contract with the C. P. R. respecting freight rates.

MINING NEWS OF THE WORLD.

GREAT BRITAIN.

Trouble is brewing in the Scotch coal trade. The masters demand that miners' wages be reduced to 5s. 6d. per day, whilst the men hold that the minimum must not go below 6s., and as the agreement hitherto existing between the masters and men has expired, a settlement may not be secured without strife.

The coming into effect on July 1st next of the Mines Eight Hours Act will terminate the present agreement in South Wales, which under ordinary circumstances would continue until March 31st, 1910. So far, all efforts to reach a new agreement have failed, and trouble is expected.

The production of pig iron in the United Kingdom last year was the smallest in sixteen years. The output last year amounted to 9,289,840 tons, as compared with 9,923,856 tons in 1907, and 10,149,388 tons in 1906. The decrease of 134,016 tons thus shown is the greatest recorded in any one year since 1892.

BELGIUM.

The Cockerill Company, who own extensive steel works in Liege, Belgium, are installing an electric furnace. The furnace is built on the Girod system, with one electrode, and has a charging capacity of from two to three tons of steel.

RUSSIA.

The Mining Department is undertaking the revision of the general statutes of the gold industry. The present law, which has been in operation since 1903, is so obscure in parts that it has given rise to many misunderstandings in practice.

A special council has been opened in the Mining Department to consider the proposals to regulate the platinum industry in Russia.

AUSTRALASIA.

The Federal High Court has sustained the principal factors of the Federal Arbitration award in the Broken Hill Proprietary Company's appeal relative to the dispute with the employees at Port Pirie and Broken Hill, but has found against the award on the question of granting a 48-hour week at Port Pirie. The company will resume concentrating and smelting

ore at Broken Hill and Port Pirie until the completion of existing contracts.

All the leading mining companies in the silver-lead district of Western Tasmania, according to Consul Henry D. Baker, showed a diminution in their earnings during 1908, with the exception of several companies engaged in mining coal; this was the only mineral product whose value showed an increase over that of 1907.

SOUTH AFRICA.

Work in some of the outlying districts of the Traansvaal has been much retarded this year on account of severe outbreaks of malarial fever, due, no doubt, in a large measure to the exceptionally heavy rains that have fallen, resulting in the creation of a large amount of decaying vegetable matter and other conditions generally associated with malaria.

Rand milling profits fell below 30 shillings per ton in March, or nearly nine shillings below the average for 1904, since which time there has been an almost continuous decrease.

A syndicate has been formed to work large iron ore deposits in the neighborhood of Alberstone, about thirty miles from Durban, Natal. The deposits consist of brown and purple hematites and limonite. An ample supply of limestone is said to be available.

UNITED STATES.

The legislature of Washington has appropriated $50,000 for the State Geological Survey for the biennial period, 1909-10. Of this amount $30,000 will be used for co-operative mapping and hydrographic investigations, and $20,000 for geologic investigations.

The miners of the Pennsylvania anthracite region have finally decided to renew the old agreement with the operators for another three years.

After a year or more of experimenting, those in charge of the electric iron ore smelter at Heroult, Cal., consider that they have made a commercial success of the project. The large new furnace was tapped for the first time last week. It is expected that the furnace will turn out about 200 tons of commercial pig iron daily.

The United States Senate has adopted the recommendation of the Committee on Finance for a duty of 25 cents per ton on iron ore. The House had placed that article on the free list, while the present law levies a duty on it of 40 cents per ton.

MEXICO.

The projected new mining law will probably not be introduced at the present session of the Mexican Congress. Inasmuch as the law is intended to be a codification of all existing laws and decrees, it is exceedingly broad in its scope, and touches on many points that are naturally open for discussion. It is said that the delay in enacting the law is due to the necessity of much consideration of these new points and phases.

COMPANY NOTES.

APRIL STATEMENT OF LA ROSE.

The preliminary statement of production and earnings of the La Rose Mines, Limited, for the month of April, 1909, follows:—

April production—	Tons.	Silver Contents.	Net Value.
Shipments	625	315,544	$133,652
On hand, April 30	285	267,913	123,139
	910	583,457	$256,791
Less on hand, March 31	237	313,090	145,882
April production	673	270,367	$110,909
Estimated expense			26,794
Net profit for April			84,115

	Silver Contents.	Net Value.
Total for 11 months, June 1, 1908, to April 30, 1909	2,732,295	$959,584

NORTHERN EXPLORATION CO. PAYS 280 PER CENT.

The Northern Exploration Co. of Cobalt, with a paid-up capital of $100,000, has recently declared a dividend of 140 per cent., payable in La Rose shares, taken at a market value of $7 per share. The company has already paid several cash dividends of 10 per cent. each.

The Northern Exploration Company's shares were originally sold at 50 cents, so that the dividend is really equal to 280 per cent. on the cash invested.

KERR LAKE DECLARES DIVIDEND.

The Board of Directors of the Kerr Lake Mining Company have declared the regular quarterly dividend of 4 per cent., and an extra dividend of 2 per cent. upon the capital stock of the company payable June 15th, 1909, to all stockholders of record June 1st, 1909.

NIPISSING'S APRIL STATEMENT.

During the month of April the Nipissing mined ore of estimated net value of $149,789, and shipped ore of an estimated net value of $96,492. This compares with ore mined in March to the value of $141,623, and ore shipped to the value of $193,845. Of the total 291,620 ounces of silver produced during April 108,689 ounces, or 37 per cent., came from the Kendall vein.

PETERSON LAKE CO. ANNUAL REPORT.

The third annual report of the Peterson Lake Silver-Cobalt Mining Company, Limited, has been mailed to shareholders.

At no expense to the Peterson Lake Company, a great deal of thorough work has been performed by the different lessees in the direction of proving up a large claim area.

Much of this work would probably not have been attempted by the parent company if conducting development and prospecting operations entirely on its own account.

Only two of the lessees have up to the present time produced any ore. The Nova Scotia and the Little Nipissing have been the producers, and from them the Peterson Lake Company draws a royalty of 25 per cent. in the form of net profit.

The double compartment shaft of the Nova Scotia has been sunk 240 feet. This shaft is located in Nova Scotia ground, so that, in order to tap the ore bodies now being explored on the Peterson property, the parent company would be under the necessity of sinking a shaft for itself.

The report makes no promise of dividends to stockholders as yet.

STATISTICS AND RETURNS.

DOMINION COAL OUTPUT.

	1908.	1908.
January	314,108 tons	200,176 tons
February	285,649 "	209,656 "
March	346,529 "	253,622 "
April	335,829 "	294,017 "
May	335,829 "	300,000 " (est.)
	1,585,364 "	1,257,471 "

Decrease, 327,893 tons.

COBALT ORE SHIPMENTS.

Following are the weekly shipments from the Cobalt camp, and those from Jan. 1, 1909, to date:—

	Week ending May 8. Ore in lbs.	Since Jan. 1. Ore in lbs.
Coniagas	65,400	590,220
Crown Reserve	102,816	1,883,935
Kerr Lake	122,201	605,643
La Rose	327,500	5,018,518
Nipissing	337,090	4,238,328
Temiskaming	150,060	993,260
T. & H. B.	60,000	670,600

Ore shipments to May 8, 1909, from Jan. 1, are 20,121,033 pounds, or 10,060 tons. Total shipments for week ending May 8 are 1,164,867 pounds, or 582 tons.

	Week ending May 15.	Since Jan. 1.
Buffalo	42,990	427,630
Coniagas	.....	590,220
Crown Reserve	108,100	1,992,035
Cobalt Central	.....	248,515
Chambers-Ferland	.....	520,440
City of Cobalt	59,000	747,522
Kerr Lake	.....	605,643
King Edward	.....	98,030
La Rose	131,200	5,149,718
McKinley-Darragh	65,370	589,650
Nipissing	62,060	4,351,388
Nova Scotia	.....	480,810
Nancy Helen	.....	40,000
Peterson Lake	.....	132,960
O'Brien	63,850	781,786
Right of Way	.....	1,205,672
Silver Queen	.....	127,865
Temiskaming	60,000	1,053,260
Trethewey	.....	845,538
T. & H. B.	64,200	734,800
Muggley Consolidated	.....	72,900

Ore shipments to May 15, 1909, from Jan. 1 are 20,777,803 pounds, or 10,288 tons. Total shipments for week ending May 15 are 656,770 pounds, or 328 tons.

B. C. ORE SHIPMENTS.

Te following are the ore shipments for the week ending April 30th and year to date:—

Boundary—	Week.	Year.
Mother Lode	7,140	139,022
Granby	22,542	313,013
Snowshoe	3,119	37,661
Other mines	.....	1,793
Total	32,801	491,489

Rossland—	Week.	Year.
Centre Star	3,591	51,182
Le Roi No. 2	654	10,511
Le Roi (milled)	260	9,260
Other mines	.....	9,393
Total	4,505	80,346

Slocan-Kootenay—	Week.	Year.
Whitewater Deep (milled)	700	11,700
Bluebell (milled)	900	14,900
Granite Poorman (milled)	250	4,100
Queen (milled)	420	6,930
Second Relief (milled)	145	2,495
Nugget (milled)	110	1,820
Silver King	487	1,465
St. Eugene	207	7,015
Ruth	123	420
Whitewater Deep	110	757
Lucky Jim	214	214
Kootenay Belle (milled)	70	1,160
Yankee Girl	67	161
Standard	33	321
Silver Cup	70	376
Other mines	.....	6,987
Total	3,906	60,815
Grand total	41,212	632,650

SMELTER RECEIPTS.

Granby	22,542	313,223
Greenwood	7,140	140,505
Trail	8,351	117,502
Total	38,033	583,991

B. C. ORE SHIPMENTS.

The following are the ore shipments and smelter receipts for the week ending May 7th and year to date:—

Boundary—	Week.	Year.
Granby	19,548	332,561
Snowshoe	1,548	30,209
Sally	16	77
Other mines	.....	22,754
Total	21,112	394,501

Rossland—	Week.	Year.
Centre Star	4,290	55,472
Le Roi No. 2	631	11,142
Le Roi No. 2 (milled)	260	9,260
Le Roi	40	60
Other mines	.....	9,393
Total	5,221	85,327

Slocan-Kootenay—	Week.	Year.
Bluebell (milled)	900	15,800
Whitewater Deep (milled)	700	12,400
Granite Poorman (milled)	250	4,350
Queen (milled)	420	7,350
Second Relief (milled)	145	2,640
Nugget (milled)	110	1,930
St. Eugene	556	7,571
Richmond - Eureka	119	1,341
Luck Jim	120	334
Whitewater Deep	135	886
Silver Cup	170	545
Kootenay Belle (milled)	70	1,160
Yankee Girl	65	226
Bluebell	79	1,886
Other mines	..	6,235
Total	3,839	64,654
Grand total	30,172	544,822

SMELTER RECEIPTS.

	Week.	Year.
Grand Forks	19,548	332,771
Trail	7,514	125,016
Total	27,062	457,787

RAND GOLD OUTPUT.

The April output of gold at the Rand is o..cially placed at 607,101 fine ounces, valued at £2,578,804. The preliminary figures, issued on May 1 last, placed the outturn at 600,000 fine ounces.

The following table gives the output of gold at the Rand (in fine ounces) for a series of years:—

	1909.	1908.	1907.	1906.
January	615,113	560,329	537,638	428,638
February	565,218	541,930	493,542	407,668
March	607,500	574,901	538,497	443,723
April	607,101	565,832	537,019	439,243

SILVER PRICES.

		New York. cents.	London. pence.
May	5	53⅞	24⅞
"	6	53½	24⅝
"	7	53½	24⅝
"	8	53⅛	24 7-16
"	10	53	24⅜
"	11	53⅛	24 7-16
"	12	52½	24 3-16
"	13	52¾	24¼
"	14	52⅞	24 5-16
"	15	52⅜	24⅛
"	17	53	24⅜
"	18	52⅝	24 3-16
"	19	52⅝	24 3-16

MARKET REPORTS.

May 18th.—Connellsville coke, f.o.b., ovens:—
Furnace coke, prompt, $1.40 to $1.50.
Foundry coke, prompt, $1.75 to $1.90.

Metals.

May 18th.—Tin, Straits, 28.87½ cents.
Copper, prime Lake, 13.25 to 13.37½ cents.
Electrolytic copper, 13 cents.
Copper wire, 14.50 cents.
Lead, 4.30 to 4.40 cents.
Spelter, 5.10 cents.
Sheet zinc, 7.25 cents.
Antimony, Cookson's, 8.25 cents.
Aluminium, 22 to 24 cents.
Nickel, 40 to 47 cents.
Platinum, $22.50 to $23.50 per ounce.
Bismuth, $1.75 per lb.
Quicksilver, $44.50 to $45.00 per 75 lb. flask.

Tin.—Reports for May 28th show wholesale price for tin at 29 cents.

Copper.—Buyers are being warned against the effect of speculation in copper. A circular distributed in London and New York points to the conclusion that copper is too high at £60, and that it is not now worth more than £48 at most. Stocks on hand amounted to about 30,000 tons at this time last year. They now amount to not less than 400,000 tons and are growing. Last year's price at this time was £57. It is now £60.