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REPORT ON MINING OPERATIONS IN THE PROVINCE OF QUEBEC DURING THE YEAR 1927

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Énergie et Ressources naturelles
Québec

PROVINCE OF QUEBEC, CANADA

Department of Colonization, Mines and Fisheries

BUREAU OF MINES

Honourable J. E. PERRAULT, Minister L. A. RICHARD, Deputy-Minister

A. O. DUFRESNE, Director

REPORT ON

MINING OPERATIONS

IN THE

PROVINCE OF QUEBEC

DURING THE YEAR 1927

QUEBEC

PRINTED BY Ls. A. PROULX

PRINTER TO HIS MAJESTY THE KING

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NOTE

In the statistical tables and in the review of the mining industry of the Province during the year, the term "production" is synonymous with "quantity sold, shipped or used", and does not necessarily represent "output".—The ore and other mineral products remaining as "stock on hand" at the end of the year are not included in the production figures.

The ton used throughout is that of 2000 lb., except when specially mentioned.

The year referred to is the calendar year, ending December 31st, unless otherwise stated.

We endeavour to give values of non-metallic products, raw or prepared, as estimated at the point of shipment or at the pit-mouth. As regards metallic products, we give the value of the metal contents of the ore, calculated at average yearly market prices of the refined metals, after certain deductions for treatment losses. This method is adopted by the Quebec Bureau of Mines in order to conform with the practice of the Dominion Bureau of Statistics.

The present report was preceded, on February 29th, by a statistical statement on the mineral production in 1927, giving provisional figures, subject to revision. The present report gives the revised statistics, and the tables in this volume supersede those of the preliminary statement.

Department of Colonization, Mines and Fisheries

BUREAU OF MINES

Quebec, May 7th, 1928.

MINING OPERATIONS

IN THE

PROVINCE OF QUEBEC

DURING THE YEAR 1927

GENERAL REVIEW

T. C. Denis

It is a matter of great gratification to be able to record that the progress and activity in prospecting and mining, which had been presaged for the year 1927, have been fully realized, practically throughout Canada. This remark applies particularly to the Quebec mineral industry which made great advances during the year, especially in the western part of the Province, known under the general term of Rouyn district.

The total value of the marketed products extracted from our mines and quarries during the year 1927 amounted to $29,124,110. It is a record annual figure for all times past. Compared with the preceding year 1926, it is an increase of $3,373,647., or a proportional increase of 11.6%. The previous high record was $28,392,939, which was for the year 1920; this now takes second place. The outlook for continually growing figures from year to year, for a considerable time in the future, is of the brightest.

The high total value of the yearly production of 1920 was essentially due to the abnormally high prices then prevailing, and not to quantities of the various products marketed. As instances of the abnormal prices which ruled in 1920, it may be mentioned that the average price of asbestos for that year was $82. a ton, as compared with $36 in 1926 and $38 for 1927, the two latter being

much nearer the normal than the former. Copper was 17½c a pound in 1920, while the average yearly price for 1927 was 12.9c; it is now 13¾c. Therefore as regards quantities, the respective tonnages of the different mineral substances are very much higher, proportionately, than the values.

The total value of our mineral production for 1927 may be decomposed as follows: Non-metallic minerals, apart from building materials $11,328,885, or 38.9% of the total; building materials, stone, brick, lime, cement, sand, $15,382,957, or 52.8%, while the metallic enter for $2,412,268, or 8.3%.

Asbestos is by far the largest individual item, entering for 36% in the total.

As regards metallics the figures show a good advance in total value, being 27% higher than in 1926 and more than double those for 1925.

The metallic products in 1927 comprise the zinc and the lead concentrates from the Montauban mines; the copper ore concentrates from the Eustis mine; the blister copper from the Noranda mine; the precious metals contained in all of these ores; and titaniferous iron ores used for the production of ferro-titanium.

We record this year a production of blister copper from the Noranda smelter which was blown in at the beginning of December, poured copper ingots for the first time on December 17th 1927, and shipped several carloads before the end of the year. The blister copper is shipped to New Jersey to be refined.

With the starting of operations at the Noranda smelter, it may truly be said that the Quebec mineral industry has entered a new era. This is the first production of metallic copper in the province of Quebec since the closing down of the small Capelton smelter some thirty-five years ago. The Capelton smelter consisted of a water-jacketed furnace, erected to treat the copper-bearing cinders resulting from the Capelton sulphuric acid works, which used the ore of the Eustis and of the Albert mines. This furnace had a feed capacity of fifty tons a day and produced low grade matte of 25 to 30% copper. The Noranda smelter has a rated capacity of 1000 tons a day, but is capable of treating around 1400, the output being blister copper, containing 99 p. c. copper, as well as the gold and the silver contents of the ores. It is built in two

independent units of 500 tons each, one of which was put in operation early in December.

Western Quebec is still holding the attention of the mining public, and the progress of the Rouyn-Harricana region is proceeding steadily. The advance has been marked by the development of promising properties, such as the Horne mine, the Alderson-Mackay, the Amulet, the Nipissing, the Waite-Montgomery, the O'Brien, the Abana, by means of shafts, underground workings and diamond drilling, more than by new discoveries. Moreover, the district has entered the producing stage, the Noranda smelter now turning ingots of blister copper steadily. All this is reviewed in detail further on, under the heading of "Progress in the development of the mineral deposits of Western Quebec in 1927."

It may also be mentioned that a renewal of interest took place during the year in the lead and zinc deposits of Lemieux township in Gaspé. Some 450 new claims were staked out in Lemieux and east of it. Moreover a great deal of development work was performed on the old properties in Chibougamau. The Campbell, Cooper & McKenzie interests; the Consolidated Mining and Smelting Company and the Lake Chibougamau Mining Syndicate, did prospecting and development work on their respective holdings. Some 250 new claims were staked out in the region, where a great deal of activity prevailed in spite of the difficulty of access. This mineralized area is 115 miles in a straight line from the nearest railway.

Dr. J. B. Mawdsley, of the Geological Survey of Canada, spent the greater part of the field-season in that region, going over the geology in the townships of Obalski, Scott and McKenzie, and also examining a large tract to the south-west of Lake Chibougamau, which had never been explored. By kind permission of the Director of the Geological Survey, his notes are given in this volume.

TABLE OF MINERAL PRODUCTION OF THE PROVINCE OF QUEBEC, 1927

Substances	No. of workmen	Wages	Quantities	Value in 1927	Value in 1926
		$		$	$
Asbestos, tons	3,170	3,411,908	274,778	10,621,013	10,095,487
Copper in ore, lb	1,564	1,811,953	3,119,848	407,146	368,886
Feldspar, tons	120	66,841	12,730	104,618	111,136
Garnet, tons	9	9,800	2	150	.....
Gold, oz	644	611,292	8,331	172,214	76,070
Graphite, tons	24	13,041	34	2,043	29,516
Kaolin, tons	15	5,687	24	120	.....
Lead in ore, lb	.....	.....	6,496,577	341,461	251,788
Magnesite, tons	107	106,313	15,305	230,309	137,431
Mica, lb	120	68,232	4,455,239	105,446	170,118
Mineral paints (iron oxide, ochre) tons	43	34,930	5,931	102,186	100,923
Mineral water, gal	4	794	10,330	1,813	2,244
Molybdenite, lb	25	9,714	.....	.....	10,472
Phosphate, tons	.....	.....	34	366	800
Pyrites, tons	.....	.....	13,404	42,795	42,117
Quartz, silica rock, tons	64	33,216	27,075	66,522	109,564
Silver, oz	.....	.....	740,864	417,777	233,513
Talc, soapstone, tons	38	17,588	1,276	51,504	38,209
Titaniferous iron ore tons	20	2,066	2,029	8,980	600
Zinc in ore, lb	238	294,884	17,189,046	1,064,690	956,199
Sub-totals	6,207	6,498,259	.....	13,741,153	12,735,273
Building Materials					
Brick, M	928	786,092	139,587	2,336,677	2,256,856
Cement, bbls	862	1,138,863	4,636,751	5,383,058	4,535,386
Granite, tons	646	456,888	163,160	750,700	873,962
Lime, tons	237	227,583	107,638	806,665	756,117
Limestone, tons	1,790	1,199,763	2,214,447	2,785,514	2,180,977
Marble, tons	142	189,215	7,545	500,713	519,032
Sand, building, tons	4,767	665,949	8,660,360	2,145,169	1,452,574
Sand-Lime bricks, M	39	33,830	8,182	96,926	.....
Sandstone, tons	194	94,863	116,243	162,606	48,937
Tile, drain and sewer pipe, pottery, etc.	139	126,702	.....	414,929	381,088
Sub-totals	9,744	4,919,754	.....	15,382,957	13,004,929
Totals	15,951	11,418,013	.....	29,124,110	25,750,463

The following table of the value of the annual mineral production of the province, gives a good idea of the progress made since 1898, the first year for which comparatively complete figures of production are available.

YEAR	VALUE	YEAR	VALUE
1898	$1,673,337	1913	$13,119,811
1899	2,083,272	1914	11,732,738
1900	2,546,076	1915	11,765,873
1901	2,987,731	1916	13,287,024
1902	2,985,463	1917	16,189,179
1903	2,772,762	1918	18,707,762
1904	3,023,568	1919	20,813,670
1905	3,750,300	1920	28,392,939
1906	5,019,932	1921	15,522,988
1907	5,391,368	1922	18,335,153
1908	5,458,998	1923	21,326,314
1909	5,552,062	1924	18,952,896
1910	7,323,281	1925	23,824,912
1911	8,679,786	1926	25,750,463
1912	11,187,110	1927	29,124,110

The mining and prospecting activities which reigned during the year in the Province of Quebec, are well reflected in the notes of the Chief of the Administrative Division, for the fiscal year ending June 30th 1927.

"During the twelve months of the fiscal year 1926-27 we have issued 3799 miner's certificates through the offices at Quebec, at Amos and at Ville-Marie and by the agencies. This is the highest number yet sold in one year. During the preceding year, 3,315 were issued, while in 1922 the number was only 509. The number of certificates sold is a good index of the degree of interest taken in our mineral resources and their prospecting, and it may therefore be stated that these activities were seven times greater during the last year than they were five years ago. It may be added that the office work of the Bureau has increased fully in the same proportion.

"The growing interest which has been manifested in the last few years towards the mineral possibilities of the Province of Quebec has been a cause of gratification. This sustained activity of prospecting cannot but have a favourable influence on the development of our Province, and will contribute appreciably to the general prosperity and growth of Canada.

"During the twelve months ending June 30th, 1927, there were staked in the Province of Quebec 12,686 mining claims, cover-

ing an area of approximately 650,000 acres. During the preceding year the number was 9,407 claims. The greater part of these were staked out in the county of Abitibi and recorded at the Amos office.

"Mining licenses, which are working permits granted six months after the staking of the claims, are all issued by the Quebec office. During the year 1926-27 we have issued or renewed 1467 such licenses, as compared with 1074 during the preceding year. The two following tables give the statistics of the administrative branch of the Quebec Bureau of Mines for the period under review.

NUMBER OF TITLES ISSUED IN 1926-27

Miner's certificates	3,799
Mining concessions (sales of mining lands)	33
Mining licenses (working permits)	1,467
Claims recorded	12,686
Transfers of mining rights	1,155

REVENUE, FISCAL YEAR 1926-27

Miner's certificates	37,990 00
Mining licenses	188,659 16
Mining concessions	29,068 59
Taxes on profit of mines	141,902 40
Transfer of titles	11,550 00
Building lots	17,875 00
	$427,045 15

"It will be observed by the above figures, that the revenue derived from our mineral resources is appreciably growing. From $270,367 in 1925-26, it increased to $427,045 in 1926-27, a proportional increase of 58%.

"The revenue item "building lots" makes its appearance for the first time. It is the amount collected by authority of article 31*a* of the mining law, adopted as an amendment to the mining law on March 11th, 1926, which provides that owners of mining concessions who subdivide their mining lands into town sites, must pay to the Department of Colonization, Mines and Fisheries, a

sum of twenty-five dollars for each building lot of 5000 square feet or less, sold, ceded or transferred.

The table which follows, of titles issued annually by the Bureau of Mines in the last seven years, strikingly illustrates the growth of the development of our mineral resources.

TABLE OF VARIOUS TITLES ISSUED BY THE QUEBEC BUREAU OF MINES

Fiscal year	Miner's certificates Number	Number of claims recorded	Mining licenses Number	MINING CONCESSIONS	
				Number	Acres
1920-21.....	493	335	212	5	464
1921-22.....	509	321	195	4	801
1922-23.....	1,973	1,183	238	8	602
1923-24.....	1,928	1,750	635	9	1,517
1924-25.....	2,239	5,143	1,045	17	3,698
1925-26.....	3,315	9,407	1,074	8	1,733
1926-27.....	3,799	12,686	1,467	33	7,249

ROADS AND RAILWAYS

In the last five years the Provincial Government has spent large sums of money in providing means of communication and of access in the mining districts. In the course of the year just past the through road, 100 miles long, from Macamic to Angliers which connects Abitibi with the heart of Temiscamingue county, passing through the mining district of Rouyn, has been greatly improved. The northern half, from Macamic to Rouyn has received two layers of gravel, while the southern half has been entirely finished as a good earth road. During the winter of 1927-28, contracts for gravelling it throughout its whole length have been awarded, and this is now proceeding. While the work is being done the road is closed, and it probably will be opened to motor traffic at the beginning of the summer.

In the Gaspé region, Lemieux township, roads have been opened up to reach several promising properties, where important deve-

lopment work was being carried out during the year. Some sixteen miles of roads were thus opened up by the Provincial Government.

From the Canadian National Railway branch line, which connects with the Transcontinental line at the station of Taschereau, a spur has been constructed to the Waite-Montgomery mine from the station of Waite.

The railway service from Taschereau to Rouyn and Noranda has been continuous throughout the year, and the traffic, both freight and passenger, has been very heavy.

Early in the spring of 1927, the Nipissing Central Railway began the construction of an extension into Quebec, of its main line which serves the mining camps of Kirkland Lake and Larder Lake, and early in the fall this railroad reached Rouyn. The Rouyn district has now two outlets by railway, one to the north by the Canadian National Railway, and another to the west by the Nipissing Central which connects with the Temiscamingue and Northern Ontario at Swastika. The Nipissing has a daily double train service each way.

There have been renewed rumors of constructing a railroad from Lake St. John to Chibougamau, but so far no definite steps have been taken in this matter, and this project is unlikely to be realized in a near future A company, the Quebec-Chibougamau Railway Company, obtained a charter some years ago, authorizing them to build a railway line from the mouth of Mistassini river, which is the present terminus of the Lake St. John branch of the Canadian National Railways, around the lake to Hébertville, and also from Lake St. John to James Bay, through the Chibougamau mineral area. The first part of the project has been started, and the location survey is now being made, between Dolbeau, at the mouth of the Mistassini and Hébertville, but the extension of the line towards the North-West is not likely to be started for some time.

There is no doubt that widespread mineralization exists in that region, and should the district become more accessible, workable deposits of copper and gold might come to light. As matters now stand, however, the discoveries made so far, would not yet justify the construction of roads, or railroads to exploit them, but the mineral possibilities should decidedly be taken into account,

with other natural resources, when the question is discussed of constructing means of access to the region.

EMPIRE MINING CONGRESS

One of the outstanding events of the year 1927 for the Canadian Mineral Industry has been the meeting of the Empire Congress of Mining and Metallurgy, which was held in Canada from August 23rd to September 27th.

It may be recalled that the Empire Congress, which is held triennially, is constituted by the principal Mining Societies and Institutes of the British Empire, which meet together as a body of cooperation to advance the interests of mining and metallurgy throughout the British Empire, by technical sessions and excursions to mining districts. Both the sessions and the excursions of the Canadian meeting were very well attented. There were numerous delegates and members of mining and metallurgical societies from Great Britain, South Africa, Rhodesia, Australia, New Zealand, India, Canada, as well as representatives from United States societies. The Congress, therefore, brought together in Canada, several hundred distinguished engineers, metallurgists, geologists, mine owners from all the continents. The Province of Quebec was particularly favoured, as the opening sessions were held in Montreal, on August 23rd and following days, and the closing session was held in Quebec city on September 26th. Moreover, several technical excursions were organized, which gave the delegates the opportunity to visit the Rouyn region, the asbestos district, and the hydro-electric and industrial development of the Lake St. John region.

A large and comprehensive exhibit of the economic minerals of the Province was collected and installed by the Quebec Bureau of Mines in a very prominent hall at the Windsor Hotel, which was the Empire Congress headquarters during the Montreal meeting. The exhibit occupied over 300 square feet of tables. Large specimens of fifty to one hundred pounds, labelled in detail, constituted the great majority of the exhibit, which favourable impressed the overseas visitors.

CHEMICAL LABORATORIES

The Quebec Bureau of Mines maintains at the Polytechnique School, of the University of Montreal, 1430 St. Denis Street, Montreal, an up-to-date, well equipped laboratory for the convenience of the interested public. Analyses, assays, determinations of minerals, and tests of various ores, samples and materials found within the boundaries of the Province of Quebec, are made in this laboratory at prices which are extremely low for the high grade work done. This laboratory has been established for the sole purpose of aiding the development of the mineral resources of the Province of Quebec. Prospectors and all persons interested in the Quebec mineral resources are cordially invited to avail themselves of the facilities offered. The fees of the tariff in force, for the analyses and assays of the various substances, ores and minerals, are very low, as the high competence of the chemists ensure results of undoubted reliability.

For the convenience of the prospectors in the new gold-fields of Temiscamingue and Abitibi counties, arrangements have been made by the Department to open assay offices in the region. As a result the firm J. T. Donald & Co., analytical and consulting chemists of Montreal has opened, at Rouyn, a well equipped assay laboratory under the name of "Quebec Testing Laboratories", and Mr. Maurice Archambault, a graduate analytical chemist of Polytechnique School of the University of Montreal, has opened a similar laboratory at Amos, on the Transcontinental railway.

During the year ending December 31st 1926, the Provincial Laboratory at Montreal has effected 1993 analyses, assays and tests bearing on the following substances: Alumina; antimony; arsenic; ash; barium; carbon; cobalt; copper; fluorine; gold; graphite; iron; lead; lime; magnesite; moisture; molybdenum; nickel; platinum; organic matter; calorific power; silica; silver; sulphur; tin; titanium; zinc; volatile matter and qualitative tests.

Besides these, it may be added that, as in past years, a large number of minerals and rocks were determined by various members of the technical staff at the office of Bureau of Mines in the Parliament Buildings, Quebec. Of these, 271 mineral samples were received by mail and 210 letters were written in answer. Many specimens were brought personally to the office by the interested finders and verbal information given, so that the total of the determina-

tions made here would be in the vicnity of 400 for the year. For the work done at the head office no fees are charged, and moreover technical advice and information as to the value, industrial uses, and commercial possibilities are gladly given free of charge, to prospectors, finders and all persons interested in Quebec mineral resources.

To encourage and train the French speaking population of the Province of Quebec to do more prospecting, series of lectures and classes on elementary mineralogy, as well as determinations of minerals from specimens, were given in the French language in several centres of western Quebec, during the winter of 1927-28. Such classes were held at Amos, Macamic and Rouyn. Mr. Maurice Archambault, of Amos, was in charge of this work. He reports that the classes were much appreciated, the attendance exceeding all expectations.

FIELD WORK AND TECHNOLOGY

The technical personnel of the Quebec Bureau of Mines has not been increased in 1927 as regards number. Mr. A. O. Dufresne, Assistant-Director, since 1914, was promoted to the directorship, and Mr. Théo. C. Denis, who was director for eighteen years was appointed geologist and technologist.

The functions of the other members of the techical staff remain as outlined in our last year's report.

Mr. John A. Dresser, mining geologist, of Montreal, has undertaken for the Quebec Bureau of Mines, an examination of the outliers of the Grenville formation, which are numerous in the precambrian area north of the Saint-Lawrence and Ottawa rivers. During the field season of 1927, from June to October, Mr. Dresser had several small geological parties, instructed to locate all possible such occurrences of Grenville rocks, and to examine them for lead, zinc, molybdenite, graphite and other minerals, in the hope of bringing to light deposits analogous to those being worked in Portneuf county, in Labelle county and Pontiac county.

His notes, with maps, which bring out several interesting features, were published as a separate report under the title of "Geological Traverses in the Counties of Maskinongé, Saint-Maurice, Champlain, Portneuf, Quebec and Montmorency." It is intended

to extend this work, both east and west, during the field season of 1928.

During the summer of 1927, the Geological Survey of Canada had five geological parties and two topographical parties working in the Province of Quebec as follows:

Dr. W. F. James.—Rouyn district, revision of Duparquet and Clericy sheets, in view of a second edition.

Dr. H. C. Cooke.—Rouyn-Harricana district. Detailed studies in various places with a view to better understanding of mode of occurrence of the mineral deposits.

Dr. J. B. Mawdsley.—Chibougamau lake, and district to the S. W. of it. The latter is an unknown area, probably underlain by Keewatin rocks.

Dr. F. J. Alcock.—Gaspé county. Investigation of the mineral deposits of Lemieux township, and detailed geological work on the lead and zinc deposits.

Dr. T. H. Clark.—Eastern Townships. Systematic geological mapping of the Sutton sheet.

Mr. K. Chipman, was carrying on a topographical survey of Rouyn township, where mining and industrial development is to a great extent concentrated.

Mr. R. C. McDonald, continued a series of accurate surveys of the main waterways and roads in the Rouyn district, as controls for photographic surveys.

MINING LEGISLATION

Several important amendments to the Quebec Mining law were passed at the last session of the Provincial Legislature and were sanctioned by the Lieutenant-Governor on March 19th 1928.

The full text of the amendments is as follows:

An Act to amend the Quebec Mining Act

His Majesty, with the advice and consent of the Legislative Council and of the Legislative Assembly of Quebec, enacts as follows:

1. Section 3 of the Quebec Mining Act (Revised Statutes, 1925, chapter 80), as amended by the act 16 George V, chapter 27, section

1, is again amended by adding thereto, after the word: "minerals", in the fourth line of paragraph 1 thereof, the words: "or any other work which the Minister may consider useful for developing a mining concession, or a mining region".

2. The said act is amended by inserting therein, after section 24 thereof, the following sections:

"24*a*. The water powers capable of supplying one hundred and fifty horse power, or over, comprised within the territory of a mining concession, are reserved to the Crown.

"24*b*. The Crown has full power to remove, from the mining concessions and lands under mining license, the sand, stone and gravel which it may need for the construction or repair of its roads."

3. Section 41 of the said act, as amended by the act 16 George V, chapter 27, section 7, is again amended by adding thereto, after the word: "metals", in the eighth line of the first paragraph thereof, the words: "The Minister may, for good and sufficient reasons, extend the delay during which the work shall be done."

4. Section 48 of the said act, as amended by the act 16 George V, chapter 27, section 9, is again amended:

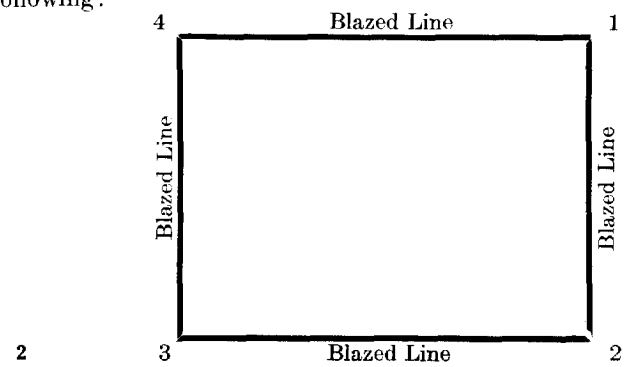
a. By striking out paragraph 1 thereof;

b. By replacing paragraph 3 thereof by the following:

"3. By putting on stake number 1, in very legible characters, the name of the discoverer, the number of his certificate and the date of the staking";

c. By striking out the words: "including that connecting the discovery stake with stake number 1", in the first and second lines of paragraph 4 thereof;

d. By replacing the diagram at the end of the section by the following:



5. Section 53*a* of the said act, as enacted by the act 16 George V, chapter 27, section 12, is amended:

a. By inserting therein, after the word: "days", in the second line of the first paragraph thereof, the words: "be cancelled by the Minister or";

b. By replacing the second paragraph thereof by the following:

"Whenever a claim has been admitted through fraud or false representations, it may, at any time, be cancelled by the Minister, or by the Mining Commissioner at the request of the Minister or any other interested party.

When the cancellation has been effected by the Minister, any interested party may appeal to the Superior Court within thirty days from the decision, by means of a mere petition served upon the Minister and upon the other interested parties. The judgment on such petition shall be final and without appeal."

6. Section 56 of the said act is replaced by the following:

"56. Any land which has formed the object of a claim or of a mining license which has been allowed to lapse or has been abandoned can only be restaked after a delay of fifteen days from the abandonment or expiration of the claim or license, but cannot be restaked by the same person nor on behalf of the same person, firm or company which previously held it.

If, however, such land remains free for thirty days from the date of the abandonment or expiration of the claim or license, it may, after such delay, be again taken by or on behalf of the former holder."

7. Section 58 of the said act, as amended by the act 16 George V, chapter 27, section 13, is again amended:

a. By replacing the word : "six", in the first line of the first paragraph thereof, by the word: "twelve";

b. By striking out the words: "Such delay shall not run during the months of January, February, March, April and December", in the fourth, fifth and sixth lines of the said first paragraph thereof.

8. Section 61 of the said act, as amended by the act 16 George V, chapter 27, section 14, is again amended.

a. By replacing paragraph 2 thereof by the following:

"2. Such license shall be valid for one year from the date of its issue, and shall be transferable only with the consent of the Minister. If it has been issued in error it may, within the next sixty days, be cancelled by the Minister or by the Mining Commissioner at the

request of the Minister or of any other interested party. If it has been issued through fraud or false representations, it may, at any time, be cancelled by the Minister, or by the Mining Commissioner at the request of the Minister or of any other interested party. When the cancellation has been effected by the Minister, any interested party may appeal to the Superior Court within thirty days from the decision, by means of a mere petition served upon the Minister and upon the other interested parties. The judgment on such petition shall be final and without appeal."

b. By adding thereto, after paragraph 6 thereof, the following paragraphs:

"7. When adjacent lands are partly under mining concession and partly under mining license in the name of the same person, firm or company, and may be considered as one and the same enterprise, the Minister may permit all the work necessary for the renewing of the license to be done on the lands covered by the mining concession.

"8. When the licensee has omitted renewing his license within the delays prescribed by this section, the Minister may, nevertheless, grant the renewal of such license, provided, however, that its renewal be applied for within twenty-five days from its expiration. Such application shall be accompanied by:

a. An affidavit giving the reasons for the delay in asking for the renewal of the license;

b. An affidavit establishing that the applicant has done in good faith, in the preceding year, all work on the land required by the act;

c. A sufficient sum to pay the fee of ten dollars and an annual rent of two dollars per acre.

The Minister may exact, in addition, from the applicant, any other sum necessary to reimburse the expenses made by the person or persons who, after the expiration of the license, may have staked out the land which had formed the object thereof."

9. The provisions of this act, except, however, those of section 24*a* of the Quebec Mining Act, as enacted by section 2 of this act, and of sections 4 and 6 of this act, shall apply to claims and mining licenses in force on the 15th day of March, 1928 and also to mining concessions not yet confirmed by letters patent.

10. This act shall come into force on the day of its sanction.

MINING INVESTMENTS AND THE PUBLIC

In March 1928, the Bureau of Mines had on record the names of some 340 mining companies which were organized and incorporated within the last five years. The great majority of these companies hold properties in the Rouyn-Harricana district, some as mining concessions, but most of them as options on mining licences and claims, which are temporary titles.

Unfortunately only a comparatively small proportion of these have as primary aim, the earnest and systematic prospecting and development of the mining claims which they detain, endeavouring to make mines out of them. And of these, quite a number after working earnestly and spending money judiciously, will be disappointed, and will finally come to the conclusion that the deposits and the mineral indications which they are investigating, are not of sufficient size to be worked with profit, and will abandon them.

So that of these 340 companies only a small number will eventually reach a dividend paying basis, which is the final criterion of a good property.

In fact it is possible that not more than a dozen of the companies organized since the beginning of the Rouyn activity may be in existence in a very few years from now, all the others having had the ephemeral life of the great majority of such ventures.

In their initial stages mining ventures are necessarily risky, even under the most favourable conditions and circumstances, but when successful the returns are very large. In our previous reports we have drawn the attention of the public to the fact that before putting money in mining enterprises they should make enquiries and investigations which would permit them to descriminate between (1) "safe mining investments" (2) "legitimate and reasonable mining speculations" and (3) "mining frauds". In the first, the returns are not high but are reasonably sure. In the second, the money resulting from the sale of shares is really expended in intelligent search and development work on the claims and mineral deposits, which may or may not answer the hopes which were founded on them; in case of losses the shareholder would at least have the satisfaction to feel that he has had "a run for his money", for all numbers of a lottery cannot be winners.

As in all cases of promising mineral discoveries, the Rouyn

district is experiencing a period of boom, and unfortunately this has given rise to many instances of the third category of mining ventures, or parasitic, not to say predatory, organizations, whose main object is to mine money out of the excited public, rather than ore from the ground. This state of things is very difficult to avoid or remedy; it is not easy to protect a certain class of people, and prevent them from parting with their money. It is good to remember that, as a rule, the promising mineral discoveries and likely claims in the Rouyn district do not have to resort to full page advertisements and house to house peddling of beautifully engraved stock certificates, making appeals to the public for funds to explore and develop them. The Rouyn camp is not "a poor man's camp" like the Klondike or even the Cobalt region. It requires very large sums of money and the best technical knowledge available, to do exploration work on these copper-zinc-gold deposits. Fortunately there are a number of powerful companies interested in the field, and such organizations do not advise the public to get in on the ground floor at 10, 15 or 25 cents a share. One may be sure that a very small proportion (in some cases less than 20 per cent) of the money obtained by such means is actually put into earnest, effective work on the claims.

History repeats itself, and the ultimate result of the Rouyn boom will be (1) a few good outstanding producing mines and a healthy smelting industry which will prove a national asset, and (2) a multitude of claims which will never produce ore, but will have been used to exploit the public. This applies more particularly to the public who expects to make money out of the stock-market rises of mining shares, rather than in ultimate dividends from ore-producing mines.

These remarks and warnings specially apply to those who think that they can amass a fortune in a short time by speculating on the fluctuations of shares of mining companies as quoted on the Mining Exchanges. As a rule these persons do not consider, in any degree, the actual physical value of the properties on which they speculate, and do not even think of their possibilities as ulterior dividend payers. And yet it should always be borne in mind that until a mine is in operation and produces ore which contributes to the smelter's output of metallic copper and gold, no new wealth whatever is produced from it. Therefore the fluctuations of the shares of non-producing mines simply represent gamb-

ling winnings made by a part of the public at the expense of another part of the same public. Such deals are comparable to winnings and losses at roulette, without production and without the community, as a whole, being any the richer by the transferring of money from one pocket to another.

As we have repeatedly stated, a good rule to adopt and follow on the part of the public, is to take the statements of salesmen of stock certificates, mining or otherwise, with a great deal of caution; to entirely distrust the glowing, insidious literature offering shares in mining, oil or other ventures, at a small fraction of their par value; and never to invest hard-earned savings, no matter how small, in mines without first consulting disinterested and competent advisers such as bank managers, officials of trust companies, officials of the various Departments of Mines, provincial or federal.

We insist on this point, as already we are receiving numerous letters from disappointed buyers of mining shares who have been lured into putting more money than they could afford to lose into mining ventures, some of which can be classed as "legitimate promotions" whose hopes were frustrated, while many others never had chances of success from the very outset. From now on such disappointments will be increasingly numerous, and many will regret not to have heeded the warnings in time.

MINING OPERATIONS

ASBESTOS

The shipments and sales of asbestos in 1927, from the Quebec mines, totaled 274,778 tons, valued at $10,621,013, as compared with 279,389 tons, valued at $10,095,487, in 1926. So that while we record a slight decrease in quantity, of 4,611 tons or 1.6%, the increase in value amounted to $525,526, or 5%. This is due partly to the fact that more of the higher grades of asbestos was marketed and partly to better prices. The average price of all asbestos shipped was $38.65, a ton against $36.13 for 1926.

The by-products of the asbestos industry, which appear as "sand and gravel" in the detailed tables of asbestos statistics are considered as building materials, and are classed accordingly; they do not enter into the total figures of asbestos production.

The quantity of rock mined and hoisted during the year totalled 4,834,761 tons, of which 3,820,024, or a proportion of 79% was put through the mill, the balance of 21%, being barren rock sent direct to the refuse heaps. The proportion of barren rock was higher than the average, owing to important development work done in some of the mines.

This means that the average of the rock mined and hoisted throughout the year contained 113.7 lb. of recovered fibre per ton, valued at $2.13. For 1926 these figures were 134.3 lb. and $2.35, and for 1925 they were 129.7 lb. valued at $1.95.

The following tables present the detailed figures of production of asbestos for the years 1927 and 1926, as well as other statistics pertaining to the Quebec asbestos industry.

PRODUCTION OF ASBESTOS IN THE PROVINCE OF QUEBEC FOR 1927

Designation of Grade	Shipments and Sales: Tons	Shipments and Sales: Value	Average Value per ton	Stocks on Hand Dec. 31st, 1927: Tons	Stocks on Hand Dec. 31st, 1927: Value*
Crude No. 1	1,107	$ 468,980	$ 423 65	303	$ 128,366
Crude No. 2	3,014	752,277	249 59	68	16,972
Crude run of mine	667	151,231	226 73	.....	
Spinning Fibre	14,348	1,855,425	129 32	579	74,876
Shingle Fibre	44,573	2,889,124	64 81	3472	225,020
Mill board and paper fibres	60,396	2,284,021	37 82	25,456	962,746
Fillers, floats and other short fibres	150,673	2,219,955	14 73	26,934	396,738
Totals	274,778	$10,621,013	$ 38 65	56,812	$1,804,718
By-products (sand and gravel)	18,974	11,101	0 58		
Totals	293,752	$10,632,114	.....	56,812	$1,804,718

Quantity of asbestos rock mined during the year 1927:—4,834,761 tons.

Quantity of asbestos rock milled during the year 1927:—3,820,024 tons.

PRODUCTION OF ASBESTOS IN THE PROVINCE OF QUEBEC FOR 1926

Designation of Grade	Sales: Tons	Sales: Value	Average Value per ton	Stocks on Hand Dec. 31st, 1926: Tons	Stocks on Hand Dec. 31st, 1926: Value *
Crude No. 1	1,094	$ 406,438	$ 371 51	909	$ 337,703
Crude No. 2	3,494	802,304	229 62	145	33,295
Crude run of mine	446	92,394	207 16	297	61,527
Spinning Fibre	15,182	1,885,835	124 22	2,215	275,147
Shingle Fibre	36,497	2,139,780	58 63	2,173	127,403
Mill board and paper fibres	86,746	2,940,675	33 90	29,499	1,000,016
Fillers, floats and other short fibres	135,930	1,828,061	13 45	21,589	200,372
Totals	279,389	$10,095,487	36 13	56,827	$ 2,125,463
By-products (sand and gravel)	15,672	10,257	0 65		
Totals	295,061	$10,105,744	.....	56,827	$2,125,463

Quantity of asbestos rock mined during the year 1926: 4,483,361 tons.

Quantity of asbestos rock milled during the year 1926: 4,002,626 tons.

* Values calculated at average price of each grade. These figures are given merely as an approximate guide of valuation of stocks on hand.

The following table is a condensation of statistics of asbestos production for the last eighteen years.

TABLE OF AVERAGE PRICES OF ASBESTOS AND TOTAL PRODUCTION FOR THE YEARS 1910 TO 1927.

YEAR	AVERAGE VALUE PER TON OF ASBESTOS					Tons of Asbestos produced	Total value
	Crude No. 1	Crude No. 2	Fibre No. 1	Fibre No. 2	Fibre No. 3		
						Tons	
1910	$ 259 57	$ 121 57	$60 88	$ 25 48	$ 10 46	70,605	$ 2,667,829
1911	177 30	113 68	65 54	20 33	13 57	102,224	3,026,206
1912	263 16	100 76	64 42	31 17	13 21	111,175	3,059,084
1913	175 00	134 00	59 00	27 75	13 75	136,709	3,830,504
1914	301 96	131 85	60 40	24 93	11 18	107,401	2,895,935
1915	274 36	122 44	64 32	26 84	12 57	113.115	3.544.362
1916	422 76	219 77	77 57	28 46	14 84	133,339	5,182,905
1917	778 38	381 46	99 90	36 77	17 75	137,242	7,198,558
1918	937 92	424 74	163 87	57 17	26 36	142,375	9,019,899
1919	1,256 74	618 77	222 15	53 02	19 40	135,862	10,932,289
1920	1,475 07	811 41	279 63	110 35	35 49	179,891	14,749,048
1921	1,281 32	446 91	263 09	101 75	31 19	87,475	5,189,789
1922	648 68	265 32	207 71	81 00	21 65	160,339	6,053,068
1923	472 60	225 90	123 37	57 05	22 01	216,804	7,364,260
1924	365 97	215 27	110 81	45 12	19 84	208,762	6,561,659
1925	364 96	206 22	106 43	50 78	20 39	273,522	8,976,645
1926	371 51	229 62	124 22	58 63	21 41	279,389	10,095,487
1927	423 65	249 59	129 32	64 81	21 34	274,778	10,621,013

EXPORTS OF UNMANUFACTURED CANADIAN ASBESTOS FOR TWELVE MONTHS, ENDING DECEMBER 31ST., 1927.

(*Dom. Bur. of Statistics Ottawa.—Trade of Canada*).

	TONS	VALUE
United Kingdom	14,496	$884,337
United States	196,308	6,536,975
Australia	1,697	119,965
Belgium	8,068	540,655
France	5,486	409,840
Germany	19,029	1,296,941
Italy	3,687	246,633
Japan	7,553	402,075
Netherlands	4,736	256,229
	263,290	$10,735,311

IMPORTS OF RAW ASBESTOS INTO U. S. FROM OTHER COUNTRIES *

	TONS	VALUE
South Africa (Rhodesia and Union)	5,606	953,623
United Kingdom	286	49,941
Other countries	1978	460,330

A few years ago practically all the asbestos used in the United States came from the Province of Quebec. In 1927 Quebec asbestos still figured for 96% of the tonnage imported into the United States, but only for 82% of the value. A great deal of the South Rhodesian long fibre now finds an American market. Moreover, 1607 tons of crude asbestos, valued at $430,000, was imported from Germany into the United States in 1927, the origin of which was problaby the Russian asbestos mines.

Asbestos mining in 1927.—Sales and shipments of asbestos were effected by six companies who operated twelve mines during the year.

* From "Asbestos" Philadelphia, February, 1928.

Asbestos Corporation, Ltd., Thetford Mines.

Canada Asbestos & Chrome Co., Ltd., Black Lake.

Canadian Johns-Manville, Ltd., Asbestos.

Johnson's Company, Thetford Mines.

Keasbey & Mattison, (Bell Asbestos Mines Department), Thetford Mines.

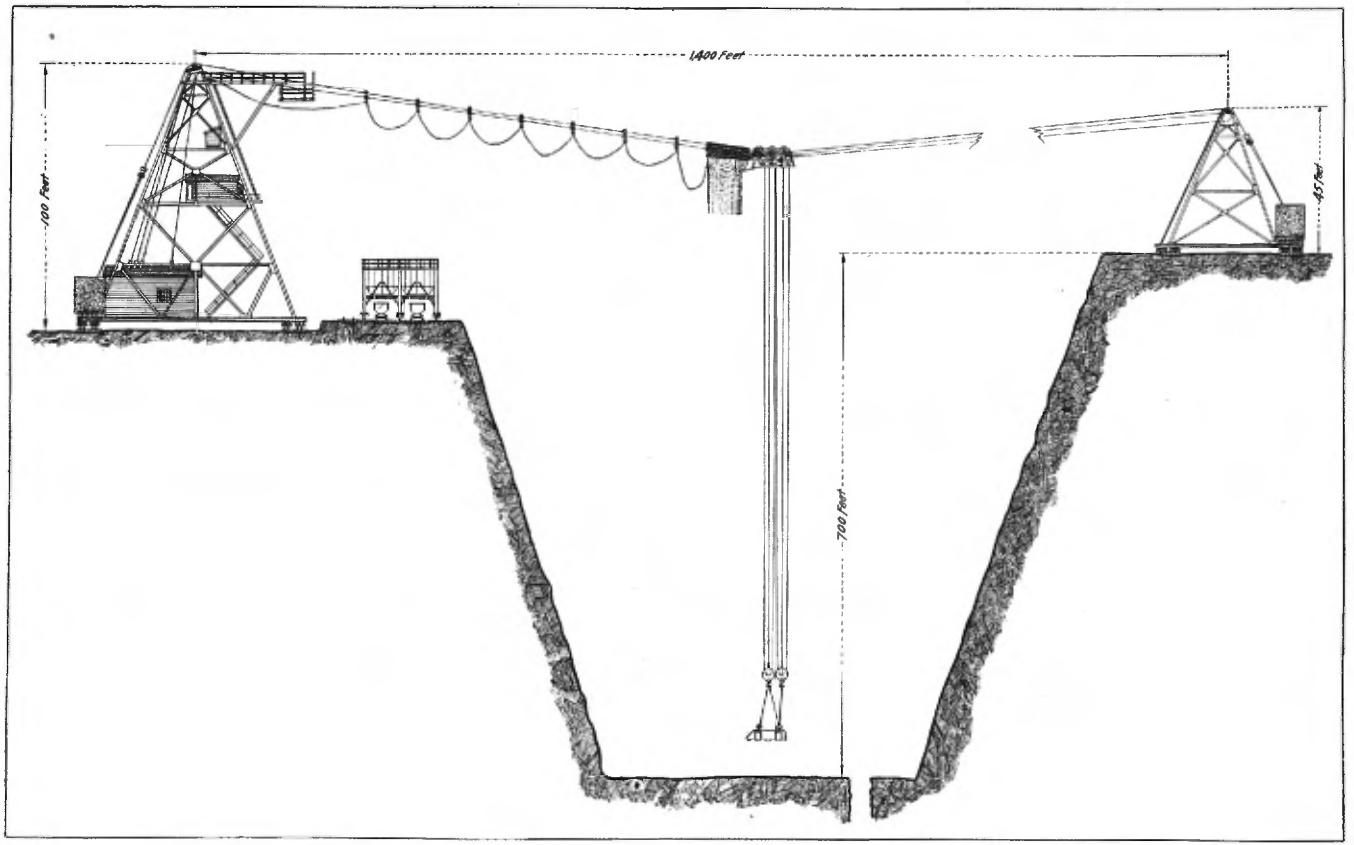
Quebec Asbestos Corporation, Ltd., East Broughton.

Besides the above, who all operate mines and mills, the Northern Asbestos Co., at Thetford Mines, also made shipments of short fibre. The Northern Asbestos Co. does not carry on any mining operations, but works over some of the tailings, or refuse, of some the large mills, to reclaim the short fibre left in the serpentine sands, which, otherwise, would be wasted. This company has put up a small simple mill, and the short fibre resulting from these operations, find a market at prices ranging from $7.50 to $15. a ton.

Asbestos Corporation, Ltd.—Asbestos Corporation, Ltd., a company owning fifteen distinct asbestos properties, operated six of them during the year 1927:—King mine, Consolidated mine, in Thetford township; Beaver mine, British-Canadian mine and Maple Leaf mine in Coleraine township; and the Vimy Ridge mine in Ireland township.

Shipments of asbestos were also effected from the "Asbestos Mines" property in Broughton township, from stock on hand.

At the King mine the open pit has now reached a depth of 400 feet. The huge cable-derricks which were put up in 1926 have given full satisfaction. These were described in our report for 1926. The head-towers, of structural steel are 105 feet high and the carrying steel cables are three inches in diameter. These new cable-ways, hoisting a load of ten tons of rock, are designed to hoist from a maximum depth of 700 feet. The King pit is now equipped with two of these cable-ways and six of the smaller ones. The table of comparisons between these is interesting. It was supplied with the accompanying sketch by Mr. H. V. Haight, designing engineer of the Canadian Ingersoll-Rand Company.



Sketch of installation of new cable-ways at King mine, of Asbestos Corporation, Ltd. Thetford Mines, Que,

	OLD CABLE-WAYS	NEW CABLE-WAYS
Span, center to center of towers	937 feet	1,400 feet
Maximum depth of pit from surface	400 "	700 "
Capacity of ore box	132 c. ft.	220 c. ft.
Net weight of rock	12,000 lb.	20,000 lb.
Total suspended load at center (including sheaves, ropes, and carriages.)	22,000 lb.	36,000 lb.
Rope speed (trolleying speed)	1,000 ft per m.	1,500 ft per m.
Hoisting speed (3 part line)	333 ft. per m.	500 ft per m.
Horse-power of hoist	200 h. p.	450 h.p.
Diam. hoisting ropes	3-4 in.	7–8 in.
Diam. main cable	2½ in.	3 in.
Stress in main cable	126,000 lb.	240,000 lb.

The new tunnel, for the entry and exit of men from the bottom of the pit has been actively proceeded with. The inclined part is being constructed by the Foundation Company of Montreal.

At the Beaver mine and the Consolidated mine, two adjoining properties, the work of combining the two mines into one is proceeding satisfactorily, without the production being unduly interfered with. A tunnel, 22 feet wide and 10 feet high, is being driven to serve the two mines. One thousand feet of the tunnel will be inclined under 25°, and will be used to hoist asbestos rock to a large new mill, now under construction to treat the production of the combined mines, work on the building having started in September.

The Asbestos Corporation, Ltd., carried on core-drilling operations on lots 30 and 31, range A of Coleraine, with Calyx drills. These lots are situated between the Beaver mine and the Maple Leaf property.

At the Vimy Ridge mine, the first part of the year was spent in remodelling the mill, which was started in July. In the fall the cable-ways of the Vimy Ridge mine were replaced by steam shovels, which, it is claimed greatly reduce the labour. Some core-drilling, with Calyx drills, was also done, with satisfactory results.

Keasbey and Mattison Company.—At the Bell mine of this company, work was carried on all year round. In December 1927,

the Bell mine was made a distinct organization under the name of Bell Asbestos Mine Corporation.

Johnson's Company.—Work was carried on at both mines of this company. At the Thetford property, extensive changes were made in the mill, to increase its capacity of treatment so as to conform with the capacity of the crushing and drying plant erected in 1926. The whole mill was practically remodelled and modernized. In the mine four new cable-ways, with steel towers and electric hoists, were erected, and new equipment was added. A standard gauge locomotive, and a steam-shovel on caterpillars were purchased. To the south of the pit the steam-shovel was operated to strip off the overburden, so as to extend the mining operations in that direction.

Important improvements were also made in the Black Lake mill of the Company. A great deal of stripping was done on this property.

Quebec Asbestos Corporation, Ltd.—This company in 1927 concentrated its operations on mine No. 1, on lot 13b range VI of Broughton township, which was formerly the Ling mine. At mine No. 2, on lot 13c, range VI, operations were carried on during the first part of the year, but were stopped in March. Later in the year the machinery was taken out of the mill, and the building itself was dismantled, the ground on which it stands being good asbestos rock. Eventually mines No. 1 and No. 2 will be combined into one set of workings. Meanwhile pit No. 1 alone is being worked.

Canada Asbestos and Chrome Co.—In December 1927, the Sudbury Diamond Drilling Co., started work on a contract for 2000 feet of drill holes on the property of the Canada Asbestos and Chrome Co., to test its ground.

Public Industrials Corporation.—This company carried on some prospecting work on lot 20, range XI of Tingwick township, some five or six miles east of the Jeffrey mine of the Canadian Johns-Manville Co.

The work effected during the summer of 1927 included 100 feet of trenching and some test-pitting. Moreover two pits which had been sunk on this property by the Martin interests eighteen or

twenty years ago, were dewatered. The larger of the old pits is 90 feet by 50 at the surface and about 60 feet deep, while the smaller measures 45 by 35 feet and is 15 feet deep.

The Public Industrials Corporation intend to treat the asbestos rock of this mine by the wet process of recovery of the fibre, developed by Selective Treatment Company, which has been referred to in our previous reports.

WORLD'S PRODUCTION OF ASBESTOS IN LONG TONS. (1)

Producing Country	1924	1925	1926
BRITISH EMPIRE			
Southern Rhodesia	23,340	30,669	29,771
Union of South Africa	6,767	9,561	13,884
Canada	202,205	251,534	282,018
Cyprus	3,836	3,290	6,197
India	125	16	18
Australia	78	51	not available
Total:	236,400	295,100	331,900
FOREIGN COUNTRIES			
Finland	not avail'le	1,325	2,133
France	868	not available	not available
Italy	2,125	2,071	2,500
Russia	8,318	12,431	(2) 20,000
United States	268	1,123	1,212
Bolivia	50	not available	not available
China	125	213	not available
Japan	611	1,155	not available
Total:	12,000	19,000	28,000
World's Total	248,000	314,000	360,000

(1) From "Statistical Summary 1924-1926." Mineral Industry of British Empire and Foreign Countries. Imperial Institute, 1927.
(2) Approximate only.

ASBESTOS IN OTHER COUNTRIES

South Rhodesia.—The 1927 production of asbestos from South Rhodesia amounted to 33,176 tons, valued at £794,217, or $3,859,900. The average value was therefore $116. a ton. Compared with the production of the previous year, which was 33,344 tons at $106, it is a slight decrease in tonnage but a substantial increase in value.

The construction of the railway branch, connecting the Shabani asbestos mines with the Rhodesian railway system, has been proceeding actively, and service was expected to be opened early in 1928.

Union of South Africa.—The latest available figures of production of asbestos for the Union South Africa are for the year 1926 and they are given in detail in the following table: (*)

	Amosite		Chrysotile		Blue		TOTAL	
Province	Tons	Value $	Tons	Value $	Tons	Value $	Tons	Value $
Transvaal.....	2,940	138,893	7,133	515,087	31	5,738	10,104	660,716
Cape Prov.....	.....	.....	.....	.....	3,993	392,391	3,993	392,391
Total:.....	2,940	138,893	7,133	515,087	4,024	398,129	14,097	1,053,107

The total figures, 14,097 tons valued at $1,053,107 constitute a record both as to quantity and value for the Union of South Africa.

Russia.—"A recent Moscow report states that during the period 1910-14, Russia produced 89,000 tons of asbestos, in the period 1915-1919, 38,000 tons, and in 1920-24, 21,300 tons. In 1925 the output was 11,600 tons, and the estimated output for 1926 is 20,000 tons. The Industrial Planning Committee of the Supreme Economic Council has ambitious schemes for development during

(*) From report Secretary for Mines and Industries, of Union South Africa, for 1926, Pretoria, 1927.

the next five years, the particular aim being to find a market for the lower grades." (1)

The imports of asbestos from Germany into the United States, presumably from Russian sources, amounted to 312 tons valued at $65,424 in 1926, and to 1,591 tons valued at $430,475 in 1927.

Cyprus.—The production of asbestos from the Cyprus mines for 1926 was reported as 6,197 long tons, and for 1927 as 11,200 long tons.

Italy.—For the last few years a deposit of asbestos fibre disseminated in serpentine, has been developed and is now actively worked in Italy, 20 miles north west of the city of Turin, at San Vittore mountain. The mine and mill are situated within two miles of the Turin-Lanzo railway.

The first mill, treating 600 tons of rock a day, is being added to in 1927, to treat 1,400 tons, which will produce 25 tons of fibre a day. A third unit is being considered, which would increase the annual production to 10,000 tons of fibre. The serpentine is of the East Broughton type according to Prof. Vinissa di Rigny, and yields short fibre for the manufacture of "Eternit" products, millboard, asbestos paper, and heat insulating coverings.

(1) From "The Mineral Industry in 1926," McGraw-Hill Book Co., New York, 1927.

ASBESTOS MILLING AND DRESSING FOR THE MARKET (*)

By Eugène Larochelle, Inspector of Mines, Thetford Mines, Que..

The serpentine of the Eastern Townships of Quebec is more or less, seamed and impregnated with chrysotile asbestos. of which we note two types: the cross-fibre and the disseminated fibre.

The cross-fibre type always appears in fibres or crystals arranged parallel to one another, disposed at right angles to the walls of the matrix serpentine. The length of fibre of these veins, which run in every conceivable direction, even crossing one another, varies from microscopic dimensions to three and sometimes four and even five inches. It is the principal form of asbestos found in the serpentine of Thetford Mines, Black Lake, Coleraine and Asbestos.

The disseminated fibre type, which is the main product of the serpentine of Broughton township, in which are located the mines at East Broughton, does not form veins, but occurs in serpentine without any definite arrangement. There is a difference in the toughness and hardness of the rock of the two types, the serpentine from Broughton being softer than that at Thetford. The disseminated fibre section of the serpentine belt is probably more regular in its content than is the cross-fibre section. It contains no crude, which is the most valuable asbestos, and the fibre is usually shorter.

Asbestos as it is put on the market, is divided into two classes: crude and fibre, which are respectively subdivided into various grades. The product known as "crude asbestos" consists of veins of asbestos, of the cross-fibre type, the length of which is 3-8 of an inch and longer. The process of converting it into a saleable article being hand cobbing as opposed to mechanical treatment through which the fibre is obtained from both types of asbestos-bearing rock or serpentine.

A separation of asbestos-bearing rock from dry or barren rock is made in the pit after blasting. Furthermore, in as far as possible, the rock containing veins of 3-8 of an inch or more is selected and,

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(*) Paper presented at the twenty-ninth Annual Meeting of the Canadian Institute of Mining and Metallurgy, Quebec city, March, 7th-9th, 1928.

as much as practical, all of the asbestos embedded in it is removed by hand cobbing and set apart as crude-bearing rock. The remainder is mill rock. The barren or dry rock is immediately sent to the waste dump. The crude-bearing rock is directed to the cobbing shed, whereas the mill rock goes to the mill for mechanical treatment.

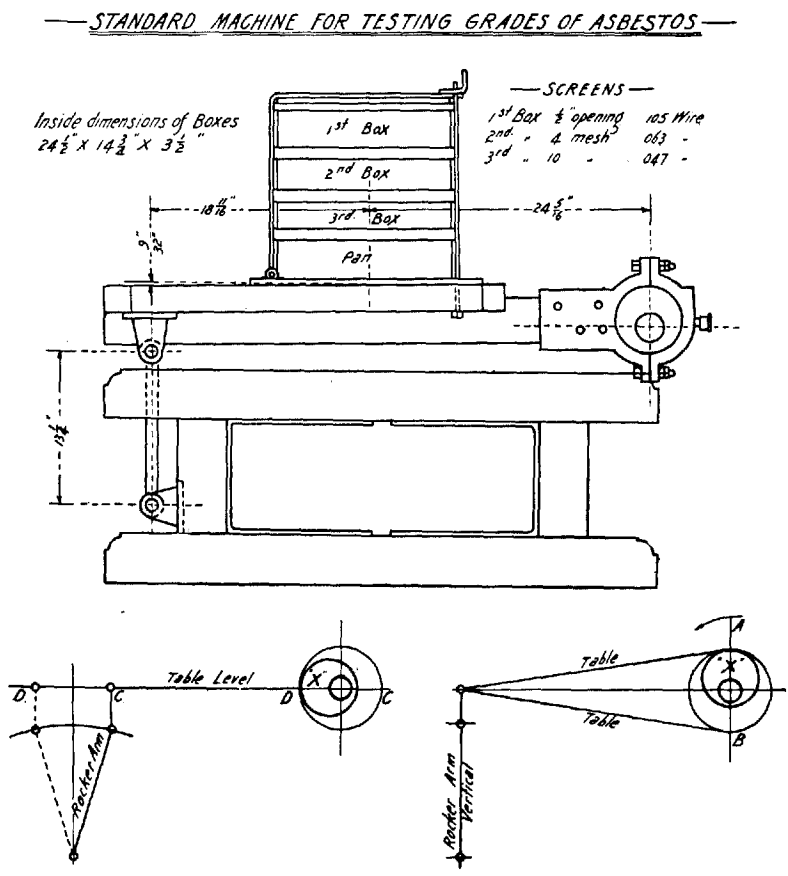
At the cobbing shed are heavy tables, with surface of thick iron plates, on these the cobbers, using a special hammer separate the veins from the rock. The vein is then lightly hammered in order to eliminate all rock adhering. At the same time, the cobber classifies the crude into two grades: No. 1, 3-4 of an inch or longer; No. 2, 3-8 of an inch to 3-4 of an inch. Crude must have a silky structure, be of a high enough tensile strength to permit its use in the manufacturing of asbestos yarn, cloth, carded fibre and other asbestos textile stocks. Its colour is also an important factor in the determination of its market price.

Each cobbing table is provided with special compartments to receive the different grades and the waste. In order to get rid of all rock particles retained in the loosened crude, each grade is passed over a screen under the supervision of an experienced man whose purpose is to see that the work has been carefully done and who accepts or rejects the crude submitted. All that is refused at the cobbing shed or rejected by the screens is directed, with the mill rock, through the mechanical treatment.

Before trying to describe the process adopted in asbestos separation, it is necessary for clearness, to describe the different grades of fibre produced in asbestos mills.

Grading.—Market requirements cover length, strength, colour and chemical composition. Undoubtedly the length of fibre is the most important factor to be considered by our producers, as the Quebec asbestos easily meets all the other requirements. The length is important as the requirements of the manufacturer vary with the use to which asbestos is put. For instance, the brake lining and textile industries require a much longer fibre than the shingle industry. The latter is much more exacting in its requirements than the paper-stock industry, and in the manufacturing of boiler insulation the fibre used is much shorter than paper-stock.

To meet the demands of the market, a standard method of classifying fibre has been adopted by which the length of fibre is controlled. In spite of the different trade names given the grades by the producers, there is no need of confusion for the purchaser



Standard machine for testing grades of asbestos.

who relies upon the standard test. The test is made on a machine known as the standard testing machine, a drawing and a description of which follow.

The machine consists of a nest of four wooden boxes, measuring 24½-in. by 14¾-in. and 3½-in. in depth. The boxes which are super-

posed one above the other, are numbered from the top down 1, 2, 3 and 4. The bottoms of boxes Nos. 1, 2 and 3 are made of metallic screen of the following specifications: Box No. 1: ½-inch opening, diameter of wire, 0.105 inch. Box No. 2: 4-mesh, wire, 0.063 inch. Box No. 3: 10-mesh, wire, 0.047 inch. Box No. 4 is a receptacle for the fines which fall through the three other boxes. The nest of four boxes or trays rests on a table to which an eccentric with a throw of 25-32 inch gives a movement of 1 inch 9-16 travel.

To make a test, 16 ounces of asbestos is put on the top tray which is covered. The machine is run at the rate of 300 r.p.m. at the shaft of the eccentric, and by means of an automatic device, this is kept going for exactly two minutes, giving the nest, a horizontal shaking movement. At the end of this time, the asbestos which remains on each tray is weighed. This gives the grades of the asbestos fibre; the longest fibre naturally stays on the top tray whereas the shorter fibre, according to its length, remains on screens 2 and 3 or drops into the pan or lowest tray. The more fibre retained on the first screen and the less fibre in the pan, the higher the grade and therefore the greater its value. If for instance a customer buys spinning fibre of the specification: 4 - 7-4 - 1, it means that in a sample of 16 ounces, representing the average of the lot shipped, 4 ounces will remain on the top screen, 7 on the second, 4 on the third and finally 1 ounce will go through all the screens into the pan. He will evidently pay more for this material than for paper-stock testing 0 - 0 - 10 - 6. This indicates that out of 16 ounces tested, nothing is retained on the first two screens, 10 ounces remain on the third and 6 ounces go through the latter into the pan. It is evident that the figures of the test represent the proportion in ounces of the different lengths of fibre in a pound of asbestos.

The following classification is generally adopted by the various producers:

Long Spinning fibre: 4-7-4-1.

Medium Long Spinning Fibre: 2-9-4-1 to 2-8-4-2;

Spinning fibre: ½-7½-6-2 to 0-8-6-2;

Magnesia and Compressed sheet fibre: 0-5-8-3;

Shingle fibre: 0-3-9-4 to 0-1½-9½-5;

Paper-stock: 0-0-11-5 to 0-0-10-6;

Pipe furnace covering or cement: 0-0-7-9 to 0-0-5-11.

Floats and refuses are not sold on guaranteed length, but according to colour, cleanliness and weight per cubic foot.

Milling.—Touching now the question of asbestos milling it must be stated that the greater part of the rock mined is mill rock containing asbestos fibre varying from microscopic lengths to three quarters of an inch. Of the 4,483,361 tons of rock mined and hoisted during 1926, 4,002,626 tons were sent to the mill. It gave 301,044 tons of fibre, and calculating on the total tonnage hoisted, we find a yield of 6.71%.

As to the process of asbestos separation, I could not find a better definition of it than the one given by Mr. John A. Dresser in his "Preliminary report on the serpentine and associated rocks of Southern Quebec." Mr. Dresser expresses himself as follows: "The essential features are successive crushings and screenings of the rock, and the removal of asbestos thus liberated by means of suction fans."

Although in the district, there are no two mills built alike, the principles applied are the same in every mill, only the methods of application differ. As the value of the fibre varies with its length, it is most important to reduce serpentine gradually, eliminating all fibre as soon as liberated thus avoiding all unnecessary crushing, bruising and cutting.

The mill rock coming from the pit contains a great deal of moisture, and before any attempt is made to lift the fibre, by means of the suction fans, the rock must be thoroughly dried, as the efficiency of a fan, when lifting, depends on the weight of the material.

Asbestos mills are generally composed of two distinct sections. Firstly, the crushing and drying plant, wherein coarse crushing and drying of the rock take place. Secondly, the fiberizing and screening plant in which the operations consist of fine crushing, fiberizing, collecting of asbestos and finally grading.

Each one of these plants, being in duplicate, assures a greater efficiency by avoiding unnecessary delays or loss of time due to repairs. In addition to this, it is the practice at almost every mill to have, between the crushing and screening plants, a storage bin for dried crushed ore, from which the feed of the screening plant is drawn. The storage bin has many advantages, of which the most important is to assure mill operations in spite of interruption of work in the mines, due to inclement weather. Also, through its means it is possible to supply the mill with a constant and regular feed which can be controlled in any way.

Crushing and Drying Plant.—All of the primary crushers in

the district are of the jaw type. Their size varies considerably in the several mills, as it is governed not only by the amount of rock to be crushed, but also by the size of the material delivered to them. In fact, when large capacity shovels are used for loading cars, the crushers must be of a size capable of receiving the rock as furnished, and crushers as big as 48″ x 60″ are then used.

As, following the primary crushing the material has to be conveyed to secondary crushers or drying apparatus, it is the custom at most of the mills to pick off whatever crude has escaped the forementioned sorting in the pit. Foreign matter, such as wood or pieces of broken steel (rubbish), are also removed. At some of the mills, after the primary crushing, the rock is immediately directed to the dryers. At others, it is passed through secondary and even tertiary crushers before it is dried.

The secondary crushing equipment varies considerably; some producers use corrugated rolls, some gyratories and others jaw crushers.

Nor is there a standard practice established in drying apparatus. Some use a single shell, direct fire, rotary type dryer, with forced draught applied under the fire-box, in some cases, this is placed at the charging end of the dryer, that is, the rock travels in the same direction as the heat; in others, the fire-box is placed at the discharging end, the material flowing in a direction opposite to the heat. Another type which is very popular with some producers, is the vertical dryer. The crushed rock is delivered to the top by elevators and it falls by gravity, in a direction contrary to the flow of the heat. The act of dropping is hindered by baffle plates placed in the inside of the drying stack.

The rock being dried and crushed to about two inches is then carried by means of elevators and conveyors into the storage bin to be drawn upon by the fiberizing and screening plant as required. The latter is the mill proper and it is in this plant that the actual separation of asbestos from serpentine takes place. The machinery used in the crushing plant has for its main object the reduction of rock to a size suitable to be treated in the fiberizing machines together with the liberation of the asbestos from the rock. However, the fibre thus liberated is in a compact form, not as yet having been opened up. Therefore the object of the fiberizing machines, is not only to reduce the rock, thus liberating the fibre, but also to divide and split the coarse fibre into fine fibre, and

bringing it to a fluffy form, and making it more amenable to the lifting and separation by means of suction fans.

Fiberizers.—There are different types of fiberizers, of which four are here described: the hammer mills, the jumbos, the Laurie and the Pharo cyclones.

The hammer mill, in addition to being a fiberizer, also reduces the size of the rock ahead of other fiberizing machines. It disintegrates the rock and reduces it considerably in one operation, thus increasing the capacity of other fiberizing machinery. It consists of a series of discs fixed on a horizontal shaft; to each disc are attached six swinging hammers. These hammers strike over grate bars of a special design. As the general size of hammer mills contains 60 separate hammers, and the discs are revolved at a speed varying upwards from 700 r.p.m., it is evident that the number of impacts or blows delivered is tremendous.

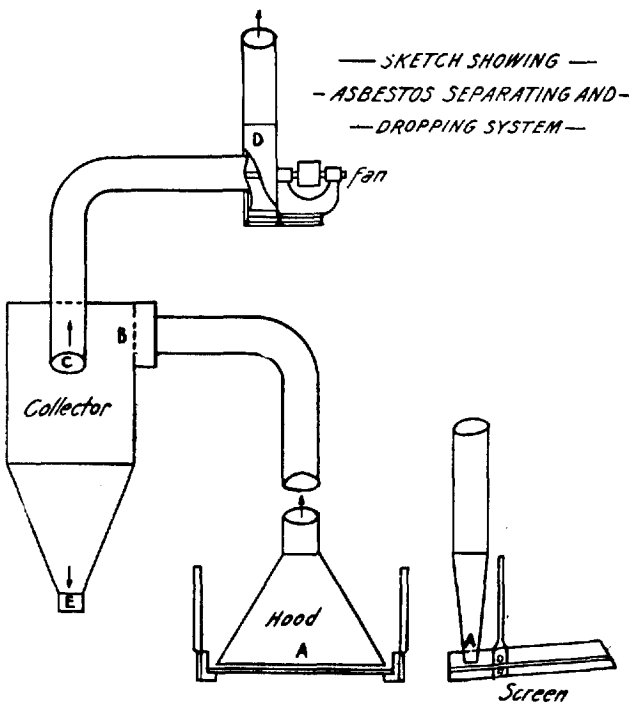
The jumbo consists of a cylindrical shell made of steel plates with cast iron heads and chilled cast iron beaters. The shell is composed of halves hinged together so as to facilitate opening for cleaning and repairs. The shaft has four keyways to receive six pairs of arms placed at six-inch interval and disposed crosswise to each other. The arms are made of heavy steel bars carrying at the cutter chilled iron beaters, the faces of which are on an angle to drive the material from the feed to the discharge end.

The Laurie cyclone consists of two beaters of the screw propeller type, driven at a speed of 1,700 to 2,000 r.p.m., in opposite directions, in a cast iron chamber. The material is regularly fed through feed holes, and the whirlwind created by the beaters hurls the particles against each other with such violence that they are disintegrated and the fibre liberated. One of the objections to the Laurie cyclone being its tearing effect on the fibre, Mr. G. E. Pharo, of Thetford Mines, has designed a special type of cyclone which has reduced to a great extent this tearing effect encountered in the Laurie cyclone.

The Pharo cyclone is essentially a cyclone of the Laurie type with the following alterations: The hood above the discharging end is cut off immediately above the latter, and the crushing blades or beaters, of which the paddles are one right and the other left, rotate in the same direction. This cyclone also has the advantage of an even discharge of the material by means of a gate which regulates the size of the outlet. The smaller the opening, the longer

time the material is thrown against the liners of the machine and the finer the reduction obtained.

As the material reaching the mill contains a great quantity of freed asbestos, the process of separating the asbestos fibre begins immediately. In fact, on its arrival in the mill, it is put through a screening trommel; the fines are discharged on a shaking screen and the overflow, that is all 1½ inch and over, falls in one of the



Sketch of apparatus to separate asbestos fibre from the crushed rock. "A" Suction hood which draws up fibre from the screen. "B" Collector in which asbestos fibre is dropped.

fiberizing devices, above described, which discharges on the same shaking screen.

The latter which is slightly inclined, is flat and made of wire or perforated plates. It is also provided with an oscillating movement by an eccentric; the frames being supported from suspending rods. This oscillating movement, apart from sizing the rock and eliminating the sand, causes the fiberized asbestos in

its forward course to come on top. At the discharging end of the screen, the hood of a suction fan takes up all the liberated fibre. The overflow falls in a second fiberizing machine which, too, discharges also on a screen where the asbestos is lifted also by means of a suction fan, and so on till the rock is practically pulverized. A tailing practically free of fibre is sent to the waste dump.

Fans and Collectors.—The work effected by the fans is of the highest importance. Asbestos must not go through the fan, for besides being cut by the blades it is very hard on the fan, and the blades wear out rapidly. Therefore, the system adopted at most of the mines is the "rarefied" or vacuum system. That is a "fall-through" type of collector is located in the path of the material between the fan "D" and the hood at "A". The circulating air, as it enters into the collector, is reduced in pressure, and the fibre retained is thus liberated. It falls through a discharge tube "E" on a screen or into a grading screen. The air and fine dust escape through the top "C" of the collector through the fan which blows then into a dust-chamber or float-chamber.

Fans for the handling of asbestos are known as the exhaust type and are constructed in different designs depending largely on the work they will be used for. In the early days of asbestos milling, a standard type of fan was used on each screen. This type of fan was pulley driven and the wheel or runner arranged with six straight blades. They were operated at speeds from 1000 to 2000 r.p.m., the pressure ranging from 7 to 10 inches water and the volume of air from 2500 to 3600 cubic feet per minute. The sizes mostly used were the 35-in. and the 40-in. The material was drawn from the screens through the fan which was blowing into a collector.

Some few years later the multiblade type of fan was tried out and gave better results than the old standard type fan. The wheel or runner has many blades fastened to a back plate. They are constructed for belt drive or for direct connection to motors. The speeds range from 850 to 1000 r.p.m. and the volume of air handled is from 18000 to 23000 c.f.m. These types of fans are arranged for connections to two or more screens and generally used with the fall-through type collector.

On the new installations put up within the last few years a special constructed asbestos type fan has been used, known as the Keith asbestos fan and manufactured by the Sheldon Co.

This type of fan is designed for handling large volumes of air at considerable less h.p. than the old standard or multiblade type. They are built for belt drive or for direct connection to motors. When for motor drive, they are specially designed and built to suit the speed of the motor. They are of heavy construction and equipped with ball bearings.

The range of speed for this latter type of fans is from 700 to 900 r.p.m. As to the air velocities used, they vary according to the material and range from 2500 to 4500 cubic feet per minute.

As to the fall-through type of collectors, they are designed and built to the size required to take care of the asbestos and the volume of air handled by the fan. In some cases a collector is used on each screen, in others, there may be two or three screens connected with one collector.

The pipe from the screen hood is connected to the side or body of the collector, and from the top of the latter the pipe connects to the inlet of the fan. The length of piping between the hood and the collector and the fan inlet together with the length of pipe on the discharge side depends largely on the system. In the design of the conveying pipes or ducts and elbows, precautions should be taken to assure a smooth and unobstructed path for the material, as irregularities in the ducts might catch and hold the material and eventually interfere with the successful operation of the system. The size of the pipe connection necessary depends on the amount of air to be moved and the velocity of flow.

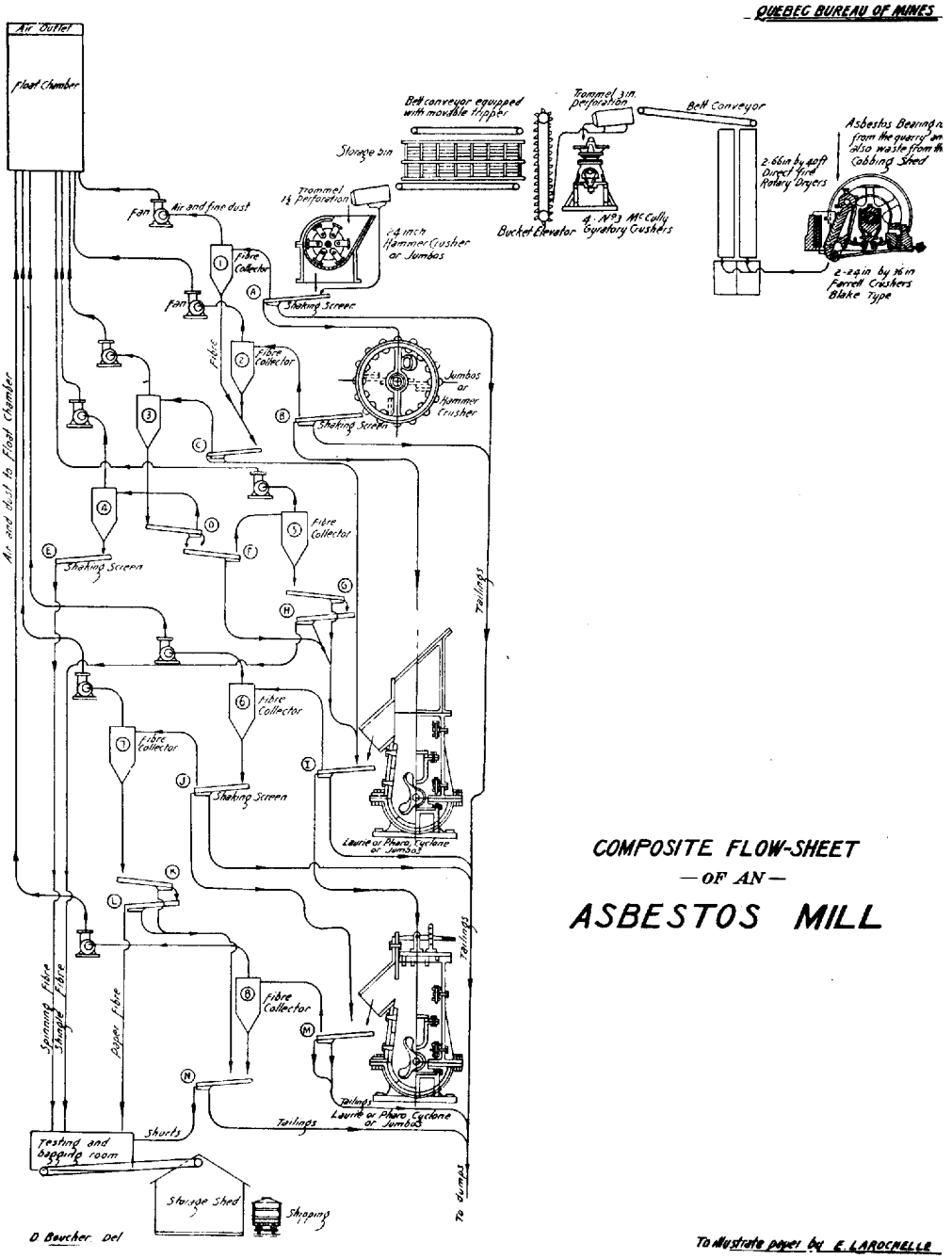
The resistance is usually found to be from one inch to one and a half inch water.

The dust-chambers are large buildings alongside the mills to which they are connected by large conduits. The lower part of the main building and conduit are hopper shaped; there is a drag in the bottom for gathering the floats to a central point. The building is sometimes provided with partition walls made of burlap as filter cloth and through which all the air is filtered before it can reach the chimneys off escape to the exterior.

The size of the dust-chambers are carefully figured so as not to affect in any way the resistance of the fan system.

Flow sheet of mill.—In order to illustrate the process generally adopted, a flow sheet of a typical mill is given on the following page.

QUEBEC BUREAU OF MINES



COMPOSITE FLOW-SHEET

— OF AN —

ASBESTOS MILL

To illustrate paper by E. LAROCHELLE

All the asbestos rock received from the mine is dumped into two jaw crushers which discharge on a belt conveyor transporting the material to two rotary type direct fire dryers. The latter discharges on a belt conveyor taking the dried rock to a screen or trommel which divides the material into coarse and medium. The coarse is crushed again by means of four gyratory crushers. The gyratory discharge and the undersize from the trommel are carried up by means of a bucket elevator to a belt conveyor which being equipped with a movable tripper distributes the material into a storage bin. The bottom of the bin is equipped with double cut-off gates discharging on a belt conveyor transporting the feed to the mill.

As the mill consists of two independent, but identical units only one of them appears on the flow sheet here described. Although there are various other combinations, to avoid confusion, I have taken one producing only four grades, as follows: spinning fibre, shingle stock, paper stock and short fibre.

As it reaches the mill, all of the material is passed on a screen which effects a division into fines and coarse. The coarse goes to a hammer mill while the fines fall on a screen "A" which also receives all the material discharged from the hammer mill. At the discharge end of screen "A", the hood of a fan takes up all the liberated asbestos fibre to collector "1". In the latter owing to a drop of pressure of the circulating air, the asbestos drops on screen "C", the air and fine escape through the top of the collector through the fan which blows into a dust-chamber. The overflow from screen "A" falls by gravity into a second hammer mill which discharges on screen "B". Thereon, takes place, after due screening, the aspiration by system "2" of which the collector discharges on screen "C". The overflow of "B" is delivered to a cyclone fiberizing machine. Screenings from "A" and "B", which are fine rock, go immediately to the tailing belt.

At the discharge of "C", the fibre collected by the system "3", drops through the collector "3" on screen "D". On the latter, which is really a grading screen, two grades are made. The long fibre is lifted by the system "4" discharging on cleaning screen "E". The overflow of "E" is the spinning fibre which being ready for the market is directed to the bagging room. The shorter fibre, that is the overflow and screenings from "D", fall on screen "F", which effects a separation of the very short from the longer fibre,

which is aspirated at the discharge of "F" and deposited by collector "5" on screen "G". The latter discharges on screen "H" of which the overflow is the shingle stock.

The overflow and screenings of "C" together with the screenings of "F", "G", "H" are directed to screen "I" which also receives the discharge of the first cyclone. The fibre goes through exactly the same process of lifting and cleaning as described for the two preceding grades, that is it is drawn off by system "6" and dropped on screen "J", thence lifted by system "7" and dropped on grading screen "K", which discharges on "L" of which the overflow is paper stock.

All of the overflow of "I" falls in a second cyclone machine which discharges on screen "M", also receiving the overflow from "J". The fibre is lifted by "8". The discharge of collector "8" together with the screenings from "K" and "L" fall on screen "N" of which the overflow is short fibre. The screenings from "I", "J", "M" and "N" are carried away on a belt conveyor to the waste dump.

The product of the above separation is classified in the Preliminary Report on the Mineral Production of Quebec in 1927, as follows:

Crude No. 1	average price		$423 65	per ton.
Crude No. 2	"	"	249 59	
Crude run of mine	"	"	226 73	"
Spinning fibre	"	"	129 32	"
Shingle fibre	"	"	64 80	"
Mill board and Paper fibres	"	"	37 82	"
Fillers, Floats and other Short fibres	"	"	14 73	"

The author would like to acknowledge his indebtedness to the following publications, which were consulted in the compilation of the material for this paper.

The Quebec Asbestos Industry. A general description by Norman R. Fisher.

Chrysotile Asbestos. Its occurrence, exploitation, milling and uses by Fritz Cirkel.

Preliminary Report on the Serpentine and associated rocks of Southern Quebec by J. A. Dresser.

Asbestos and its importance as a National Asset, by E. Schaff Regelman.

The author is very much indebted to Mr. Geo. Oliver of the Sheldon Company for information given in regard to fans as used in asbestos separation.

COPPER

In the past in our annual reports the copper ores and the pyrite, or sulphur ore, have always been considered together as the larger tonnage, or even the whole production, of the ores, consisted of copper-bearing pyrite which was used for the manufacture of sulphuric acid and the cinder, or residue, resulting from this operation was smelted for the extraction of the copper metal.

The methods and the conditions have changed. The copper-bearing pyrite ore of the Eastern Townships is now milled and separated into copper concentrate which is shipped direct to the smelter, and sulphur ore which is shipped to sulphuric acid works. So that those two products can now be reviewed separately.

Moreover an important copper producing industry is developing, with the coming in of the Western Quebec deposits and the blowing in of the Noranda smelter, which began producing blister copper in December 1927.

In 1927, the copper produced in the province of Quebec amounted to 3,119,848 lb. which represented a value of $407,146. This was partly in the shape of high grade concentrate shipped from the Eustis mine to United States smelters, and partly as blister copper produced by the Noranda smelter from the Horne mine ore in Rouyn township. There was also a small trial shipment made in the course of development work, by a mine in the Harricana district.

The Eustis Mining Company operated the Eustis mine from January 1st to June 30th, when the name of the organization was changed to the *Consolidated Copper and Sulphur Co.*, The new company continued the exploitation of the Eustis mine and mill, and moreover acquired the neighbouring property, the Albert mine.

Apart from the actual mining operations a great deal of development and security work has been effected at the Eustis mine. Old stopes have been filled between levels 28 and 32 to the east of the shaft, and between levels 34 and 37 to the west. From level 3,700 a 300-foot winze has been sunk 45° inclination to

a depth of 4,000 feet from the main adit, which gives a total length of 4,500 feet along the inclination of the shaft, measured from the old shaft collar on top of the hill to the lowest point in the workings.

At level 3,400, a long tunnel, 2,000 feet in length, is being driven towards the Albert mine, to strike the ore deposit of the latter below the old workings. The two mines will be worked as one, the hoisting being done by the Eustis shaft.

We record this year the first production of blister copper from Western Quebec, the first pouring of the Noranda smelter converters having been effected on December 17th, as recorded elsewhere. This is an event which is an important milestone in the copper industry of Quebec. Before the end of the year, 235 tons of copper ingots had been shipped to a New Jersey refinery. The ore from which this was produced came altogether from the Horne mine. A great deal of activity reigned all year in Western Quebec, which is reviewed in detail in the article entitled "Progress in the development of the Mineral deposits of Western Quebec in 1927", by Messrs A. O. Dufresne and R. H. Taschereau, which is given further on in this report. Much development work was done on the copper deposits, over and above the assessment work required by the law to keep the mining claims in good standing.

ZINC AND LEAD

The lead and zinc production amounted to 7,729 tons of lead concentrate and 21,839 tons of zinc concentrate, which contained 7,524,120 lb. of lead and 22,444,641 lb. of zinc. Of these quantities 6,496,577 lb. of lead, valued at $341,461, and 17,189,046 lb. of zinc valued at $1,064,690, were accounted recoverable, and the latter figures are the ones appearing in the table of production.

These concentrates were produced from 152,324 tons of ore milled, of which 14% were retreatment of old tailings taken from the dumps left by previous operators.

These figures are very gratifying indicating an increase of 65% in the quantity of lead, and of 35% on the quantity of zinc as compared with the production of 1926. As to the total value of these metals it increased only by 16% owing to the fact that the average price for lead in 1927 was 6.755 c. a lb., as compared with 8.417c. in 1926, and zinc was 6.24 c. instead of 7.337 c.

The British Metal Corporation, (Canada) Ltd, report having worked their mine at Montauban, near Notre-Dame-des-Anges, in Portneuf county, for the full possible 310 days during the year.

During the year, 1,415 feet of diamond drilling was done, from the surface and from the 500-foot level. Drifting and cross-cutting to the amount of 464 feet was done on the 400-foot level, all towards the north as exploratory work.

The ore was mined on all levels, from the surface down to the 500-foot level. The average production was increased from 8,000 long tons a month to 10,000, and all the production came from the workings to the north of the shaft, the southern portion of the mine having been practically abandoned for the present.

The head of the shaft was remodelled and enlarged during the year

Extensive improvements were introduced in the mill. A second 20" x 10" crusher was set up. Eight Callow cells $15\frac{1}{4}$ by $2\frac{1}{4}$ feet were renewed, and a new No. 4 Root blower was put in place. A new plant was put up to treat over the mill tailings left by the previous operators; it consists of pumping equipment, a duplex Dorr classifier and thickener model C. The concentrates are hauled from the mill to the station of Notre-Dame-des-Anges, about $5\frac{1}{2}$ miles, by three four-wheel-drive trucks, self-dumping. The concentrates are all shipped from Quebec harbour to Belgium.

An extremely good and detailed paper on the Tetreault mine and mill, was presented at the Quebec meeting of the Canadian Institute of Mining and Metallurgy, in March 1928. It appeared in full in the Bulletin of the Institute for March 1928. The paper, entitled "Mining and Milling at the Tetreault Mine", contributed by the staff of The British Metal Corporation (Canada), Ltd. was ably presented by Mr. R. D. Hearn. Extracts from this paper are given further on in this report.

It may be added that along the southern border of the Laurentian Plateau, from Murray Bay to Mattawa, there are numerous patches, or outliers, of Grenville rocks, where the geological associations such as have been observed at Montauban, are duplicated, quartzites, paragneisses of sedimentary origin and crystalline limestone. Such areas are worthy of close examination, for mineralization conditions analogous to the Tétreault mine deposits might very easily exist in them.

For the purpose of calling the attention of the prospectors to the favourable opportunities which the region offers, Mr. John A. Dresser, mining geologist, has undertaken, for the Quebec Bureau of Mines, a series of geological traverses, to map and examine such developments and patches of Grenville rocks. In 1927, such traverses were effected in the southern portions of the counties of Montmorency, Quebec, Portneuf, Champlain, St-Maurice and Maskinongé, and the results of the season's work, have been recently published, with maps and plans, in a short separate report. (1)

In Gaspé, the renewal of interest which we mentioned in our last year's report as having taken place in the winter 1926-1927, was well sustained all year, and considerable prospecting work was carried on all summer.

By kind permission of the Director of the Geological Survey of Canada, an excellent article, by Dr. F. J. Alcock, entitled "Gaspé Peninsula, its Geology and Mineral Possibilities" is given elsewhere in this report. To it is adjoined a sketch plan of the holdings, in the township of Lemieux, of the companies and individuals who have done some work on their claims, beyond assessment requirements. The article brings right up to date the discoveries made and the underground work done.

Deposits of lead and zinc are not confined to the eastern part of the Province. In the western part of the Province important deposits of zinc ores have been discovered in the townships of Rouyn, Dufresnoy, Duprat, Boischatel, Desmeloizes. An occurrence of lead has been observed in Guyenne township. These deposits and occurrences are referred to in the article by Messrs Dufresne and Taschereau, under the heading "Progress in the development of mineral deposits of Western Quebec in 1927" on page 77 of this volume.

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(1) Geological Traverses in the counties of Quebec, Montmorency, Portneuf, Champlain, Saint-Maurice, and Maskinongé. Published by the Quebec Bureau of Mines, 1928.

MINING AND MILLING AT THE TETREAULT MINE (*)

The Tétreault mine, operated by the British Metal Corporation (Canada), Limited, holds a unique position in Canadian mining, being the only steady producer of zinc in Canada east of the Rocky mountains.

Its importance in Canadian zinc production may be gauged with some accuracy, since, in 1927, it was responsible for over 13 per cent of the zinc output of the Dominion. In addition, it also made valuable contributions to the production of lead, silver, and gold.

Situated in the foothills of the Laurentian mountains, 600 feet above sea level, 20 miles from the St. Lawrence river, and 52 miles due west from the city of Quebec, the property is in the township of Montauban, county of Portneuf, Province of Quebec.

The municipality of Montauban, immediately adjoining the mine, has a permanent population of 700 people and is six miles by road from Notre-Dame station on the main line of the C. N. Rys. between Montreal and Chicoutimi—Notre Dame being 126 miles by rail from Montreal.

Although the country between Notre Dame and the St. Lawrence river has been a settled agricultural region for over sixty years, the first known discovery of mineral was made in 1910, when zinc blende and galena were found at Montauban. In 1911 Mr. Pierre Tétreault acquired the ground now forming the Tétreault mine.

The following year a gravity-concentration mill was erected, but failed to produce a commercial grade of zinc concentrates from the complex ore. In 1913 and 1914 about 1,300 tons of high-grade sphalerite were shipped from sinking operations.

In October, 1914, the Weedon Mining Company leased the portion of the property extending for 800 feet south and 100 feet

(*) From Bulletin Can. Inst. of Mining and Metallurgy, March 1928. Extracts from paper by "Staff of The British Metal Corp. (Canada)", read at Quebec meeting of Can. Inst, of M. and M.

north of what is now the main shaft, which, at that time, had been sunk to a depth of 90 feet, and encountered high-grade sphalerite.

In 1915 a separate operating company was formed, the Zinc Company, who worked the lease until its expiration in 1921. During this time the old Tétreault mill was remodelled, and milling began with some success. In 1916 a new mill of 200 tons capacity was constructed and embodied some oil flotation in the flow sheet.

In the meantime, the old mill had reverted to Mr. Tetreault, who added a roasting unit and magnetic separation plant. The process was not successful.

In addition to the new mill, the Zinc Company erected a zinc oxide plant, at Notre-Dame station to treat the mixed zinc and iron sulphides from the concentrator. After having been in successful operation for some time his plant was destroyed by fire.

In this period of operation, production of zinc and lead amounted to $680,000, with other values in gold and silver, high prices during the war years accounting for a great deal of the value, compared to the tonnage mined.

It is interesting to note the terms of an agreement formulated by producers and smelters in 1918, whereby flotation material was penalized $5 per ton.

After a desultory period of more than a year and a half, the property was reopened in the spring of 1923 by the Pierre Tétreault Estate, who operated until October, 1924, when The British Metal Corporation (Canada), Limited, began active operations.

Prior to the advent of the British Metal Corporation, practically all mining had been carried out south of the shaft. It was estimated that close to 250,000 tons had been extracted from the stopes and very little more could be expected from this portion of the mine.

The shaft had been sunk to a depth of 300 feet at 60°, with stations at 85, 200 and 300 feet, and a winze sunk a further 100 feet to what is known as the 400 level. At the 200, 300 and 400 levels, short drifts extended northward and small open stopes from each of these levels had been started.

In addition, the old Tétreault shaft about 1,000 feet to the north was at a depth of 100 feet, with a small amount of stopping done in its vicinity.

The rocks of the region are Grenville quartzites and gneisses intruded by amphibolite and granite. The gneisses consist of

Tétreault mine and village of Montauban-les-Mines, Portneuf county.

quartzose-biotite gneisses, hornblende-biotite gneisses, sillimanite-gneiss, and cordierite gneiss.

The ore occurrence is confined to an impure dolomitic limestone body within the gneisses. The limestone, highly altered in part to tremolite and containing numerous other secondary minerals, can be traced on the surface for a length of 3,000 feet, and varies in width from a few feet to 100 feet. This tremolite-bearing band tapers out in both directions, and to the north loses its distinctive character.

The amphibolite rocks occur mainly as sills following the foliation planes of the gneisses with small irregular dykes cutting into, and in some cases through, the limestone. Garnet has been developed to a marked degree on the marginal contacts of these sills.

To the south and east of the shaft, a large pegmatite intrusion, carrying tourmaline, garnet, and a preponderance of feldspar crystals, is the representative of the granite. Smaller outcrops of pegmatite occur at intervals over the property, but so far none have been encountered in underground work.

The strike of the formation is generally north-south, with a steep dip to the east. An illustrative section on the following page shows the intense folding of the ore-zone which has taken place.

Mineralization is confined to the altered dolomitic limestone and consists of an intimate mixture of sphalerite, galena, pyrrhotite, and pyrite, together with a little chalcopyrite. There are associated appreciable values in gold and silver. The distribution of silver is about one and one-half ounces per unit of lead. The zinc is in proportion of three to one of lead.

The ore occurs fairly uniformly along the footwall contact, with a gradual dissemination towards the hanging-wall side. Different phases of limestone alteration are synonymous with ore concentration. Extremely rich pockets of ore occur where alteration is complete, and the less the alteration the more disseminated are the sulphides.

One of the more partial alteration phases of the limestone is interesting from a mineralogical point of view. This rock is white and coarsely crystalline and is more generally associated with lean ore horizons. When struck, or even when two pieces of the rock are rubbed together in the dark without undue pressure, a momentary red glow appears. No definite explanation of this phenomenon

has been advanced; but in consequence of it the mineral has been given the local name of *'fireite'*.

The region has suffered intense glaciation, and the ore-bearing series is a much eroded remnant of old sedimentary rocks.

Development by the British Metal Corporation (Canada) commenced in October, 1924, and consisted of the simultaneous drifting north on the footwall contact of limestone and gneiss at the 300 and 400 feet levels. Chute raises put up at frequent and regular intervals determined the width of the orebody, and served subsequently to open up the stopes. The information gained led to discontinuance of the 300 level, the slope distance between levels being only 100 feet. The shaft was deepened to 400 feet to speed-up development on this level.

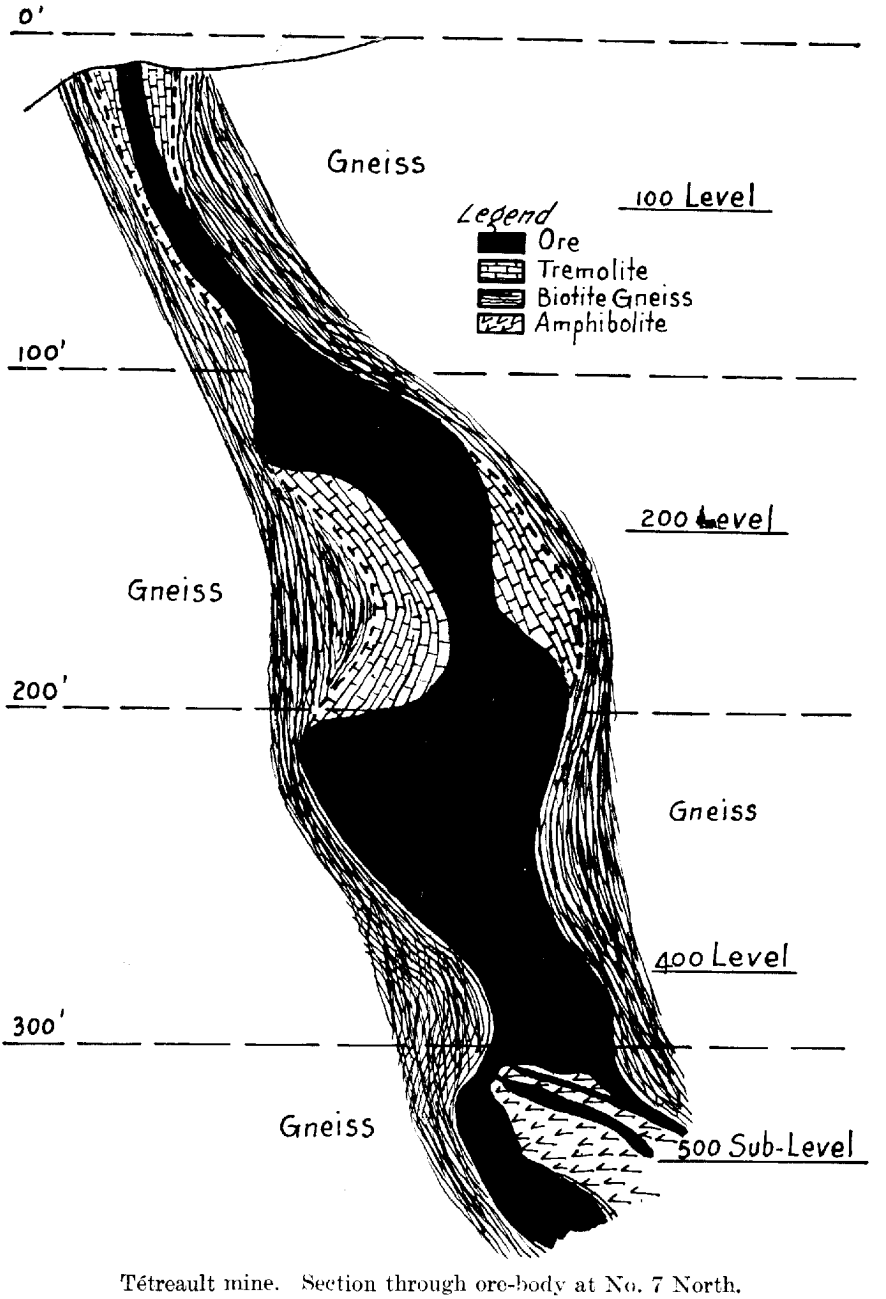
By this means ore was blocked out at the rate of 500 tons per day from October until milling operations were started in February, 1925.

More recent development includes sinking the shaft to the 500-foot level and extended development on the 100, 200, 400 and 500 feet levels, with connections between levels and to the surface. Where the orebody flattened or widened, in conformity with the folding, to greater widths than could be handled through the main drift chutes, cross-cuts were run into the footwall and secondary chute raises were driven to win the ore.

The total development carried out from October, 1924, to December, 1927, amounts to:

Drifting	5,543 feet
Cross-cutting	1,606 "
Raising	4,998 "
Winzes	275 "
Miscellaneous	440 "
TOTAL	12,862 "

The work done since 1924 to the present has demonstrated the continuity of the orebody over the whole of this distance, and it has been found superior in size and grade to that part previously worked to the south. Development is still continuing along original lines, and the plan adopted to the present has resulted in a constantly increasing ratio of ore reserves to extraction.



Tétreault mine. Section through ore-body at No. 7 North.

The present flow sheet of the Tétreault mill has been developed by the experience gained on this particular ore since February, 1925. Previous to that date, all serious effort had been devoted to gravity concentration. As the result of knowledge obtained from other operations and through successful tests conducted by the Department of Mines' Ore Testing Branch at Ottawa, the British Metal Corporation decided to completely change over the old gravity mill and apply the principles of differential flotation.

The ore is a complex mixture of sphalerite, galena, pyrite pyrrhotite, and small amounts of chalcopyrite, in a gangue of altered limestone of which the chief alteration product is tremolite, but which may also contain very appreciable quantities of muscovite and biotite, as well as many other secondary minerals.

Silver and gold occur in the ore in a variety of forms, and a large amount of experimental work has, up to the present, proved no definite relationship. The galena is both argentiferous and auriferous, the iron sulphides and chalcopyrite carry varying quantities of precious metals, and it is known that native silver and a native silver-gold alloy occur. It would appear that forms in which the gold and silver occur vary with different parts of the orebody. There is a tendency to zonal deposition of sulphides, which is however, irregular, but it may be that ultimately some relationship can be established between the precious-metal minerals and this zonal phase. The effect commercially is to intrude an acute problem into what is otherwise an ore admirably adapted to flotation methods.

The changing over of the mill from gravity concentration to flotation, with the retention of some of the original equipment, principally in the crushing and grinding departments, had the effect of introducing numerous mechanical problems which have had to be dealt with from time to time. It is not an over-statement to say that in bringing the mill to its present efficiency, the mechanical problems encountered have at least equalled those purely metallurgical.

Briefly, the operations in the mill include the crushing and grinding of the ore to size, followed by differential flotation and the production of first a lead concentrate and second a zinc concentrate, followed, by tabling of the flotation tails to produce a gold-silver-iron concentrate which is run in with the lead concentrate previ-

ously produced. The flotation of gold and silver is accentuated with the lead and prevented with the zinc.

The tails from the final operation are pumped to waste.

Current production at the Tétreault mine is 450 to 500 tons (of 2,000 lb.) per day of run-of-mine ore assaying roughly 9 per cent zinc, 3 per cent lead, 0.1 per cent copper, 0.09 oz. gold, and 8.3 oz. silver.

Zinc concentrates are produced carrying 50 per cent zinc and containing 93 per cent of the zinc in the mill feed, while lead concentrates carry 45 to 47 per cent lead and contain 95 per cent of the lead in the feed. Over 70 per cent of the gold and silver in the feed is collected in the lead concentrates by methods which result in a lower grade concentrate than might otherwise be expected.

Ore milled during 1927 amounted to 130,800 tons of run-of-mine and 21,420 tons of tailings from previous operations, resulting in the production of 21,800 tons of zinc concentrates and 7,890 tons of lead concentrates.

Ore milled from February, 1925, to December 31st, 1927, amounted to 285,283 tons of run-of-mine, and 35,798 tons of tailings, resulting in the production of 50,100 tons of zinc concentrates and 15,200 tons of lead concentrates. Reports would indicate that some 250,000 tons of ore had been taken from the mine prior to commencement of operations by the British Metal Corporation. This would bring the total output of Tetreault mine as at December 31st, 1927, to 535,283 tons.

GOLD AND SILVER

The production of gold amounted to 8,331 fine ounces, which at the standard $20.67 an ounce represented a total value of $172,214. Silver was produced to the amount of 740,864 ounces, valued at $417,777. It is an increase of nearly 150% for gold and of nearly 80% for silver.

The production of precious metals for the last fifteen years, has been derived practically altogether from the smelting of complex ores, zinc and lead from Portneuf county and copper-bearing pyrites from the Eastern Townships mines. This year a part of the production comes from the Rouyn ores smelted at Noranda, and shipped in the blister copper from that smelter. As this establishment only began pouring in the second half of December, 1927, a

greatly increased production of gold may confidently be expected for 1928.

As stated in our previous reports, there are straight gold ore deposits in the Abitibi region, more particularly to the east of Rouyn township. These are in the shape of veins and elongaged lenticular masses of gold-bearing quartz filling fissures and open spaces in shattered zones of altered Temiscamingue sediments and schistose greenstones of Keewatin age. Interest in these has in the past been overshadowed by the rapid development and progress of the complex copper-gold-zinc ores of that region, of which the Horne mine, the Aldermac, the Waite-Montgomery and other properties, are outstanding examples. Nevertheless the work done on the gold-bearing quartz deposits has been appreciable, if less spectacular. From present appearances, the year 1928 will see considerable work done on gold quartz deposits in the townships of Dubuisson, Fournière, Malartic, Cadillac. The progress made on the gold-bearing quartz deposits of this region is described in the article by Messrs Dufresne and Taschereau, entitled "Progress in the development of Western Quebec", elsewhere in this volume.

MOLYBDENITE

There was no production of molybdenite in the Province of Quebec in 1927. At the Quyon plant of the *Henry E. Wood Mining Co.*, whence shipments were made in 1926, both the Moss mine and the mill remained closed all year.

Of all the other owners of molybdenite deposits only one reported having done work during the year 1927. It is the *Molybdenite Reduction Co., Ltd.*, who owns the Eureka mine, situated in La Corne township, Abitibi county.

The property controlled by the Molybdenite Reduction Company comprises four adjoining half lots at the intersection of the townships of La Motte, La Corne, Malartic and Varsan, held under mining concession. It is easily reached in summer by water route from Amos to a wharf on the east side of lake Malartic, hence by road, three miles eastward. Both the wharf and the road were built by the company. In winter the mine is reached by a winter road along the east side of the lake. The property is 24 miles from Amos.

Up to the fall of 1927, the work done on the property consisted

of a large amount of trenching, stripping, test-pitting, and shaft sinking.

An inclined shaft was sunk in 1918, following one of the veins and reported to have then reached a depth of 45 feet along the slope of 56°. In the fall of 1927, the shaft was dewatered, and found to have reached 30 feet only. Sinking work was then resumed on it. A complete mining plant was installed and by the 1st of April, 1928, it had reached a depth of 150 feet. The shaft is a two compartment one, 7 x 9 feet outside timbers. The machinery comprises an Ingersoll-Rand reversible steam hoist in a hoist house, a 150 cu. ft. steam driven air-compressor, a 20 h. p. boiler and two pumps. A headframe was also erected. At the 100-foot level the following lateral work was effected:—West drift 15 feet, north crosscut 36 feet and east drift 18 feet. It is reported that the results have been encouraging. Lateral work is planned for the 150-foot level, and shaft sinking will be continued to 200 feet. On the whole the deposit is promising, but a great deal more work will have to be done before the value of the property can be appraised.

According to Professor Mailhiot, who examined the deposit in 1919 for the Quebec Bureau of Mines (x) and in 1922 for the owners, the claims are underlain by banks of highly metamorphosed sedimentary rocks, micaceous schistose rocks, cut by granite masses and pegmatite veins. The prevalent type is a quartzose biotite granite, frequently displaying pegmatite characteristics. On the La Corne property molybdenite is found in the pegmatite dykes, associated with sericite and a little pyrite.

Although the preliminary statement on the Mineral Production of Canada in 1927, published by the Dominion Bureau of Statistics, reports that there was no shipment of molybdenite made from any of the Canadian mines, the "Trade of Canada in 1927", of the Trade and Commerce Department mentions an export to the United States of "209 cwt. of Molybdenum valued at $10,472." This is apparently the 1926 production from the Moss mine which was exported in 1927.

"The market for molybdenum continued to increase during "1927. Numerous new consumers of steel containing the metal as "an alloy became regular users. Molybdenum is now used in steel

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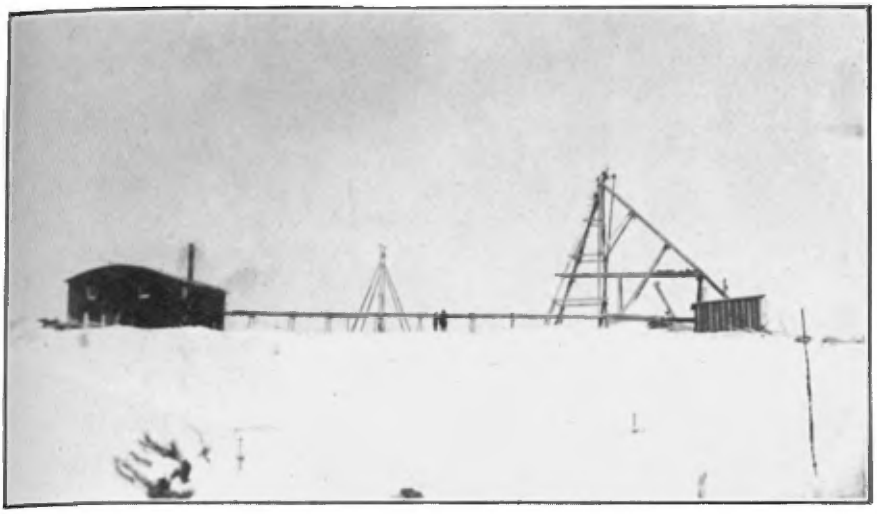
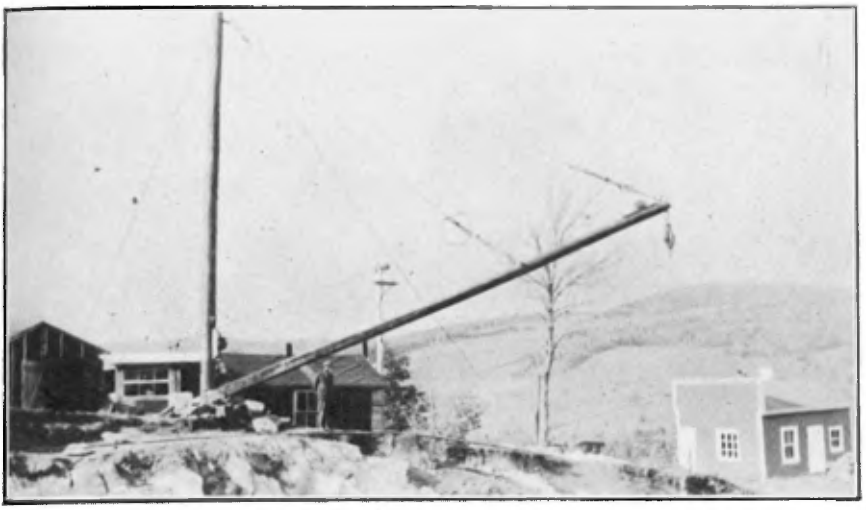
(x) See Report on Mining Operations in the Province of Quebec for 1919, page 40.



The Molybdenite Reduction Co., Ltd.—Headframe and power plant at the Eureka mine, La Corne township.



The Robertsonville Soapstone Quarry Co., Ltd.—Method of hoisting blocks from soapstone quarry, Broughton township.

"rarely by itself, but usually in conjunction with chromium in the "chrome-nickel-molybdenum types used for such parts as gears "and die-blocks; and with nickel alone in the nickel-molybdenum "case hardening steels used in the manufacture of roller bearings, "differential gears, and other carburized parts." (x)

It is the United States who are the main producers and consumers of molybdenum ores, and unfortunately for the Canadian producers there is a high duty on molybdenum ores entering that country.

TITANIFEROUS IRON ORE

The production of titanic iron ore in 1927, consisted of 2,029 tons valued at $8,980 mined from the General Electric mine at St. Urbain, part of which was shipped to Niagara Falls for the manufacture of titanium alloys, and the balance to Lynn, Mass., probably to the General Electric works, for the manufacture of electrodes for arc lights. For the latter purpose high titanium content is desirable, and as the ore from General Electric mine at St. Urbain contains rutile, besides ilmenite, it is very suitable.

For the report of progress on the use of our ilmenite ores in the manufacture of titanium white, see the remarks under the heading of "Mineral Paints", on page 63 of this volume.

CHROMITE

Chromite mining in the Province of Quebec has lain dormant since 1924, and although a renewal of interest in our chrome deposits was manifested in 1926, it petered out without any work having resulted from it. In 1927 all properties remained closed down, and no operations were effected.

It may be interesting to note that the consumption of chrome ore in the United States increased from 149,047 tons in 1925 to 215,085 in 1926.

Rhodesia is by far the main source of the world's supply of chromite. In 1927 its production totalled 182,094 tons, a slight increase as compared with 1926. Cuba's exports of chromite to the United States was 40,342 tons, a substantial increase over the previous years.

(x) Engineering and Mining Journal, New York, Jan. 21st., 1928.

PYRITES

The shipments of iron pyrites, used as a source of sulphur for the manufacture of sulphuric acid, amounted to 13,404 tons, valued at $42,795, or $3.19 a ton. This was shipped by the *Eustis Mining Co.*, and their successors the *Consolidated Copper and Sulphur Co.*, from the Eustis mine, near Sherbrooke.

This pyrites comes from the concentration of the cupriferous pyrite ore of the Eustis mine, in the flotation mill, from which operation the iron pyrites is recovered and sold to sulphuric acid works, in Ontario and in the United States.

The Spanish pyrites is now quoted, at Atlantic ports, from 12 to 13c a long-ton unit, for lump ore, which would be $5.35 to $5.80 a short ton for 50% sulphur ore. The Quebec sulphur ore is just as high grade, but it is ground fine, as a result of the mill concentration, and the freight to the point of manufacture of sulphuric acid is deducted, which reduced the price at the mine to $3.19 for the year 1927, as quoted above.

The market for pyrites is showing improvement as the price of crude sulphur at the Texas mines is increasing. In 1925 crude sulphur was quoted $14 a ton f. o. b. mine, while now it is $18 to $19.

MAGNESITE

The production of magnesite from the quarries and kilns of Harrington and Grenville townships amounted to 15,305 tons of crude magnesite,which were used for the production of 1028 tons of calcined magnesite and 6309 tons of dead-burned or sintered magnesite, of a total value of $230,309.

This is a gratifying increase when compared with the production of 1926, when 9,130 tons of crude were fed into the kilns to produce 1,187 tons of calcined and 3,384 tons dead-burned, valued at $137,431.

Practically all the magnesite was used in Canada or exported to England, the exports to the United States having been only 99 tons valued at $2,667. It is a source of satisfaction to note that the Canadian steel works use Canadian magnesite almost exclusively, the imports into Canada for the year 1927 having been less than $6,000 in value.

What changes took place in the magnesite situation, were for

the better, when compared with 1926. The value of the production increased by 66%, and the exports to England were appreciably higher.

FELDSPAR

The shipments from the feldspar quarries in 1927 amounted to 12,730 tons valued at $104,618, compared with 13,168 tons valued at $111,136 in 1926.

Returns of shipments were received from ten operators of feldspar mines or quarries, the principal ones being *O'Brien and Fowler, Bon Ami, Ltd.; E. M. Lapointe; Wm. and J. J. Cameron; Bush Winning*, all of whom had also produced the previous year and to whom are added this year, *John Laneville*, Buckingham; *Ed. Couture*, Glen Almond; *R. J. Donaldson*, Glen Almond; *Alfred Parcher*, Glen Almond; *Henri Mercier*, Glen Almond. All of the latter produced only small quantities from 6 to 60 tons each.

Apart from the preceding operators who mined and shipped, reports of work done on feldspar properties were received from *Laurentian Feldspar Co.; S. E. Melkman;* and *A R. Whittemore.*

The main market of the Quebec feldspar is the United States, where practically the whole production is shipped to feldspar-mills, whence it is distributed to consumers.

The production of feldspar in the Province of Quebec is only limited by the demand, as the feldspar resources are very large in the Laurentian Plateau.

ANNUAL PRODUCTION OF FELDSPAR OF THE PROVINCE OF QUEBEC, 1914 TO 1927.

YEAR.	TONS	VALUE	YEAR	TONS	VALUE
1914	98	$2,156	1921	9,797	$ 79,732
1915	32	640	1922	12,472	115,483
1916	4,606	20,760	1923	12,026	97,591
1917	1,195	8,225	1924	16,222	143,076
1918	191	4,357	1925	11,287	94,730
1919	925	11,665	1926	13,168	111,136
1920	849	11,252	1927	12,730	104,618

The production of feldspar comprises several grades of material, from albite, or soda feldspar, valued at $4 to $5 a ton used as abrasive element in the manufacture of scouring soap and cleaning

powders, through pottery feldspar valued at $8 to $12, to the highest grade of "dental spar", hand picked, used in the manufacture of artificial teeth, valued at $20 to $25 a ton.

GRAPHITE

The production of graphite consisted of 34 tons of dust graphite, valued at $60 a ton, shipped by the *Canadian Graphite Corporation*, from their Guénette mine, in Boyer township.

There was practically no demand for Canadian flake graphite during 1927. The market prices were low throughout the year, and the demand small. As stated in our last year's report, the greater part, by far, of the world's production of flake graphite, is used in the manufacture of crucibles for making high grade crucible steels. For the last few years electric-furnace steel has been steadily replacing crucible steel. On the other hand the use of graphite in the manufacture of electrical apparatus, such as dynamo brushes, dry batteries, and electrodes has greatly increased, but for such purposes amorphous graphite and graphite dust are used. As Quebec graphite is mostly high-grade flake qualities, it derives practically no benefit from the increased use of graphite in electricity.

Madagascar, to a great extent, controls the world's market of flake graphite.

MICA

Reports of shipments of mica in different forms, were received from nine operators, the total production having been 4,455,239 lb. valued at $105,446, as compared with 3,327,695 lb. valued at $170,-118 in 1926. It is therefore a decrease of 38% in value. It is true that the quantity figures show a considerable increase, which, however has little significance. It is due to the fact a great deal more "scrap" mica at $10. to $14. a ton, was marketed, and less thumb-trimmed and thin-split mica, the prices of which vary from $0.15c. to $3. a lb.

The mica produced in the Province of Quebec in 1927 may be roughly divided as follows, according to the forms under which it was sold:—Thumb-trimmed, 432,514 lb, valued at $50,339; splittings, 36,250 lb, valued at $16,049; rough-cobbed 229,130 lb.

valued at $6,349; the balance being approximately 1,850 tons of scrap mica, valued at $22,709 or about $12. a ton.

Prices did not show very material variations from last year's The range, as gathered from the returns of production received having been as follows:—

1 x 1 inch,	12 to 20c. a lb.	2 x 4 inch,	40 to 70c. a lb.
1 x 2 "	15 to 25c. "	3 x 5 "	$1. to $2. "
1 x 3 "	25 to 35c. "	4 x 6 "	$1.50 to $2.50 "
2 x 3 "	40 to 60c. "	5 x 8 "	$2, to $4. "

In 1927, Quebec production figured for 60% in the total Canadian production of mica.

Exports of Canadian mica in 1927 were made to the United States and England. Apparently the European continental countries get their supplies from Madagascar and India.

EXPORTS OF CANADIAN MICA IN 1927:

United Kingdom	$ 21,035
United States	304,701

The exports of mica are always valued much higher than the production, as mica is mostly exported in the state of thin-splittings, and cut mica, that is in a more advanced stage of manufacture than the mine output usually is. Thus, the exports in 1927, which represented only a part of the output of the mines, were valued at nearly $326,000 while the whole Canadian production from the mines, which comprised both exports and Canadian consumption, totalled to a value of $182,000.

MINERAL PAINTS

The production of ochre and natural iron oxides amounted to 5,931 tons, valued at $102,186. It is a slight decrease in tonnage, and a small increase in value as compared with 1926, when the production was 6,517 tons of a total value of $100,923.

Returns were received from three producers, *The Canada Paint Company, The Montmorency Paint Products Co.,* both mined and calcined natural iron oxides for the manufacture of

paints, and *Thos. H. Argall* who mined and sold raw natural iron oxide, mainly used in gas works for the purification of coal gas. The average price of the calcined oxide was $41. a ton while the raw oxide was slightly under $3. a ton.

An examination of an iron oxide deposit, situated near Saint-Raymond, Portneuf County, was made for the Quebec Bureau of Mines, by Dr. Carl Faessler, in the summer of 1927. The result of this work are given in detail in the report issued by the Quebec Bureau of Mines entitled "Geological Traverses in the counties of Maskinongé, Saint Maurice, Champlain, Portneuf, Quebec, and Montmorency."

It was found that this deposit covers an area of 66,000 square feet, and has an average thickness of $2\frac{1}{2}$ feet. Analysis of fifty samples, dried and calcined, gave an average content of 42% of $Fe_2 O_3$. The deposit is two miles distant from the station of St-Raymond, and is on an excellent wagon road which connects St-Raymond, St-Basile and Ste-Christine.

The province of Quebec is the only province in Canada which produces natural iron oxides and ochre.

TITANIUM PIGMENTS

For several years *McArthur, Irwin, Ltd.*, a well known paint manufacturing firm of Montreal, have been conducting research and experiments, on white titanium pigments, under the direction of Mr. R. H. Monk, and a process which is claimed to be economic and sound has successfully been developed.

This new titanium white pigment differs from the other titanium whites, in being a double salt of barium and titanium, a barium titanate, instead of the usual mixture of titanic acid and barium sulphate sold under the name of Titanox, or of the lime-titanium pigment which is a mixture of titanic oxide and calcium sulphate.

The new titanate pigment possesses the qualities of the composite titanium pigments, of being non-poisonous and unaffected by sulphur fumes and sea-water, and is claimed to have a greater opacity than any commercial pigment now being manufactured, and moreover, being a double salt instead of a mixture, it is more stable.

The new Monk process also allows recovering the iron of the

ilmenite, as a by-product, but as this is secondary the efforts are for the present concentrated on the pigment production part of the process.

A new company *"Titanium Limited"* has been formed to acquire the large deposits of ilmenite near Ivry, on lots 37 and 38, range V of Beresford township and also the patent rights to the process of manufacturing the titanate. They are now considering the erection of a plant in Canada for the production of the pigment on a commercial scale.

TALC AND SOAPSTONE

The production of soapstone blocks, from the deposits of Leeds, Thetford and Broughton townships is steadily growing. In 1927 it amounted to 1,276 tons valued at $51,504, while in 1926 it had been 885 tons, valued at $38,209.

Operations were carried out at three deposits. The *Robertsonville Soapstone and Quarry Company, Ltd.* worked their quarry on lot 15, range XV, of Leeds township, for the first few months of the year, while they were opening and equipping their property comprising lots 12, ranges X and XI of Broughton township. At the latter both the quarry and the mill are now equipped with electric power. The plant is situated at only $1\frac{1}{4}$ miles from the railway station, while from the previous property there was a six-mile haul.

Some work was done by *Mr. Jos. Houle*, on lot 12, range III of Thetford. A few tons of soapstone were mined, and sold, in the rough, to the Robertsonville Soapstone and Quarry Co.

In the last five years, soapstone has been quarried, and cut into blocks for furnace linings, from the following localities:—

Thetford township:—Range III, lot 12; Range IV, lot 13*c*; Range V, lots 4, 5 and 6.

Broughton township:—Range X, lot 12*d*.

Leeds township:— Range XV, lot 15.

KAOLIN

The small production of kaolin, or china clay, reported consisted of 24 tons of the crude clay, valued at $120, extracted from

the St. Remi d'Amherst deposit for experimental purposes. A part was sent to the ore dressing plant of the Federal Mines Branch, Ottawa, and the balance to the laboratory of the Dorr Company, at Westport, Conn.

The property of the *Canadian China Clay Company,* which was put in the hands of a trustee, for the bondholders, in the spring of 1923, has not been operated since that time. However during the latter part of 1927 a renewal of interest seems to have been taken in the deposit, with the result of the shipment of the above mentioned samples.

GARNET

There are in the Province of Quebec a number of occurrences of garnet, some of which are known to be of economic size and quality, while others are insufficiently known, and may prove workable on further investigation.

One of the most promising garnet deposits is situated on lot 16 of range I, Joly township in the county of Labelle. It is held now by the *Labelle Nickel and Garnet Co., Ltd.,* who reports a little development work during 1927. They have made a trial shipment, to a concentrating plant in the United States, and have sent large samples, ton lots, to the Department of Mines' ore-dressing laboratory in Ottawa, for experimental purposes.

Experimental work has also been done on a garnet sample from Langlade, a flag station on the Transcontinental Railway, Quebec-Cochrane line. This was done at the ore-dressing laboratory of the Mines Branch at Ottawa.

The following description of the Labelle occurrence is reproduced from the report on "Abrasives" by Mr. V. L. Eardley-Wilmot, published by the Federal Mines Branch, Ottawa. (x)

"Joly township, range I, lot 16.—Garnetiferous biotite-quartz-gneisses interbanded with parallel veins of pyrrhotite and massive crystalline garnet occur on the east side of a small lake two miles southwest of Labelle station on the Mont-Laurier branch of the Canadian Pacific railway, 100 miles north of Montreal.

"Massive, deep wine-coloured, crystalline garnet occurs on both contacts of the pyrrhotite which is 2 to 4 feet thick. The

(x) Abrasives, Technology and Application, Part III, Garnet, by V. L. Eardley-Wilmot, Department of Mines, Mines Branch, Ottawa, 1927.

mineral zones, which are variable in width, occur in a series of lenses or pockets. In places the garnet is distributed throughout the pyrrhotite, almost to the exclusion of the latter, whereas in others about an inch of garnet crystals is along the contacts only. The widest part of one of the veins showed 3 feet of almost solid garnet and 4 feet of pyrrhotite. Small grains of quartz and fine garnet crystals are found in the centre of some of the large crystals of the red garnet. In other parts of the veins, fracturing has been more developed and the garnet, which is of a paler colour, is somewhat granular.

"The pyrrhotite in places occurs as solid masses 2 to 4 feet wide and in others intimately mixed with finely divided quartz grains and garnet. The pyrrhotite occurs both fine and coarsely crystalline and in the former the garnet is more abundant, although even the solid pyrrhotite contains some garnet.

"Four parallel veins, which are 50, 70, and 200 feet apart and which strike about north 30 degrees east, are exposed, the first being 250 feet east of the small lake. The most easterly outcrop, which is on top of a hill, is about 15 feet wide and consists of very rusty and almost black iron-stained gneiss, in which remains of decomposed garnet masses are visible.

"For several yards on either side of the mineral veins the gneisses contain a high percentage of small, pale red garnets varying from the size of a pin's head to a pea. The veins near the lake can be traced at intervals along their strike for several hundred yards and in a southerly direction from the workings they continue to the south end of the lake. For at least a quarter of a mile easterly across the strike there are outcrops of four or five parallel rusty mineral zones, in some of which large garnets are visible. The ore in each of the exposures examined appears to be very similar.

"The pure garnet has a clean irregular, sharp to sub-conchoidal fracture with a highly vitreous lustre. It contains the usual parting planes common to this type of massive almandite, but the fragments are exceptionally hard and tough. It is usually of a dark wine-red colour, but there are pockets where the massive mineral appears almost black. In appearance it is very similar to that of the best American garnet from New York state and is of excellent quality both for colour and abrasive properties, and it is probable that the black variety is better than the New York garnet. Samples

sent to some well-known makers of abrasive-coated papers have been very favourably reported upon.

"The ore should be easy to concentrate, since the only impurities are pyrrhotite, quartz, mica and a little magnetite, all of which can be eliminated by the ordinary gravity methods and magnetic separation, the first named mineral being a by-product having a possible market value.

"Prospecting work in the nature of stripping and some trenching up to 5 feet in depth has been carried out on the second and third veins.

"Although the quantity of garnet in each vein appears to be small, a fair tonnage may be expected if several of the close and parallel veins are worked together. Since the ore-bodies are on the hill-side on the edge of a lake, they are well situated for economic mining and milling. A new road is being constructed to Labelle station, 2 miles to the northeast."

The occurrence of garnet at Langlade, in Baudin township, was first mentioned in "Mining Operations in the Province of Que-Quebec during the year 1916". (x)

"GARNET.—Bands of gneiss containing abundant garnets are of frequent occurrence within this area. In only one locality, viz., in a shallow cutting on the railway, three and a quarter miles east of Langlade station, or about sixty yards east of the seventieth mile post west of Parent, were the gneisses sufficiently garnetiferous to suggest that they might be exploited as an economic source of garnet to be used as an abrasive. Here, a band of dark gneiss, exposed for a width of several yards is exceptionally rich in red garnets very many of which are a third of an inch across. The garnets comprise from one-fourth to slightly more than one-half of the volume of the rock. In thin section under the microscope, the garnets in this paragneiss are found to be lying in a matrix composed chiefly of grains of quartz, with numerous flakes of biotite and a few grains of orthoclase, sphene, black iron ore and pyrite."

(x) Geology and Mineral Resources along National Transcontinental Railway in the Province of Quebec, by J. A. Bancroft. Published in Mining Operations Province of Quebec in 1916, Quebec Bureau of Mines ,1917.

BUILDING MATERIALS

(Henri Gauthier)

The value of the building materials production in the Province of Quebec during 1927 shows an increase of 18 per cent over that of 1926. It amounts to $15,382,957 as compared with $13,004,929 for the previous year.

This is the largest production of building materials ever recorded in the Province. Cement, brick, stone, lime and sand showed increases both in quantities and in values of production.

In 1926 a slight decrease was registered as compared with the 1925 production, which had been the record year until then. The figures of the production for that year were $13,197,105.

The great activity in the building and construction industry which prevailed throughout the year 1927 has benefitted the quarries and the other structural material industries of the Province. The value of building permits issued in six cities of the Province, as recorded by the Dominion Bureau of Statistics, is substantially higher than in any other year since this record was begun in 1920, while the cost of building materials was the lowest in the record of the same years. The estimated cost of building and construction contracts awarded in these six cities, during 1927, amounted to $57,970,697. as against $41,851,680 in 1926, and $34,801,343 in 1925.

The operation of stone quarries, sand and clay pits, and of their annexed plants, being closely connected with the construction activities, gave work, in 1927, to a larger number of workers than in preceding years. There were 9,744 workmen employed, who earned $4,919,754. The number of workers reduced to a basis of a full year of 300 working days is 4643.

A complete list of quarry owners and operators will be found at the end of this volume.

The Province of Quebec is rich in raw building materials. It possesses almost unlimited supplies of building and ornamental stones of fine quality including: limestone, granite of various textures and colours, sandstone, marble and slate. Its numerous outcrops of limestone are capable of supplying dimension and cut stone for building purposes, crushed stone for concrete and road work, raw material for the manufacture of lime and cement, stone for use in

the manufacture of pulp and paper, for use in sugar factories, tanneries, foundries and chemical works. The granite resources of the Province are inexhaustible. The grey granites of the Eastern Townships are extensively quarried: high grade building stone and monumental stone are shipped to other provinces. Clays of good brickmaking quality are common; and shales in the neighbourhood of Montreal and Quebec cities are used on a large scale in the manufacturing of common, face and fancy brick.

A review of the various structural materials resources of the Province was given in the reports on Mining Operations for the years 1921 and 1926.

CEMENT

The sales of cement for the year 1927 showed an appreciable advance over the previous year and totalled 4,636,751 barrels valued at $5,383 058, as compared with 3,727,477 barrels valued at $4,535,386 in 1926. The increases in number of barrels and in value of the sold product are therefore 24 per cent and 18.7 per cent respectively.

The plants of the *Canada Cement Company* at Montreal-East and Hull, and that of the *National Cement Company* at Montreal-East operated the whole year; while the plant of the *Unic Cement Company* at St. François de Sales remained idle. This company has been in liquidation since the early part of 1926.

Selling prices of cement remained about the same as they were at the close of 1926, the year during which prices were cut to the lowest point since 1916. While in 1926 the prices dropped from a maximum of $1.72 to a minimum of $1.14, they remained stable during 1927 within the narrow range of $1.42 and $1.13 at the three plants.

The Canada Cement Company was reorganized in October last. The new owners have issued $20,000,000 twenty-year 5½% first mortgage bonds; $21,000,000 of 6½% cumulative preference shares; and 600,000 shares of no par-value common stock. According to advertisements published, the net earnings of the business for the year 1927, available for bond interest and depreciation are estimated at $4,583,649 compared with annual bond interest requirements of $1,100,000.

In February 1928, the *National Cement Company*, when it passed into the hands of Alfred Rogers, owner of the *St. Mary's*

Cement Company of Ontario, became a privately owned concern. The production capacity of the plant will be increased by the installation of a 300,000 barrel unit, which will bring the total new capacity to 1,200,000 barrels per annum.

BRICK

The brick industry, as it did in 1926, largely benefited by the favourable building conditions during 1927.

The number of brick manufactured and sold is but slightly higher than in 1926 but the prices were more stable. The total quantity of brick made from domestic clays and shales is 139,587 thousands as compared with 139,371 in 1926 and 126,612 thousands in 1925. The total selling value amounted to $2,336,677 while it was $2,256,856 in 1926. (1)

Fifteen plants were operated; the number of men employed totalled 928 and the wages paid $786,092. By far, the quantity of brick made out of shale, with or without the addition of a small proportion of clay, exceeds the volume of clay brick. Over 80 per cent of the brick manufactured came out of the plants of the *National Brick Co.*, the *St. Lawrence Brick, Ltd.*, of Laprairie, and of the *Citadel Brick, Limited*, of Quebec, all of which companies produce shale brick.

Amongst other important brickyards are: *La Brique de Scott, Limitée; La Cie de Brique de Chicoutimi* and the *Ascot Tile and Brick Co., Ltd.*

In October 1927, the *McCrea Walley Brick Co.*, of Lennoxville, was wound up voluntarily and dissolved, after its business had been acquired by the *Sherbrooke Brick, Reg'd;* and in November the new owners sold to the *Lennoxville Brick and Tile Co., Limited*, which intends to resume the operations with a total capital of $2,000,000.

La Brique Frontenac, Limitée, of Quebec which was organized in 1926, will probably be in operation during the summer of 1928. Its $300,000 modern plant at Beauport-East was nearing completion at the end of the year.

The *Eastern Townships Manufacturing Company*, organized

(1) These figures are exclusive of terra-cotta and hollow blocks which are included in the pottery statistics.

in 1926, made but little progress with the construction of its brick plant at East Angus.

Table I shows in detail the quantities and values of the several classes of brick made and sold during the year.

TABLE I.

Statistics of Brick Production in 1927.

KIND	No. of thousand	Selling value f.o.b. plant	% of total volume.	% of total value.
Common:—				
Soft mud	6,167	$ 63,353		
Stiff mud (wire-cut)	101,890	1,566,385		
Total common	108,057	$ 1,629,738	77%	70%
Face and Fancy:—				
Soft mud	83	1,243		
Dry press	2,235	67,403		
Stiff mud (wire-cut)	29,212	638,293		
Total face	31,530	$ 706,939	23%	30%
Grand total	139,587	$ 2,336,677	100%	100%

STONE.

The total value of stone quarried and sold in 1927 amounts to $4,199,533, an advance of more than 15 per cent over last year. The activity of the quarries during the year reflects the general good conditions in the construction industry which prevailed.

The table of mineral production of the Province, on page 8 of this report, gives the respective values of the production of limestone, granite, marble and sandstone for both the years 1927 and 1926. Tables II and III show the distribution by uses of limestone and granite taken out of the quarries. While by far the largest

quantity of stone produced each year is crushed for use as mineral aggregate in concrete, we register this year a substantial increase in the production of building limestone as compared with last year.

As in past years, the chief quarrying centers of cut limestone for building purposes were St. Marc des Carrières, in Portneuf county, and Isle Jesus, north of Montreal.

Reports were received on the operations of 65 limestone quarries scattered throughout the province. These quarries provided work to 1790 men who received $1,199,763 in wages.

TABLE II

Distribution of Limestone Production in 1927, by uses. (1)

Uses	Tons	Value	Per cent of total	
			Tonnage	Value
Building stone:—				
Rough	137,861	$ 152,236	87% } 7%	24% } 22%
Dressed	20,356	480,387	13% }	76% }
Crushed stone	1,931,928	$ 2,025,944	87%	73%
Industrial stone:—				
Pulp & Paper mills	28,041	28,987	} 6%	} 5%
Foundries, etc.	88,271	69,425		
Agriculture	7,990	28,535		
Totals	2,214,447	$ 2,785,514	100%	100%

The figure of the granite production value is $123,000 lower this year than it was last year, but it must be remembered that exceptional large quantities of crushed granite were produced at high cost in connection with the construction of barrages and hydro-electric plants in 1926. More building granite was quarried this year and large increases were also registered in the production of curbstone and paving blocks.

(1) Limestone used in the manufacture of lime and cement not accounted for.

Granite for building and monumental purposes as in the past, has been extensively quarried at Beebe and Graniteville, in Stanstead county, at St. Samuel in Frontenac county, and Rivière-à-Pierre in Portneuf county, to mention but the more important producing centers. The number of granite quarries in operation in the Province during 1927 totalled 30.

The quantity of marble produced in 1927 is slightly lower than in the previous year, when a record figure was reached. Practically all the monumental and ornamental marble produced comes out of the Missisquoi quarries at Philipsburgh operated by *The Wallace Sandstone Co.*

TABLE III

Distribution of Granite Production in 1927, by uses.

Uses	Tons	Value	Per cent of total			
			Tonnage		Value	
Building:—						
Rough	2,978	$ 18,795	17%	11%	7%	36%
Dressed	14,880	250,650	83%		93%	
Monumental:—						
Rough	7,305	101,541	90%	5%	76%	18%
Partly dressed	783	32,680	10%		24%	
Paving blocks	20,601	122,987		12%		16%
Curbstone	16,092	68,163		10%		10%
Crushed, rubble, rip-rap, etc	100,521	155,884		62%		20%
Totals	163,160	$ 750,700		100%		100%

LIME.

The statistics of lime production for 1927 show slight increases over last year both in quantities and in values. A total of 107,638 tons of lime valued at $806,665 were produced, while the 1926 production amounted to 99,800 tons estimated at $756.117.

Out of the total lime production, 10,576 tons of hydrated lime valued at $80,789 were sold.

Each year the number of lime-burners reporting operations

decreases, and while there are still 14 lime-kiln owners and operators, more than 95 per cent of the lime burned comes out of but five plants.

Two new lime companies were incorporated during the year. They are: *The Canada Lime, Ltd.*, of St. Marc des Carrières and *La Compagnie de Chaux Nationale*, also of St. Marc. The former company fired its kilns practically the whole year, while the latter had not yet started operations at the close of 1927.

TABLE IV

Distribution of Lime Production in 1927, by uses.

Uses	Tons	Value	Per cent of total	
			Tonnage	Value
Building trades....	33,001	$ 327,056	30%	40%
Pulp and Paper mills.....	70,942	447,276	66%	56%
Tanneries, Sugar factories, Foundries, etc.....	2,624	22,780	2%	3%
Agriculture.....	1,071	9,553	1%	1%
Total.....	107,638	$ 806,665	100%	100%

POTTERY

The statistics of brick do not account for the production of hollow-blocks and terra-cotta. This production is included in pottery which also comprises the manufacturing of tile-drains, sewer-pipes and pottery made of domestic clays. The total value of production in that industry amounted to $414,929 in 1927.

During the year the *Citadel Brick, Limited*, of Quebec, acquired and operated the plant of the former *Compagnie des Tuyaux de Drainage*, at L'Islet Station. The new owners have considerably enlarged the plant.

SAND-LIME BRICK

For the first time since 1915 a production of sand-lime brick is reported. A total of 8,182 thousand bricks valued at $96,926

were made. The prices varied between $17 and $14 per thousand. These bricks are nothing else but an artificial sandstone. They are produced in a steam bath, using a very fine siliceous sand and hydrated lime as ingredients. The lime content is around 8% or 300 pounds per thousand of brick. The bricks are milk white and are manufactured the size of the standard-sized clay brick, viz. 8 x $2\frac{1}{4}$ x $3\frac{3}{4}$ to $3\frac{7}{8}$ inches, as recently adopted by the various Canadian brick manufacturers.

Sand-lime brick is manufactured by *Silico, Limited* and *Lime Products Co.*, both companies with head office in Montreal.

SAND

The production of sand and gravel in 1927 reached the record figure of 8,660,360 tons appraised at $2,145,169. This production surpasses that of last year's by $692,595, an increase of 48 per cent in monetary value.

As shown in table V, road building and maintenance, railway ballasting and harbour works absorbed a large proportion of the production but it will be noted that the building trades consumption figures for nearly half of the total amount of sales and shipments for which returns were received.

The number of sand producers who reported activities exceeds seventy-five, exclusive of railway companies and of builders and contractors who incidentally produced building sand on the site of construction works.

TABLE V

Distribution of Sand and Gravel Production in 1927, by uses.

Uses	Tons	Value	Per cent of total	
			Tonnage	Value
Building trades....	3,548,311	$ 1,027,616	41%	48%
Road building and maintenance....	2,667 603	626,736	31%	29%
Railway ballasting and Harbour development.....	2,444,446	491,117	28%	23%
Total.....	8,660,360	$ 2,145,469	100%	100%

PROGRESS IN THE DEVELOPMENT OF THE MINERAL DEPOSITS OF WESTERN QUEBEC IN 1927

A. O. Dufresne and R. H. Taschereau

The year 1927 is signalized by an outstanding event in the history of Western Quebec: In December of this year the Horne Copper Corporation's smelter at Noranda was blown in. On December 17th, the first ingots were poured, and, by the end of the year, the company had shipped 235 tons of blister copper. This production placed the Province of Quebec once more amongst the copper-metal producers.

Some thirty-five years ago the small Capelton smelter in the Eastern Townships produced a small quantity of metallic copper. The Capelton smelter consisted of a water-jacketed furnace erected to treat the copper bearing cinders resulting from the sulphuric acid works, operated near-by. The pyritic ore of the Eustis and Albert mines was then used. The furnace had a feed capacity of fifty tons a day and produced low grade matte of 25 to 50 per cent copper. The smelter at Noranda can treat 1000 tons of ore per day. It produces ingots of blister copper, containing 99 per cent metallic copper and the precious metals of the ore.

The Abitibi-Temiscamingue region was exceptionally active in 1927. While the prospectors were invading the unexplored townships, numerous companies were organized to undertake extensive searches and developments. The prospectors recorded 11,500 claims mostly in the townships of Dasserat, Boischatel, Rouyn, Montbray, Desmeloizes, Dalquier, Landrienne, Barraute, Malartic, Fournière and Cadillac. The companies worked mostly in Boischatel, Rouyn, Montbray, Duprat, Dufresnoy, Clericy, Desmeloizes, Dalquier, Landrienne, Cadillac and Dubuisson.

RAILWAYS

The Canadian National Railways has successfully operated, since December 1926, the line between Noranda station and Taschereau on the Transcontinental line: a distance of 43 miles. Early in 1927, the "Nipissing Central Railway" was granted permission to extend its Swastika-Larder Lake line into Quebec. The con-

struction was actively pushed during the summer and regular daily trains were operated before Christmas, between Swastika and Rouyn. In direct communication with the Abitibi settlements to the north, and the mining districts of Ontario to the west, the towns of Rouyn and Noranda enjoy a favoured position both as a mining and business center.

ELECTRIC POWER

The necessary power for mine and metallurgical operations in the Rouyn area is transmitted, a distance of 55 miles, from the hydro-electric power plant on the Des Quinze rapids at the head of lake Temiscamingue.

The plant is owned by Des Quinze Power Company, Limited, a subsidiary of Canada Northern Power Corporation, Limited. It is located four miles west of Angliers, on the Des Quinze river, which is the outlet of the lake of this name into lake Temiscamingue. The construction of the plant was completed in 1924.

Two units have been erected, each with a capacity of 10,000 h.p., to supply the growing demand for power both in Ontario and Quebec. The company is contemplating the installation of two other units during the coming year. The plant is designed for an ultimate development of 60,000 h.p.-year. The head of water is 90 feet; the river basin has an area of 9,700 square miles.

A transmission line was built to Noranda in 1926; secondary lines were built, in 1927, to Larder Lake, the Waite-Ackerman-Montgomery mine and the Aldermac mine. These subsidiary lines supply power to the townships of Dasserat, Boischatel, Rouyn, Dufresnoy and Duprat.

ELECTRICAL PROSPECTING

In 1926, exploration for minerals with the aid of electrical methods took considerable development in Quebec. This was continued during 1927. Amongst the organizations prominent in this work were the following:—"C. M. Schlumberger Electrical Prospecting", "Swedish American Prospecting Corporation", "Electrical Prospecting Corporation of Canada", Messrs. Bieler and Watson," "Geophysical Company of Canada, Limited", "Radiore Company".

Rouyn Township.—Smelter of the Horne Copper Corporation

The following properties have been examined by one of the above named organizations: — Abana Mines, Limited; Abbey Mines, Limited; Aldermac Mines, Limited; Amulet Mines, Limited; Area Mines, Limited; Armstrong Mines, Limited; Arno Mines, Limited; F. S. Arntfield; Brownleee Gold Mines, Limited; Calartic Mines, Limited; La Chatelaine Mines, Limited; Clericy Consolidated Mines, Limited; Confederation Mines, Limited; Coniagas Mines, Limited; Copper Hill Mines, Limited; Corona Mines, Limited; Cyclone Rapids Mines, Limited; Don Rouyn Gold Mines, Limited; Dubec Mines, Limited; Duprat Mines, Limited; Dupuy Mines, Limited; Halliwell Group; Hecla Mines, Limited; Horne Copper Corporation, Limited; Jay Copper Gold Mines, Limited; Laval Quebec Mines, Limited; McDougall Mines, Limited; Newbec Mines, Limited; Notre-Dame Gold Mines, Limited; O. K. Syndicate; Osisko Lake Mines, Limited; Pontiac Rouyn Mines, Limited; Quebec Copper Mines, Limited; Raynor Mines, Limited; Ribago Mines, Limited; Richardson Group; Robb-Montbray Mines, Limited; Stadacona Rouyn Mines, Limited; United Verde Extension Mines, Limited; Vickers-Porcupine Mines, Limited; Waite-Ackerman Montgomery Mines, Limited; Wiltsey Coghlan Mines, Limited; Windfall Rouyn Mines, Limited.

These surveys were followed, on some of the properties, by trenching and diamond drilling to prove the nature of the indicated underground electrical "conductors". The owners of the properties have not as yet made known the results of the work done on these conductors.

GEOLOGY

During the summer season of 1927, the Geological Survey of Canada continued the mapping of the general geology of the Abitibi-Temiscamingue region. Dr. H. C. Cooke carried on the special work begun two years ago on the country rocks of the copper and zinc ore bodies of the district. Dr. W. F. James completed the survey of the geology of the townships of Montbray, Hébécourt, Roquemaure and La Reine.

The Geological Survey has issued in the last four years a series of reports and maps on the general geology of Abitibi and Temiscamingue counties. The interested public will find in them notes on the distribution of various rock formations occurring in

the region, and descriptions of the geology of some of the known ore occurrences. The maps will be found of valuable assistance to the prospector who plans the exploration of new territories.

During the past three summers Dr. Cooke's work has been especially directed to the study of the rocks associated with the occurrences of copper and zinc sulphides. His results have been set forth in the Summary Reports of the Geological Survey for the years 1925 and 1926; the summaries of which are given hereafter:—

SUMMARY OF OBSERVATIONS OF THE SULPHIDE DEPOSITS. *

"Four important sulphide deposits were studied during 1925: on the Chance, Amulet, Waite-Montgomery, and Horne claims. In addition one or two minor deposits were seen, northwest of lake Dufault. In all cases the sulphides replace the country rock, and are accompanied by little or none of the ordinary vein materials such as quartz, feldspar, or calcite. Magnetite, however, occurs here and there with the sulphides. The introduction of the sulphides seems to have been accompanied by very little alteration of the country rock other than the replacement by sulphide.

"The mineral species formed, pyrite, pyrrhotite, and magnetite with small quantities of hornblende, epidote, and feldspar, on the Chance property, indicate deposition from highly heated solutions, such as must have risen from greater depths through fissures. The fissures or their original inferred position may be seen on the Chance and Horne claims, and also on the Norbec claims northwest of lake Dufault, but have not yet been located on the Amulet or Waite-Montgomery properties.

"The most important result of the work in 1925 is the recognition of the influence of the country rock on the character of the ores. Wherever a sulphide body has been found in light-coloured, acid rhyolite, the principal sulphide is pyrite, with or without zinc blende which appears to be a more or less accidental constituent. If the rhyolite is a massive lava, the sulphide body is apt to be small; but if a tuff, the replacement is more extensive and great bodies of pyrite have developed. On the other hand, the commercially valuable masses of pyrrhotite-chalcopyrite ore have so far been found only within rocks of more basic types, such as the

* H. C. Cooke, Geological Survey—Summary Report 1925, p. 49c.

chlorite-rich andesite of the Horne claims, and the biotite-rich dalmatianite of the Amulet property. That this difference is due to the influence of the wall-rock is shown, not only by the fact that no exceptions to the above rule have been found, but also by the change, on the Horne, of pyrite to pyrrhotite deposition within a single mass of sulphide at a rhyolite-andesite contact.

"Since, therefore, deposits of commercially valuable ore may be looked for at the intersection of sulphide-bearing fissures with chlorite-rich or biotite-rich lavas, it is obvious that successful prospecting must depend, primarily, on the discovery of a sulphide-bearing fissure, and secondarily, on a determination of the geology of the area, so that an estimate may be made of the position where the fissure will intersect the more basic flows. Such a position may be beneath deposits of drift, where prospecting would not otherwise be carried. Thus prospecting may be most economically carried on if accompanied by careful geological work.

"The origin of the sulphide deposits is not yet known and only a few facts have been obtained that bear on this question. Since the ores were formed from highly heated solutions, it is natural to turn to some igneous rock of the vicinity as the source of such solutions. Of the igneous rocks on the Horne, later gabbros and the syenite porphyry are younger than the ore-bodies and cut through them, hence cannot be regarded as possible sources. On the other properties intrusive rocks are either absent or are subject to the same objection. The diorite dykes on the Horne property are small and fine grained, and have not been differentiated; so that they cannot have given rise to ore-bodies. The only remaining body of igneous rock is the small batholith of granodiorite around the northern end of lake Dufault, and it is interesting to note how the known sulphide bodies are spaced around its margin. The Horne property lies about 3 miles southwest, the Amulet and Waite are less than a mile from the western boundary. The Chance, and the latest discovery, the Pioneer claims northeast of the Chance, are about 9 miles away, but may have originated from the lake Flavrian granodiorite batholith only 3 miles to the north.

"On the Norbeck claims northwest of lake Dufault, the roof of the granodiorite batholith has been barely exposed by erosion over a considerable area, and in consequence there are numerous patches

of lava of all sizes from 1 to 20 feet in diameter, still partly clothing the granodiorite surface. These remnants are of a very acid, slightly greenish, translucent, glassy rhyolite, but in spite of this composition which is most unfavorable for replacement, the few inches of rhyolite next to the granodiorite are filled with splashes of chalcopyrite up to an inch or more in diameter. The proximity of the chalcopyrite to the granodiorite, particularly in view of the inhospitable character of the highly acid rhyolite, strongly directs suspicion to the granodiorite as the source of the mineral. Somewhat farther south, about the middle of claim T-1291, where the cover of lava is thicker and more continuous, there is a fissure which strikes north 60 degrees east, has vertical dip, and cuts andesite lava. The fissure is filled with chalcopyrite with some pyrite, for widths of 1 to 12 inches. As the granodiorite boundary is close by, and probably less than 50 feet below the surface, the occurrence is suggestive of solutions rising from the igneous mass below.

"The facts cited, therefore, point to the granodiorite as being the source of the sulphide bodies, but without proving the supposition. If the conclusion is a true one, then it is obvious that the areas most favourable for the discovery of sulphide deposits are those within 3 or 4 miles of the boundaries of such granodiorite masses, of which there are at least three, namely the Lake Dufault, Lake Flavrian, and Clericy batholiths."

RELATIONSHIPS BETWEEN THE GRANODIORITE OR QUARTZ DIORITE AND THE COPPER ORES.*

"In the Summary Report for 1925, a few facts were noted suggesting that the granodiorite was the source of the copper ores. A few more facts supporting this hypothesis were obtained during the field work of 1926, but the hypothesis must still be regarded as unproved until further work is done.

"In the 1925 report attention was called to the spacing of the known ore-bodies around the margin of the intrusive mass. To-day this is more evident. The detailed mapping of the area shows that the Waite-Montgomery discovery, the four different discoveries on the Amulet property, and some minor discoveries to

* H. C. Cooke, Geological Survey, Summary Report 1926, p. 54c.

the south, are all spaced close to the boundary, and commonly less than half a mile from it. This summer's work also brings out the fact that these discoveries, which are all of heavy sulphides with little or none of the ordinary gangue materials, all lie beneath the base of the intrusive sill, a fact that the writer believes to be of significance.

"Another type of deposit has been found in the large remnant of Keewatin roof overlying the central part of the Lake Flavrian granodiorite. One of the best examples is about half a mile northwest of the 2 mile-post of the north-south centre line of Duprat, in the northwest corner of claim A-9626. It is a vein or lens varying from a few inches to 3 feet in width and lying in a small fault. It strikes north 35 degrees east, and dips about 80 degrees south. The vein material consists of quartz and chalcopyrite in about equal parts, together with a little specularite and pyrite.

"It will be noted that this vein differs from the Horne and other deposits to the east in two important particulars. The sulphides, pyrite, pyrrhotite and sphalerite, which form so large a part of the eastern deposits, are almost entirely absent; and quartz, almost absent in the eastern deposits, here forms 50 per cent or more of the vein. Also, chalcopyrite, which in the eastern deposits appears to have come in somewhat later, replacing the other earlier-formed sulphides, is here deposited contemporaneously with the quartz.

"A considerable number of veins of this type have been found, east of the Flavrian mass in the southwest corner of Duprat township and the adjoining part of Dufresnoy township. They are all of the same type, rather narrow, filling fault fissures, and composed mainly of quartz and chalcopyrite in varying proportions.

"It will be noted that all the veins of this second, quartz-chalcopyrite type, have been found above and close to the highly siliceous top of the granodiorite mass; whereas, as already mentioned, the heavy sulphide deposits lie stratigraphically beneath the basic bottom of the Dufault sill. Such relations strongly suggest the conclusions that the heavy sulphide bodies are basic segregations that separated in some way, perhaps by sinking during the early stages of cooling of the magma; whereas the quartz-chalcopyrite veins represent the other end of the differentiation process, and were given off in the final stages of cooling, together with water and other volatile constituents.

"Direct evidence that the diorite and granodiorite have given rise to the sulphide bodies is not plentiful as yet. In the Summary Report for 1925 it was mentioned that north of lake Dufault, in the northeast corner of claim No T-1290, there are numerous fragments of glassy rhyolite in the granodiorite, and these fragments of rhyolite are filled with splashes of chalcopyrite, although the rhyolite a few feet farther from the contact contains no chalcopyrite. The only explanation for the presence of the chalcopyrite in the fragments thus seems to be that it was introduced by emanations from the cooling granodiorite.

"Again, toward the east end of claim Block 9 on the south shore of Osisko lake, the acid granodiorite dyke that cuts across the basic diorite dyke is filled with a network of veinlets composed mainly of sulphides. A sample weighing 15 or 20 pounds was crushed and the sulphides separated and assayed. They contained 0.94 per cent of copper, so that the sulphides present consist of approximately 97.2 per cent pyrite and 2.8 per cent of chalcopyrite. The network of sulphide veinlets is entirely confined to the acid granodiorite, and hence it is difficult to avoid the conclusion that the sulphide is a product of the differentiation of the granodiorite.

"Again, mention has been made of the acid veining universally characteristic of the quartz diorite and the basic parts of the granodiorite. A railway cut on the north side of the Horne property, claim Block 15, cuts through certain quartz diorite dykes, and makes it possible to see that at the centre of each such acid band is a narrow veinlet carrying a considerable amount of pyrite together with gangue minerals. The gangue minerals accompanying the pyrite are epidote with a certain amount of quartz and chlorite apparently secondary after hornblende. These veinlets occur so uniformly throughout the diorite and basic granodiorite that it seems necessary to conclude that they have formed by differentiation from the cooling magmas themselves.

"These facts, therefore, all suggest that there is some close connexion existing between the sulphite bodies and the granodiorite-quartz diorite masses, but is equally evident that much yet remains to be done toward working out the exact nature of this connexion and the conditions under which the different sulphides, pyrite, pyrrhotite, chalcopyrite, and sphalerite, respectively, are formed."

Noranda, 1927.—From the Horn smelter.

Rouyn, 1927.—Part of the town; Horne smelter and mine in the back ground.

PROSPECTING AND DEVELOPMENT WORK IN 1927

DASSERAT TOWNSHIP

Lake Maron Gold Mines, Ltd.—The claims are situated on the western boundary of Dasserat township. The camps, located on the east shore of lake Maron, are reached by waggon road from Cheminis, a distance of three and a half miles. The fifteen claims in the group are as follows:—T-1507 to T-1510, T-1535 to T-1538 and T-1566 to T-1572.

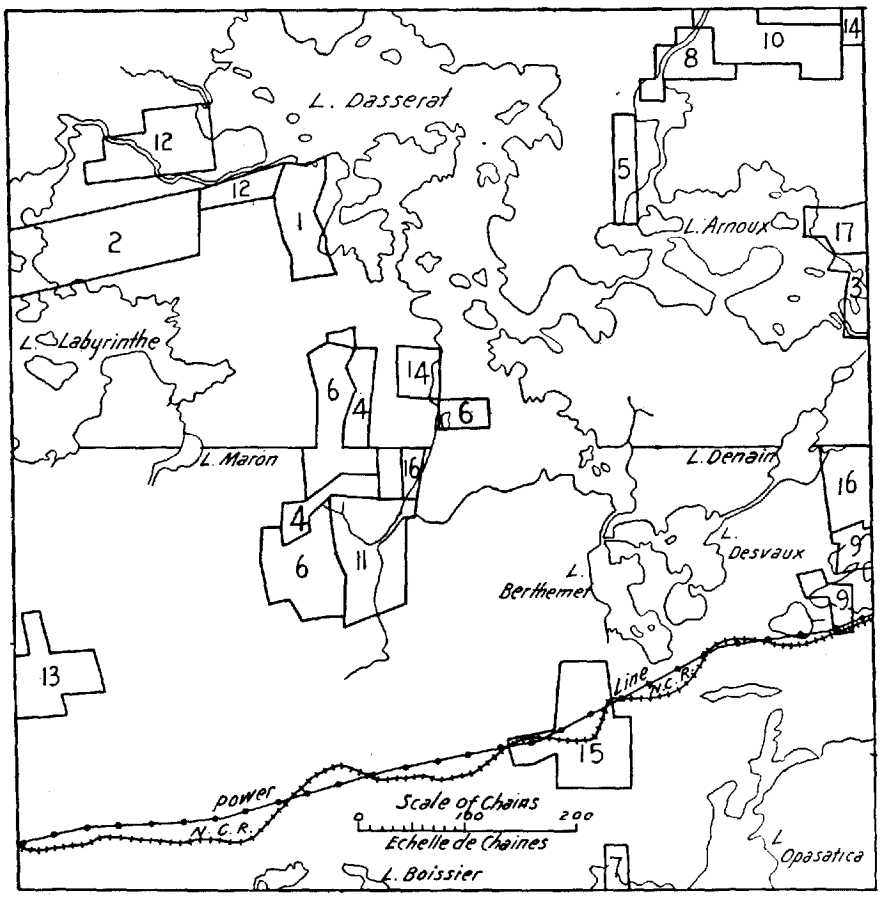
The area is heavily drift-covered. To the west of lake Maron, Temiscamingue sediments including greywackés and conglomerates are exposed; these are intruded by dykes of red and grey porphyry. To the east of this lake, a high ridge of Cobalt sediments may be seen. Attention has been concentrated on quartz veins which parallel the porphyry dykes and in which gold values have been found. A geological map made by the company shows that two of these porphyry dykes received special attention: these are called respectively, the north and south dykes. The north dyke strikes east and west, paralleling the bedding planes of the sediments, through claims T-1507 and T-1535 and has a width of 180 feet. The south dyke strikes in the same direction and is approximately 400 feet wide; it crosses through claims T-1510 and T-1538.

Four thousand feet of diamond drilling was done in 1926. Since then from eight to ten man have been employed in surface work until August 1927, when diamond drilling was resumed. At this time, four holes were put down on the north porphyry intrusion. Four holes were also drilled on the south dyke; these were started in conglomerate and greywacké, from the north and directed to the south across the porphyry contact. The total drilling this year aggregated 4,000 feet. In December, operations were discontinued on this property.

Mr. Dalby, the manager of the company, states that gold values appear to be associated with tetrahedrite, which is found in association in small amount with chalcopyrite and other sulphides, in the quartz veins. No free gold has been observed.

Towagmac Exploration Co., Ltd.—This company, in their annual report for 1927, give the following information in regard to a block of claims lying to the south-west of Dasserat lake.

DASSERAT TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Argonaut Consolidated Mines, Ltd.; 2.—Balzimer-Mitto group; 3.—Boischatel Mines, Limited; 4.—Brownlee Gold Mines, Ltd.; 5.—Buckingham Mines, Ltd.; 6.—John A. Brownlee; 7.—Th Cogomet Mining Co., Ltd.; 8.—Corona Mines, Ltd.; 9.—Crown Reserve Consolidated;10.—Chas. M. Heron; 11.—Hughes Development Corp'n, Ltd.; 12.—Labyrinth Lake Mining Synd.; 13.—Lake Maron Gold Mines, Ltd.; 14.—Quebec Prospectors, Ltd.; 15.—Syndicat Miljour; 16.—Towagmac Exploration Co., Ltd.; 17.—Victory Gold Mines, Ltd.

"On this group of twelve 40-acre claims, a large outcrop of breccia carrying disseminated chalcopyrite was uncovered. Although not of ore grade, it nevertheless encourages the hope that commercial concentrations of chalcopyrite may be found. To that end, your management contemplates having the property electrically surveyed."

"Russian Kid" Claims.—"In October, 1924, A. W. Balzimer and Mike Mitto staked a group of thirty-three 40-acre claims on the northeast side of Labyrinth lake, Dasserat township. Balzimer later made a discovery of gold on claim T-2108 that created much interest. Since that time the partners have done much work both in opening up this discovery and in prospecting the remaining claims. The vein has been exposed by cross-trenching for a length of about 350 feet, and a number of shallow pits have been sunk on it, one about 12 feet deep. At the west end the vein pinches out, but a quarter mile beyond this point and on the projected strike of the vein, a pit was sunk in the drift and ore was found at bedrock; so that there is evidently another expansion of the vein in this direction, though little is yet known of it.

"The vein follows closely the contact between a body of granite and one of the diorite, cutting here into the one, there into the other rock. It strikes north 70 degrees east, and dips 75 degrees south. At the easternmost exposure, where it disappears beneath a swamp, it is 7 feet wide. About 200 feet west the width lessens to 2 feet, then increases again to 5 feet 70 feet farther on, finally decreasing to zero about 350 feet from the eastern exposure.

"The vein matter consists of white quartz and a little iron carbonate very heavily mineralized with coarse-grained pyrite. The wall-rock is also rather heavily mineralized with pyrites for distances of 1 to 3 feet from the vein. The pyrite apparently carries the gold. A sample consisting of about 80 per cent pure pyrite, taken by the writer, assayed $9.60 in gold per ton. The average tenor of the vein matter, excluding free gold, is $6 to $7 per ton according to the owners, and that of the heavily mineralized wall-rock $3 to $4 per ton.

"Much free gold was found in the vein when it was first opened up, giving the discovery a highly spectacular character. The free gold has been found, up to the present, only in the limonitic material formed by weathering of the pyrite; it seems probable, therefore, that the free gold is merely residual, and will not be

found in unweathered vein material. Accordingly, it seems unlikely that the average tenor of the vein materials will exceed the values quoted.

"The rock on the north side of the vein is a large sill of the diorite, differentiated in place so that the southern or upper side is much more highly feldspathic than the northern or lower part. On the south side of the vein there is a good-sized body of a granite so similar in its general texture and appearance to the more acid phases of the diorite as to suggest that it is a differentiate of the diorite magma. It is made up of about 30 per cent or more of free quartz, 5 per cent of hornblende in long needles, now largely altered to chlorite, 2 or 3 per cent of magnetite in coarse crystals, and the remainder mainly oligoclase, Ab80 An20. Unfortunately, time did not permit of a more extended study of these interesting rocks.

"The rock along the granite-diorite contact is rather highly sheared, either by faulting or by slip between the two formations during folding." *

The following organizations also have mining rights in the township of Dasserat:—Argonaut Consolidated Mines, Ltd.; Boischatel Mines, Ltd.; Brownlee Gold Mines, Ltd.; J. A. Brownlee; Buckingham Mines, Ltd.; The Cogomet Mining Co., Ltd.; Corona Mines, Ltd.; Crown Reserve Consolidated; Chas. M. Heron; Hughes Development Corp.; Labyrinth Lake Mining Synd.; Miljour Synd.; Quebec Prospectors, Ltd.; and Victory Gold Mines, Ltd. Operations on these groups were confinded to assessment work and no important discoveries were reported.

BOISCHATEL TOWNSHIP

Aldermac Mines, Ltd.—This company was formed during the past year to operate the Alderson-Mackay mine. Previous to this, interest in the property was held by Towagmac Exploration Co., Ltd. and by N. A. Timmins, Inc. An agreement was entered into during the summer whereby Noranda Mines, Ltd. secured the interest formerly held by N. A. Timmins, Inc., and the above named company was formed with a capitalization of 3,000,000 shares of no par value stock. Towagmac shareholders received 200,00 shares in the new company in the form of rights.

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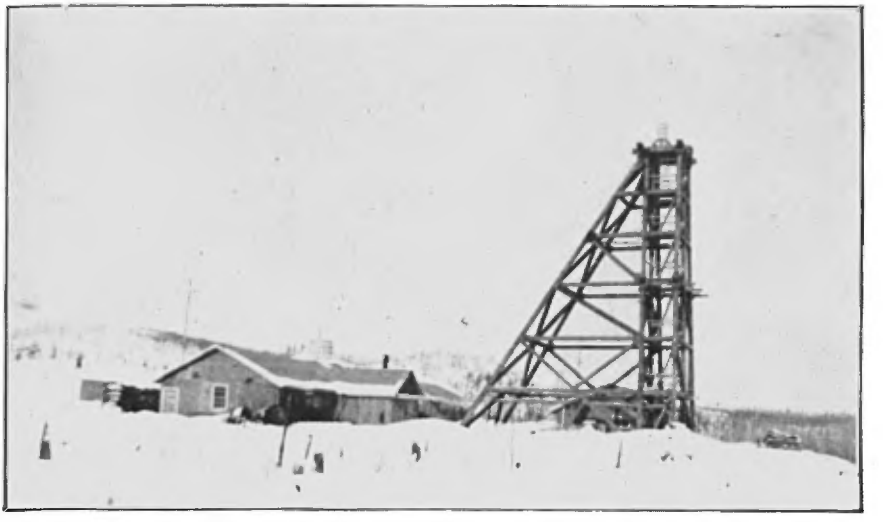
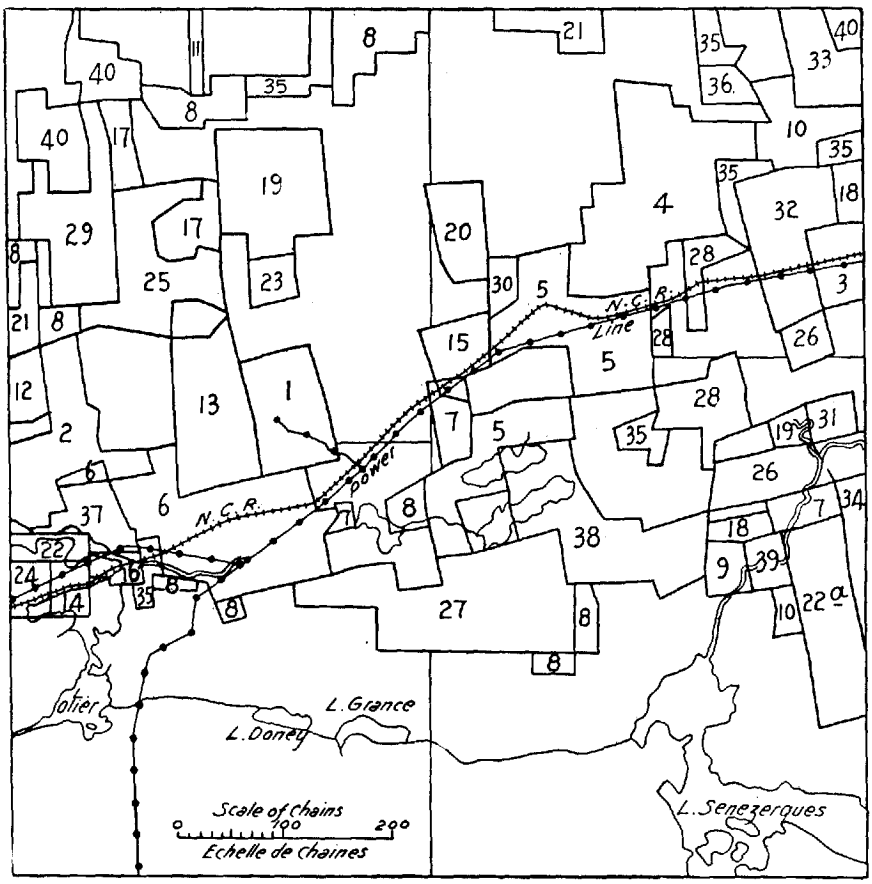
* H. C. Cooke, Geological Survey, Summary Report 1925, p. 30c.

Aldermac Mines, Ltd.—Headframe, ore dump and plant, Boischatel township.



Waite-Ackerman-Montgomery Mines, Ltd.—Headframe and power plant, Duprat township.

BOISCHATEL TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Aldermac Mines, Limited.; 2.—W. P. Alderson group.; 3.—Amulet Mines, Ltd.; 4.—Armstrong Mines, Limited.; 5.—F. S. Arntfield Group.; 6.—Arntfield Gold Mines, Ltd.; 7.—Astoria Rouyn Mines, Ltd.; 8.—Boischatel Mines, Ltd.; 9.—Boischatel Quebec Mines, Ltd.; 10.—Buffalo Rouyn Mines, Ltd.; 11.—Campbell Mines, Ltd.; 12.—Capital Rouyn Mines, Ltd.; 13.—Chance Syndicate.; 14.—La Compagnie des Mines d'Or Pontiac & Abitibi, Ltée.; 15.—Consolidated Mining & Smelting Co., Ltd.; 16.—Crown Reserve Consolidated Mines; 17.—Fairwood Mining Syndicate; 18.—Fiske Giold Mines, Ltd.; 19.—Granada Rouyn Mining Co., Ltd.; 20.—Halliwell group; 21.—Heela Consolidated Mines, Ltd.; 22.—King of the North Gold Mines; 22*a*.—The Huronian Belt Co., Ltd.; 23.—La Chatelaine Gold Mines, Ltd.; 24.—Lake Fortune Mining Co., Ltd.; 25.—La Salle Copper Gold Syndicate; 26.—Laval-Quebec Mines, Ltd.; 27.—Marclay Mines, Ltd.; 28.—Miller-Boischatel Mines, Ltd.; 29.—The Mount Royal Copper Gold Syndicate; 30.—The O. K. Development Co.; 31.—Quebec Center Mines, Ltd.; 32.—Quebec Copper Gold Mines, Ltd.; 33.—Ribago Copper Corporation; 34.—Rubec Mines, Ltd.; 35.—Stadacona Rouyn Mines, Ltd.; 36.—Thormoor Copper Mines, Ltd.; 37.—Towagmac Exploration Co., Ltd.; 38.—Twin Lakes Mining Corporation; 39.—United Copper Syndicate, Ltd.; 40. Vickers Porcupine Mines, Ltd.

The geological conditions which exist on the property were described in last year's report together with a full description of the three ore zones which had been found up to that time. It may be recalled that zones 1. and 2. were discovered in the fall of 1925, trenched the same year and diamond drilled in the spring of 1926. No. 3 ore-body was discovered in the winter of 1926, with the aid of a dip-needle and was diamond drilled the following summer.

The power line was completed to the property early in 1927, and heavy machinery was installed for underground development. The shaft was then continued to a depth of 532 feet, with levels at 125, 250, 375 and 500 feet. Lateral work done on these four levels during the year amounted to 1,828 feet. 6,404 feet of diamond drilling was done at this time, most of which was concentrated on the shaft area where the sulphide bodies, Nos. 3 and 4, are located. Sulphide body No. 4 was found by diamond drilling during the summer of 1926 at a depth of 450 feet. While sinking the shaft, this body was encountered at a depth of 412 feet and continued in the shaft for a vertical distance of over 100 feet. It is composed of massive sulphides. Over 1000 feet of drifting was done on the 500-foot level, and diamond drilling from this horizon was in progress at the end of the year, The body appears to lie underneath the No. 3 deposit and is parallel to it, striking slightly north of west. It has not been found on the surface.

Armstrong Mines, Ltd.—The group of claims registered under the name of this company lies to the north-west of the Quebec Copper Gold Mines Ltd.; it is made up of 43 claims with an approximate area of 2200 acres. The north boundary of the claims closely follows the southern margin of a large granite mass; granite outcrops are found also in the south part of the group. In the centre of the property, the surface is heavily drift-covered, but, from outcrops observed, it appears to be underlain by acid and basic volcanics of Keewatin age.

In August, 1926, a dip-needle survey was made of these claims; in March 1927, an electrical survey was made by the Swedish-American Corporation of the areas underlain by Keewatin rocks. No further developments have been reported.

Arntfield Gold Mines, Ltd.—The mining rights to a group of claims lying to the east of lake Fortune are held by this company. This is known as the West Arntfield; and comprises the

following claims:—T-445 to 450, 298, 465, 466, 559 and 1162 to 1167.

During 1927, two claims of this group, were under option to the Towagmac Exploration Co., Ltd. and were explored by these interests. The option has expired. Further development work will be undertaken, during 1928 on these claims, by the Arntfield Mining Syndicate, Ltd. who own a block of stock in Arntfield Gold Mines, Ltd. The syndicate carried out some prospecting work, during the year, on the other claims of this group.

The following information is obtained from the Annual Report of Towagmac Exploration Co., Ltd.

"Since the issue of the last annual report, a total of 3,659 feet of diamond drilling was done, 1,606 feet on the Francœur claims (Towagmac) and 2,053 feet on the Arntfield property (T-298 and 450). In general, the drill results on the Francœur confirmed the continuation to depth of the ore shoot uncovered by trenching on the surface, although a decrease, both in widths and values, was noted.

"The drilling done on the optioned part of the Arntfield group did not bear out the favourable widths and assay values obtained from trenching this vein system, although, with two exceptions, no hole was drilled which did not shew the presence of some gold values. Generally, however, these values were below ore grade, hence your company's option on this group was relinquished."

Dr. H. C. Cooke, of the Geological Survey who examined this property in 1925 describes the ore occurrences as follows:

Arntfield and Francœur Claims.—"The country rock of the claims is mainly Keewatin lava of about the composition of trachyte, but varying slightly to both more basic and more siliceous varieties. Near the east side of claim T-298 and 4 or 5 chains south of the base-line, there is also exposed a thick bed of coarse rhyolite breccia or agglomerate. The strike of the flows is nearly due east and west, the dip steeply northward, and the upper surfaces of the flows face toward the south. A few small dykes of syenite porphyry and gabbro cut the flows, usually nearly parallel to their strike.

"The ore-bodies are all replacements of the country rock by quartz, carbonates, and other minerals. The replacement seems to have occurred mainly at the contact of two flows, perhaps because the upper surface of a flow is more readily replaced than any

other part by reason of its fine-grained texture, or perhaps because the slipping of one flow on another during folding created a zone of fracture or shear through which solutions flowed readily. Whatever the reason, however, these contacts appear favourable to the localization of replacement ore-bodies, and consequently the dip and strike of the ore-bodies is controlled by the structure of the flows, and is parallel to it.

"Three bodies of ore have been found, one at the east side of the F. S. Arntfield claim, T-298, one at the west side and extending across the line into the Joe Baker claim, and a third on the Francœur claim near the east side. All these bodies, as previously mentioned, are close to a base-line run north 79° 55′ west from the east line of T-298 from a point 150 feet south of post No. 1.

"The easternmost ore-body has been traced for some 300 feet by trenching the north slope of a low, rocky hill. The drift is up to 6 feet in depth, and becomes deeper to the east and west, so that the vein has not been traced farther. The best exposures are in trenches 750 to 800 feet along the base-line from the east boundary of the claim. Here the exposed width of the ore-body is nearly 30 feet, and the north contact is still hidden beneath drift. The ore is very fine-grained, light grey rock liberally sprinkled with very fine-grained pyrites, and weathering to a reddish-brown. This material, which is much altered country rock, is traversed by ill-defined and discontinuous bands of lighter grey or white material which appear to be vein material. The microscope shows that they consist largely of calcite, with a little quartz, pyrite, and a few grains of clear, fresh albite. The least replaced material between the veins is largely feldspar of the rock, albite or oligoclase albite; in other parts of the thin sections the replacement of this sericite-albite mixture by the carbonate and pyrite of the veinlets may be observed in all its stages. The average tenor of the replacement ore on the surface is $7 per ton in gold.

"The second ore-body is at the west end of the F. S. Arntfield claim, T-298, extending west into the Joe Baker claim. It has been traced for some 400 feet, and runs into low ground at both ends. The known eastern extremity of this body is 200 feet south of the base-line and 3,000 feet from the eastern side of the claim. The stretch of swamp east of it is 850 feet wide, and in a trench just beyond the swamp, or 2,150 feet from the east side of the claim, there have been discovered some bands of similarly altered rock

that may possibly represent the eastern end of the ore-body. The ore-body has a maximum width of more than 50 feet 3,000 feet from the east end of the base-line, and narrows on the west to 6 or 7 feet. In the wide part, the tenor averages $8 per ton in gold, throughout an 8-foot section.

"The third ore-body lies near the east side of the Francœur claim. It crosses the base-line about 4,300 feet from its eastern end, and has been traced west about 250 feet. Like the others it has the shape of a lens, measuring 22 feet across at the widest part. The gold values vary from $7 to $9 per ton."*

F. S. Arntfield.—Two groups are registered in the name of F. S. Arntfield. During the year, exploration work was carried out by the Arntfield Mining Syndicate, Ltd. The Helen lake group comprises six claims; T-432 to 435, 749 and 750, situated in the south-east quarter of Boischatel township. The second group, known as the east Arntfield, comprises claims T-519, 520, 523, 524, 526, 527, 625 and 654, situated in the northeast quarter of the township, to the southwest of Armstrong Mines, Ltd.

The Helen lake group was prospected during the year, and the syndicate reports that a wide quartz vein, well mineralized with pyrite, was stripped and sampled, but that no commercial values were found.

On the east group, the Geophysical Company of Canada conducted an electrical survey over claims T-519, 520, 625 and 654. In the fall this was followed by 1,100 feet of diamond drilling on several areas of higher conductivity.

Astoria Rouyn Mines, Ltd.—This company holds the mining rights to three claims in this township. T-544 and 548 lie near the centre of the township and T-688a in the southeast quarter, close to the east boundary of the township. Late in the year, camps were built on claim T-548 and some trenching effected. This company is capitalized at $5,000,000.

Boischatel Mines, Ltd.—The mining rights to the following claims in Boischatel township are held by this company: T-4247 to 4254, T-5588 to 5595, T-4368 to 4371, T-5805 to 5814 and T-6018 to 6021, which lie in the northwestern part of the township; T-6396 and 6397, south of the Arntfield Gold Mines, Ltd., T-3256 to 3261,

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* H. C. Cooke, Geological Survey of Canada, Summary Report, 1925, p. 31c.

east of Wasa lake, T-6660 to 6664, east of the Marclay Mines, Ltd.

Development work has consisted in stripping, trenching and an electrical survey by the Schlumberger method. Boischatel Mines, Ltd. has a capitalization of three million shares of no par value.

Buffalo-Rouyn Mines, Ltd.—This company holds two groups of claims in this township. One group, situated to the south of the Ribago, is made up of thirteen claims, as follows: T-2850 to 2861 and T-6785 and 6786. The other group lies in the south-east quarter of the township and comprises mining claims T-2908 and 2909.

During the summer and fall, a number of men were employed in surface trenching, on the north group. A log cabin was erected and a road cut through to the camp.

Chance Syndicate.—The option, held by the Tonapah Canadian Mines, Ltd., on the claims belonging to this syndicate, was relinquished early in March, 1927, and no important operations were carried on during the remainder of the year.

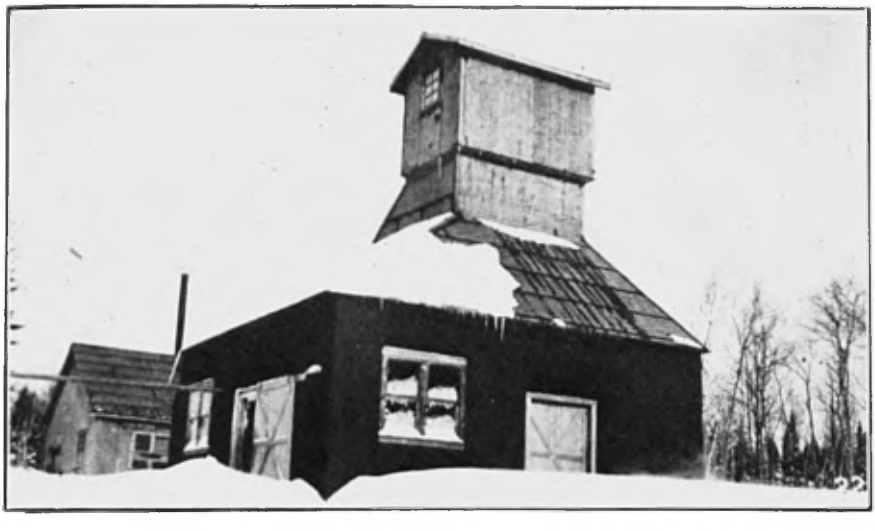
La Chatelaine Gold Mines, Ltd.—This group comprises four claims situated in the north-west quarter of the township and to the north of the Aldermac mine. They are as follows: T-3780 to 3783.

The two south claims, T-3780 and 3783 are heavily drift-covered: very little work has been done on them. The north claims are underlain by acid and basic volcanics intruded by a coarse-grained feldspar porphyry and by dykes and bosses of diorite, which are found on the east part of claim T-3781. Since April, 1927; five men were employed in surface work; magnetometric and electrical surveys were completed. In the middle of October, a diamond drill was brought in and three holes were put down totalling over 1000 feet. One hole was drilled to the north of the camp, on claim 3781, and the two others were put down near the west boundary of claim 3782. Operations have since been discontinued.

The company was incorporated in 1927, with a capitalization of $5,000,000.

Lake Fortune Mining Co.—In 1926, a proportion of the issued capital of this company was held by Towagmac Exploration Co., Ltd., and an agreement was later entered into, whereby the Towag-

Windfall-Rouyn Mines, Ltd.—Camp buildings in Clericy township.



Ribago Copper Corporation, Ltd.—Shaft house in Boischatel township.

mac Company undertook to explore this property by diamond drilling; in return they will receive stock for amounts expended on the claims and an option on further treasury shares.

During the year 1927, an intensive diamond drilling programme was carried out, and the annual report of the Towagmac Company furnishes the following information:

"The diamond drill programme, initiated in 1926, has now been completed and has indicated, between the 300 and 500 foot horizons, the existence of an ore shoot, at least 500 feet in length, of an average width of 3 feet 7 inches, with an average value of $10.71 in gold. Your directors are now considering ways and means of financing the further exploration of this ore zone by underground work."

Marclay Mines, Ltd.—This company holds the mining rights to a group of forty-two claims, situated on either side of the north-south centre line of Boischatel township and to the south of the Nipissing Central Railway. The camps consist of two cabins on the northeast corner of claim T-4071. A few men were employed during the summer in surface stripping and trenching; later in the year, a shaft was sunk to a depth of 40 feet, near the north-east corner of claim 4070. At this point, there is a shear zone filled with quartz stringers in which fine pyrite and, to a lesser extent, chalcopyrite are found. The wall-rock is coarse grained and basic in composition, probably a diorite. A range of hills strikes from east to west across the south-half of the claims and this is composed of sedimentary rocks of the Cobalt series.

Miller-Boischatel Mines, Ltd.—At the end of the year, this company held three blocks, comprising twenty-four claims, situated near the east boundary of the township and on either side of the east-west centre line. The claims are as follows: T-3553 to 3562, 3784 to 3788, 3925 to 3928, 3959 to 3962 and 9272.

The camps, which were constructed during the summer, are situated on the Cheminis road, about six miles from Rouyn. Diamond drilling was commenced in September, 1927, and four holes were put down, totalling over 2000 feet. In December, a Radiore electrical survey was made of the claims.

O. K. Development Co., Ltd.—A group of four claims, lying in the northeast quarter of the township and close to the north-south centre line, is registered in the name of this company. They are as follows: T-3292 to 3295. A camp was constructed and sur-

face trenching was carried on during the year. A magnetometric and electrical survey was also completed. Operations were discontinued in the fall.

Quebec Copper Gold Mines, Ltd.—A 1004-acre block, west of the Amulet group "C", is registered in the name of the Quebec Copper Gold Mines, Ltd. This property is often referred to as the Aconda because the Aconda Mines, Ltd., a holding company, owns the stock of the Quebec Copper Gold Mines, Ltd.

These claims are, for the most part, covered by a heavy mantle of glacial drift. Where exposed, the rocks are acid volcanics. A large amount of surface stripping and trenching was accomplished, and an electrical survey was made, early in the year, by the Swedish American Corporation. During the last half of the year, no operations were carried on, but it is planned to do further work in 1928.

Ribago Copper Corporation, Ltd.—This company was organized in 1926, with a capitalization of $4,000,000, to purchase and develop a group of 12 claims, situated in the northeast corner of Boischatel township and extending into the adjoining township of Rouyn. These are as follows:—T-3027 to 3034 and T-3047 to 3050.

During the year, very good camps were built and a new road was cut through, from the Macamic road, a distance of three miles.

Most of the area is covered by glacial drift, but, where exposed the rock is a schisted basalt. A diorite dyke cuts across the northeast corner of claim 3028. On claim 3049, where most of the work has been concentrated, the rocks appear to be more highly schisted than in other parts; three mineralized zones were found, in which chalcopyrite is present. Early in the year, three diamond drill holes were put down to intersect these three parallel zones, which are only a few hundred feet apart. No. 1 hole was drilled to a depth of 504 feet, at an inclination of 35 degrees to the south; No. 2 hole was drilled to a depth of 565 feet, at an inclination of 35 degrees to the north; No. 3 hole was drilled to the south, at an inclination of 35 degrees and to a depth of 332 feet. The annual report of the company states that these holes were indeterminate, all showing disseminated copper but no ore-bodies of commercial grade. Later in the year, test pits were sunk on two of these zones. In view of the encouraging results obtained in one of these pits, it was made into a two-compartment shaft, and was continued to a depth of 147 feet. A station was cut at 125 feet, and 161 feet of lateral work accomplished on this level.

Diamond drilling was then commenced, from this level, and four flat holes were driven in various directions; at the same time an electrical survey was made of this area by the Radiore Company. Results were disappointing and the property was closed down early in 1928.

Towagmac Exploration Co., Ltd.—This company, in addition to holding a substantial interest in Aldermac Mines, Ltd., owns, or has under option, a large number of claims in Western Quebec. The group on which most attention was centred during the year is made up of five claims, which lie close to the western boundary of the township and to the north of the Nipissing Central Railway. The claims are as follows: T-134, T-135, T-165, T-298, T-450. The two last were under option from Arntfield interests.

The mineralized zone described in last year's report was diamond drilled. The second annual report of the company furnishes the following information:

"Since the issue of the last annual report, a total of 3,659 feet of diamond drilling was done, 1,606 feet on the Francœur claims and 2,053 feet on the Arntfield property. In general, the drill results on the Francœur confirmed the continuation to depth of the ore shoot uncovered by trenching on the surface, although a decrease both in widths and values was noted.

The drilling done on the optioned part of the Arntfield group did not bear out the favourable widths and assay values obtained from trenching this vein system, although, with two exceptions no hole was drilled which did not show the presence of some gold values. Generally, however, these values were below ore grade, hence your company's option on this group was relinquished."

The following companies have mining rights in this township:—Boischatel Quebec Mines, Ltd.; Capital Rouyn Gold Mines, Ltd.; Campbell Mines, Ltd.; Crown Reserve Consolidated, Ltd.; Consolidated Mining and Smelting Co., Ltd.; Fairwood Mining Syndicate; Fiske Gold Mines, Ltd.; Granada-Rouyn Mines, Ltd.; Hecla Consolidated Mines, Ltd.; La Salle Copper Gold Synd.; Mount Royal Copper Gold Synd.; Quebec Copper Gold Mines, Ltd.; Quebec Centre Mines, Ltd.; Laval-Quebec Mines, Ltd.; Rubec Mines, Ltd.; Stadacona Rouyn Mines, Ltd.; Thormoor Copper Mines, Ltd.; Twin Lakes Mining Corporation; United Copper Co., Ltd.

ROUYN TOWNSHIP

Bagamac Rouyn Mines, Ltd.—This company was incorporated in Ontario, in 1926, to explore and develop two claims lying within and to the west of the town of Rouyn. The property has an area of 509.48 acres. The east claim, known as Block 41, has been turned into a town site and a number of lots have been sold. Last summer the surface rights to the remaining part, were purchased by Realty and Mines of Rouyn City, Ltd. This company also has an option on a block of Bagamac Rouyn Mines stock.

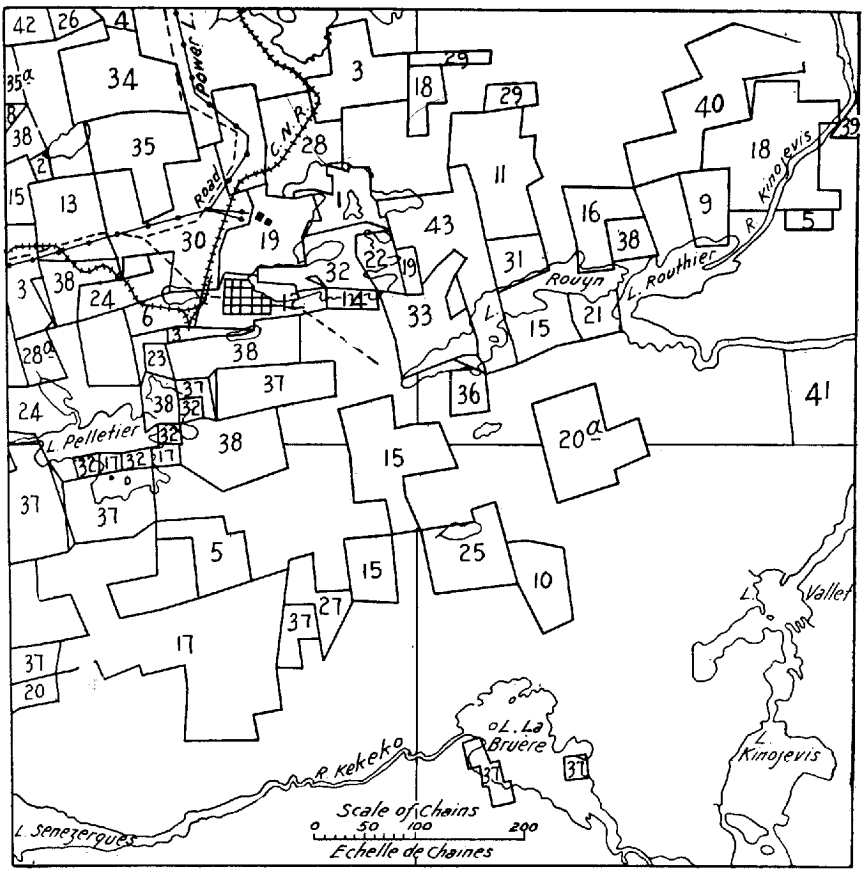
Splendid camp buildings were erected early in the year on the shore of Noranda lake and a programme of intensive surface exploration was carried out. It is said that this is to be followed by diamond drilling. Encouraging gold assays were obtained in quartz veins, in association with feldspar porphyry dykes, on Block 41. About 20 men were employed during most of the year.

Brownlee Gold Mines, Limited.—This company holds mining rights on M. L. 1763 and 1768, in Rouyn township. The claims are located northwest of the property of the Horne Copper Corporation. The provincial highway and the Canadian National Railways track cut the claims.

The company reports for 1927 approximately 3,000 feet of trenching, a total of 2,700 feet of diamond drilling, the sinking of a shaft to a depth of 50 feet and the construction of permanent camp buildings. This work is said to have exposed copper mineralization in five different places.

La Compagnie Minière Ville-Marie-Rouyn, Ltd.—The mining rights to a group of claims, formerly held by the Syndicat Minier de Ville Marie, Ltée., have been transferred to this company. This group lies in the north-east quarter of the township, to the north of lake Rouyn. It has an area of approximately 900 acres, and comprises claims T-289, 290, 291, 1940, 1941, 1942, 2806, 2807, 2808 and 2809. These have been surveyed. From eight to ten men were employed in surface stripping and trenching operations, during the year and a magnetometric survey was completed. Several well mineralized zones were found. Most of this work was concentrated on the north half of the group, as the southern part is heavily drift-covered. Diamond drilling is comtemplated during the coming year.

ROUYN TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—The Adsit Mining Corp'n.; 2.—Allied Mines, Ltd.; 3.—Amulet Mines, Ltd.; 4.—Area Mines, Ltd.; 5.—Astoria Rouyn Mines, Ltd.; 6.—Bagshaw Rouyn Mines, Ltd.; 7.—Brownlee Gold Mines, Ltd.; 8.—Buffalo Rouyn Mines, Ltd.; 9.—Buffalo Rouyn Syndicate; 10.—Capital Rouyn Gold Mines, Ltd.; 11.—Compagnie Minière Ville-Marie-Rouyn; 12.—Dasserat Rouyn Goldfields, Ltd.; 13.—Don Rouyn Gold Mines, Ltd.; 14.—Farrell Rouyn Mines, Ltd.; 15.—Fiske Gold Mines, Ltd.; 16.—The Gold Exploration of Canada, Ltd.; 17.—Granada Rouyn Mining Co., Ltd.; 18.—Hecla Consolidated Mines, Ltd.; 19.—Horne Copper Corporation.; 20.—Huronian Belt Co., Ltd.; 20*a*.—Kenojevis Syndicate; 21.—La Chatelaine Gold Mines, Ltd.; 22.—Lakeside Mines, Ltd.; 23.—Larose Mines, Ltd.; 24.—Laval-Quebec Mines, Ltd.; 25.—London Canadian Gold Mines, Ltd.; 26.—McDougall Mines, Ltd.; 27.—Monargo Mines, Ltd.; 28*a*.—Montreal Rouyn Mines, Ltd.; 28.—Murray Group; 29.—Newbec Mines, Limited;—30.—Noranda Mines, Ltd.; 31.—Notre-Dame Mines, Ltd.; 32.—Osisko Lake Mines, Ltd.; 33.—Osisko Rouyn Exploration Co., Ltd.; 34.—Pontiac Rouyn Mines, Ltd.; 35.—Powell Rouyn Mines, Ltd.; 35*a*.—Ribago Copper Corporation, Ltd.; 36.—Rouyn Lake Gold Mines, Ltd.; 37.—Rubec Mines, Ltd.; 38.—Stadacona Rouyn Mines, Ltd.; 39.—Syndicat Marilac.; 40.—Sir Thomas Tait; 41.—Thompson-Cadillac Mining Co., Ltd.; 42.—Vickers Porcupine Mines, Ltd.; 43.—Wiltsey-Coghlan Mines, Ltd.

Don Rouyn Gold Mines, Ltd.—This company has a capitalization of 5,000,000 shares of no par value. During the past year, interest has been centred on group 1, which comprises mining claims T-1785 to 1789, M. L. 1799, M. L. 1800 and M. L. 2028. These claims lie to the east of Amulet group "C", in the northwest quarter of the township. The camps are situated on the Cheminis road, a few miles from the town of Rouyn.

Over 7,000 feet of diamond drilling was done on this property during the year and about twenty-two men were employed in surface stripping and trenching. Sinking of a shaft was commenced and at the end of the year, a depth of 68 feet had been reached: further sinking has been suspended until weather conditions are more suitable. A narrow quartz vein is exposed in the shaft. It is nearly vertical and strikes almost due east and west. Some patches of chalcopyrite occur in it and in the rhyolite walls nearby. The rhyolite, for some distance on either side of the vein, is impregnated with fine disseminated chalcopyrite.

A large amount of trenching has been done on the property. These trenches run from north to south, and are spaced at 150-foot intervals, across the general strike of formations in the district. This property was electrically surveyed, early in the year, by the Swedish-American Corporation.

Fiske Gold Mines, Ltd.—The operations of this company were devoted to the exploration of three groups of claims. One group lies to the south of Rouyn lake and is made up of claims T-312, 319, 324, 343 and 344. The second group lies to the north-east and comprises claims T-3771 to 3774. The third group, claim T-202, is situated on the boundary line between Rouyn and Boischatel townships, to the north of Amulet "C" group.

The first-mentioned group, comprising about 1,400 acres, was explored during the summer. On claim T-312, camps were built, a considerable amount of stripping and trenching was performed, and a shaft was sunk to a depth of 37 feet; from the bottom of this shaft, a crosscut was driven to the south, for a distance of 30 feet, to intersect some quartz veins which were exposed on the surface. On claim T-344, where the outcrops are, for the most part, composed of Temiscamingue sediments, a large quartz vein has been opened up. This has been traced for a distance of over 400 feet, and varies from one to ten feet in width. The walls are not well

defined. The wall rock is a schisted greywacké grading into a coarse conglomerate. The vein is slightly mineralized.

On claim T-202, which lies on the Rouyn-Boischatel boundary, trenching and stripping operations were carried out and some quartz lenses, carrying chalcopyrite, were exposed.

Granada Rouyn Mining Co., Ltd.—This company was organized early in 1927, with a capitalization of $5,000,000, to explore and develop several groups of claims in the townships of Rouyn, Duprat, Boischatel and Dufresnoy. Operations have been confined, during the year, to a block of seventeen claims, lying in the southwest quarter of Rouyn township, and comprising the following:—T-338, 364, 366 to 371, 372*a* to 375*a*, 596 to 598, M. L. 1974 and M. L. 1976.

A, 7′ x 9′, two-compartment shaft was sunk to a depth of 150 feet, on claim T-371. A station was cut at a depth of 125 feet, and on this level, before the end of the year, over 3,000 feet of drifting and crosscutting had been completed.

This claim is underlain by Temiscamingue sediments, for the most part composed of schistose greywackés, intruded by a coarse grained feldspar porphyry, dark in colour, which occurs in the form of dykes and bosses, and with which are associated several irregular veins of bluish quartz. These veins cut through both formations. They are mineralized, to some extent, with pyrite and arsenopyrite, and free gold has also been found in a number of places. Vein No. 1, which was exposed on the surface near the shaft, was encountered on the 125-foot level north of the shaft, at a distance of 130 feet. It varies from a few inches, up to two feet in width. Coarse free gold was observed in places, and a fairly dense, fine pyrite is present in the walls, on either side of the vein.

It has been decided to install heavier machinery, in order to continue the shaft to a depth of 500 feet, and to carry on further exploration work at this horizon.

Some surface work was in progress, during the year, on the north part of this group, in the Keewatin volcanics. A mineralized zone, several feet in width and containing chalcopyrite and pyrrhotite, was blasted into, and an electrical survey was made of this section by the Schlumberger Company.

Hecla Consolidated Mines, Ltd.—A group of five claims, T-3044, 3045, 3046, 5266 and 5267 are registered in the name of this company. These lie on the north-south centre line of the township,

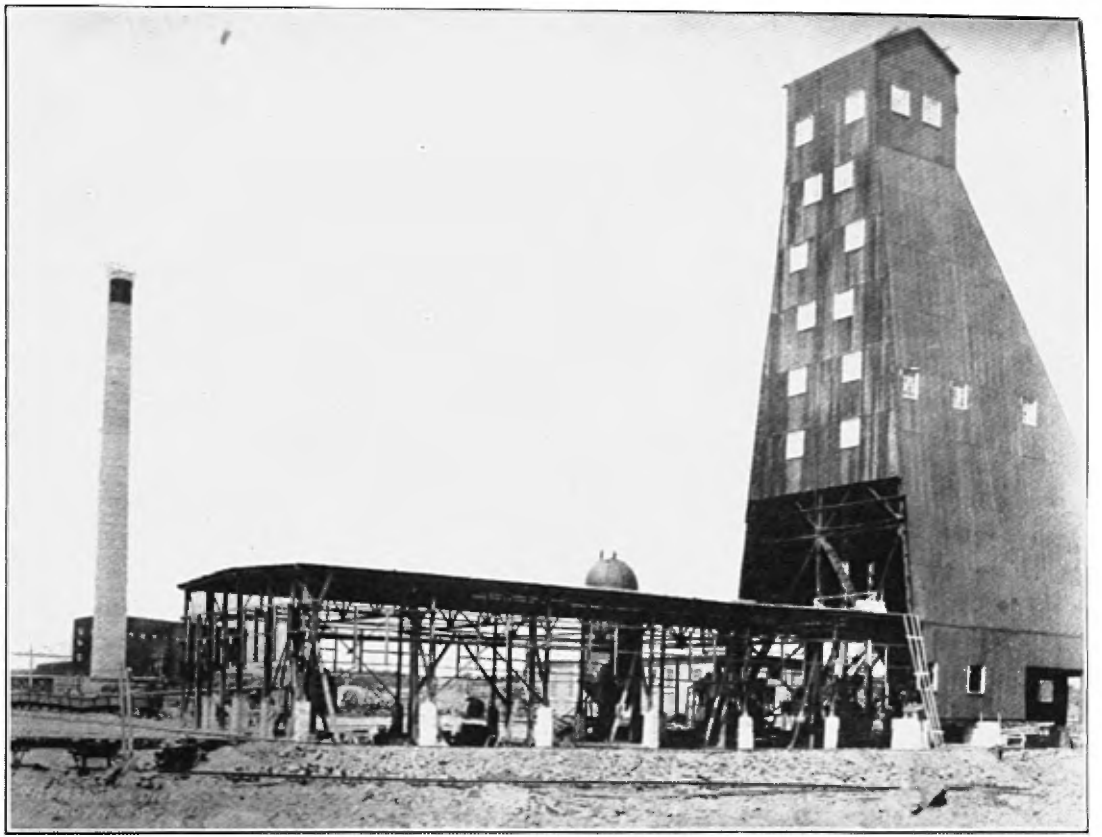
south of lake Dufault. It is reported that controlling interest in adjoining claims, formerly held by the Ontabec Copper Corporation and by Stadamac Mines, Ltd., was purchased during the year, and that the development of claims T-497, 2334, 2335, 349, 405, 613*a*, and 3503 to 3506 is now in the hands of this company.

All of the above mentioned claims, with the exception of T-349, 405 and 613*a*, were electrically surveyed early in the year, by the Swedish-American Corporation, and considerable trenching and test pitting was done during the summer. A magnetometric survey was made of claims T-349, 405 and 613*a*, and four diamond drill holes were put down to a depth of 175 feet, to intersect a mineralized zone exposed on the surface. The company reports that no commercial ore was encountered but that results were distinctly encouraging.

A second group, in the north-west section of Rouyn, previously held by Stadamac Mines, Ltd., has been transferred to this company.

Horne Copper Corporation.—The entire capital of 2,250,000 shares without par value is held by Noranda Mines, Ltd.

Previous to this year, underground operations were essentially of an explorative character. During the past year, however, it was the policy of the company to devote all their energy to developing the known orebodies for production, which entailed the sinking of the No. 3 shaft to a depth of 591 feet, with levels at 100, 200, 300, 400 and 500 feet. A number of new drifts and crosscuts were driven and the old ones had to be widened and regraded, to permit the use of larger cars. Large stations were cut on the five levels, and tracks and semi-automatic caging devices were installed. Drifting to the amount of 2,234 feet and the raising of 3,305 feet of was done during the year. At the end of 1927, the total underground openings consisted of 1,077 feet of shaft-sinking, 16,199 feet of drifts and crosscuts and 3,459 feet of raises. In this connection, it may be remarked that, while shrinkage stoping may be resorted to in some instances, the method of mining which will be adopted in the majority of cases will involve the driving of wide raises, inclined at 45 degrees, between the levels, with loading chutes at the bottoms: from these, similarly inclined branch raises will be driven at right angles, about 35 feet apart, and the benches between them will be broken down by a combination of underhand and overhand stoping. By this means, the danger of spontaneous combustion in the



Rouyn Township.—Horne mine, Shaft-house and headframe

broken ore is eliminated, as the ore is withdrawn shortly after blasting. This is mentioned as one of several advantages that this method possesses.

Diamond drilling from the surface during the year amounted to 5,597 feet and the footage drilled underground was 8,415 feet. The only diamond drilling done below the 300-foot level, during 1927, was on the "D", "K" and "E" orebodies. The total drilling done on the property, up to the end of 1927, was 46,739 feet.

In the Report on operations of the company for the year 1927, * it is stated that, "only a limited amount of drifting was done below the 300-foot level but drifts on both the 400-and 500-foot levels, reached the "H" orebody, which lies to the north of the shaft. On the 400-foot level, 35 feet of ore was passed through averaging $5.17 gold and 1.11% copper. On the 500-foot level, 30 feet of ore was passed through averaging $3.40 gold and 2.4% copper. On both the 400-and 500-foot levels, a band of waste was passed through but, at the end of the year, the faces of both drifts were again in low grade ore."

The "H" orebody, on the upper levels, is composed almost entirely of pyrrhotite, with very low amounts of copper and gold.

In addition to the orebodies, in which the gangue matter is made up of metallic sulphides, there are several bodies of highly siliceous rhyolite in the mine, in which fair gold and copper values are found. This material is used at the smelter as a siliceous flux.

In regard to the ore reserves, the annual report of the company gives the following information:—"During 1927, considerable raising in the various orebodies, in preparation for the work of extracting same, was done and from this work and also from further exploration, it became necessary to slightly revise the figures for ore reserves on some of the lenses carrying high copper values. Revising previous figures and taking into account the new ore discovered during the year, the indicated tonnage as of January 1st. 1928, above the 300-foot level, is 1,198,375 tons, having a gross value of $27,474,475, taking copper at 13 cents a pound. The average grade of the ore is approximately $5.44 gold and 6.73% copper."

Smelter.—The smelter was fully described in Annual Report

* Fifth Annual Report of Noranda Mines, Limited.

of Mining Operations for 1926.† The construction of this and all subsidiary buildings went ahead in a very satisfactory manner, and, on the 17th. of December, 1927, the first blister copper from western Quebec ore was poured. By the end of the year, 276.2 tons of blister copper had been produced, carrying 767.2 ounces of gold and 2,643.5 ounces of silver. The first unit was brought up to its 500-ton capacity, early in 1928, and there has been a steady increase until, at the present time, it is smelting over 650 tons a day. The second unit is nearly completed and will be ready when needed.

The construction of a 500-ton custom concentrator has been commenced, and it is expected that this will be completed by the autumn of 1928.

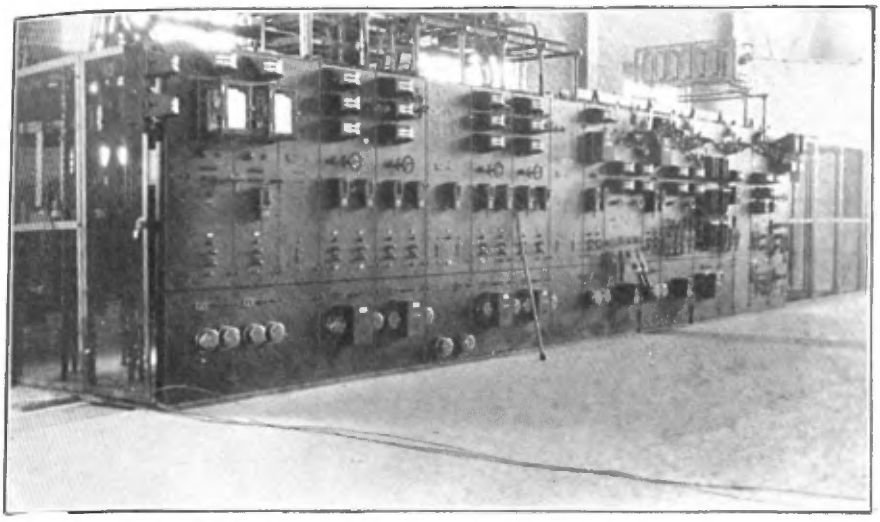
Town site.—In the spring of 1927, a town site was planned and an area of 113.79 acres was divided into 400 large lots for this purpose. These were sold at auction. A sewage disposal plant and a water filtration and chlorination plant were constructed, sewers and water pipes were laid and several substantial buildings were in the course of construction, before the end of the year.

Laval-Quebec Mines, Ltd.—The properties held in the name of this company, in Rouyn township, comprise two groups. The first of these is made up of two blocks, 96 and 97, situated to the west of the town of Rouyn; the second lies to the south-west and comprises M. L. 1840, 1841, 1842, 1844, 1744*a* T-4116 and blocks 4, 5, and 7.

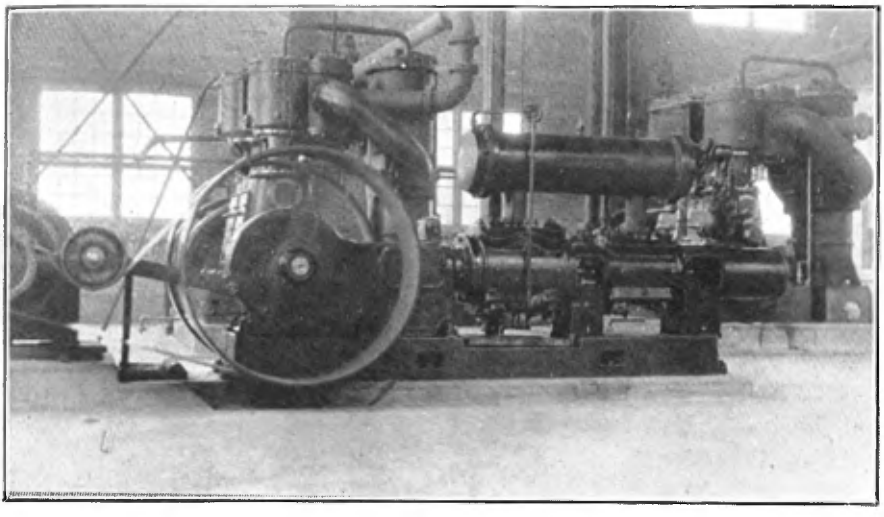
Early in the spring an electrical survey was conducted over this area, with the exception of block 96, by the Swedish-American Company. This was followed by diamond drilling; several holes were put down totalling 2,751 feet. All this drilling was done on the second group, in the vicinity of Pelletier lake. Trenching and surface stripping were in progress during the summer months. In November, operations were discontinued.

In regard to the electrical survey, the company reports as follows:—"Very little information was gained through the survey. Few indications of attraction were located by the Swedish process but diamond drilling did not substantiate the readings: that is, in

† Annual Report on Mining Operations in the Province of Quebec during the year 1926, Qubec Bureau of Mines.



Horne Copper Corporation.—Switchboard for Horne mine and smelter, Rouyn township.



Horne Copper Corporation.—Three electrically driven air compressors. Rouyn township.

some cases, mineralization was encountered, but never in commercial value."

The Pelletier lake group is underlain by acid and basic volcanics, of Keewatin age, intruded by a large mass of gabbro, with other basic phases. Widely disseminated chalcopyrite is found throughout this gabbro.

Murray Group.—An option was secured by the United Verde Extension Mining Corporation, in 1926, on the Murray group, lying north of the Horne and west of the Brownlee. This group is made up of the following claims: M.L. 1733, 1734a, 1734b, 1745, 1796 and T-361.

Operations were commenced early in the year. A power line was installed to the property, a distance of 3000 feet from the Quinze Power Company's sub-station. A substantial headframe was contructed. A hoist house, a blacksmith shop and a change-house were also built. The mechanical equipment included a 750 cu. ft. belt driven compressor, motor, reversible steam-hoist and a Leyner drill sharpener. During the preliminary work, the hoist was run on air from the compressor.

A two-compartment shaft, 7 feet by 11, was sunk close to the south boundary of claim M.L. 1734a. Sinking was under way in June, and in slightly over a month, the shaft had been put down to a depth of 235 feet. A level was established at 215 feet, and by the end of the year nearly 3000 feet of lateral work had been accomplished and over 5000 feet of diamond drilling had been done from this level. About 20 men were employed in this operation.

The geology is similar to that on the Horne and neighbouring claims. The newer diabase dyke, in the vicinity of which most of the Horne ore-bodies have been found, extends into this property for, at least, a short distance. Another feature of interest is a deep draw, which strikes across the country in a south-westerly direction from the claims and which forms a long narrow bay on Osisko lake. This draw follows a zone of intense shearing, in which coarse fragments of rock are held together by a tenacious gouge. This zone was encountered underground in a crosscut, and diamond drilling showed it to have a width of about 150 feet. There was no evidence in it of replacement by sulphide minerals.

In December 1927, a reconnaissance electrical survey was made by the Radiore Company over a part of this ground.

It may be recalled that the Murray group was under option

to the Victoria Syndicate, some years ago and at this time, an electrical survey was made by the Electrical Prospecting Corporation of America. This was followed by diamond drilling.

The option held by the United Verde Extension was relinquished early in 1928 and operations were discontinued.

Noranda Mines, Ltd.—This company holds several blocks in this township, as well as owning all the capital stock of the Horne Copper Corporation, its most important subsidiary. Besides this, it owns a majority interest in Aldermac Mines, Ltd., in Boischatel township ,and in Waite-Ackerman-Montgomery Mines, Ltd., in the Duprat-Dufresnoy area.

Full details of work performed by the subsidiary companies will be found elsewhere in this report. The Noranda Mines, Ltd. did not perform any work on its other holdings in Quebec.

Notre-Dame Gold Mines, Ltd.—This company holds mining rights on T-4741 to 4744, on the north shore of lake Rouyn. A few men were kept on the property from March to September; camps were built; working lines surveyed and the claims electrically prospected by the Swedish-American Prospecting Corporation. The company reports surface work on the two south claims, represented by 420 feet of trenching, followed by 1356 feet of diamond drilling in nine holes.

Osisko Lake Mines, Ltd.—The operations of this company, during the past year, were confined to the drilling of a deep hole, close to the north boundary of their group, which is situated to the south and east of the Horne Copper Corporation, and comprises blocks 11, 12, 40 and 126.

During the first part of the year, the diamond drill was set up on the ice on Osisko lake. After the break-up, it was supported on piles, and drilling was continued until early in September. The hole was started at an inclination of 80 degrees and a depth of 2500 feet was reached before the drill was removed.

Rubec Mines, Ltd.—A reorganization of the Quebec Gold Belt, Limited, to which had been transferred previously, the claims of the Rouyn Gold Mines, Ltd., of the Ottawa Rouyn Mines, Ltd., and a few others, was put through during the latter part of 1926. The Rubec Mines, Ltd. has a capitalization of 5,000,000 shares of no par value. During the latter part of 1927, a party of men was

Murray property.—Headframe and camp buildings of United Verde Extension, Rouyn township.

Abana Mines, Ltd.—Headframe on lot 43, range IX, Desmeloizes township.

engaged in cutting roads and trails, and some surface trenching was done before the end of the year. The camps, constructed a few years ago, are situated on M.L. 1851, on the south shore of Pelletier lake.

Stadacona Rouyn Mines, Ltd.—During the past year, this company carried on exploration work on several groups of claims in Western Quebec. In the spring a detailed electrical survey was conducted by the Swedish-American Corporation over an area, 2400 feet in width, along the strike of a diabase dyke, mentioned in last year's report, which has been traced through the two groups situated to the south of Edward lake. These groups comprise the following: M.L. 1813, 1815, 1801, 1802 and 1818. Surface stripping and trenching was followed by diamond drilling. Five holes were put down in the vicinity of this dyke and four others were drilled across an east-west fracture, about 2000 feet west of the dyke. The total diamond drilling, up to the end of November, amounted to 2800 feet.

In December, the Radiore Company performed an electrical survey of the north group.

Exploration work on the other groups, in this township, was confined to surface stripping, trenching and magnetometric surveys.

Wiltsey-Coghlan Mines, Ltd.—This company is capitalized at 3,000,000 shares of one dollar par value, of which 1,500,000 shares are held by the Mentor Exploration and Development Company, Ltd. The property comprises fifteen claims, lying to the east of Osisko lake and totalling 931.74 acres. The claims are as follows: blocks 30 to 33, M.L. 1805 to 1807, M.L. 1834, M.L. 3131, T-6087, 6088, and T-3061 to 3064.

The company reports that a heavily schisted well-mineralized fracture zone extends through this property. During the summer, from eight to ten men were employed in surface stripping and trenching. This was followed by an electrical survey by the Geophysical Company of Canada, and this, in turn, was followed by diamond drilling totalling 3000 feet. Operations were discontinued, early in 1928.

Vickers Mines, Ltd.—This company was formerly known as the Vickers-Porcupine Mines, Ltd. During the year nearly four miles of trenching was done on claim M.L. 1784, which lies on the

Rouyn-Boischatel boundary. Nine diamond-drill holes, amounting to 2000 feet, were also put down. Towards the end of the year, an electrical survey was made of the claim by the Radiore Company, and these results will guide future development to some extent.

The southern part of the claim is underlain by rhyolite, intruded by granite. The remainder is underlain, for the most part, by basic volcanics; a gabbro dyke cuts across the property in a north-easterly direction.

Some very interesting mineralized zones, in which chalcopyrite was found in fair amount, were opened up during the year.

The following companies also have mining rights in this township:—McDougall Mines, Ltd.; Area Mines, Ltd.; Allied Mines Synd.; Pontiac Rouyn Mines, Ltd.; Montreal Rouyn Mines, Ltd; Huronian Belt Co., Ltd.; Dasserat Rouyn Goldfields, Ltd.; Farrel Rouyn Mines, Ltd.; Lakeside Mines, Ltd.,; Adsit Mining Corporation; Amulet Mines, Ltd.; Newbec Mines, Ltd.; London Canadian Gold Mines, Ltd.; Thompson-Cadillac Mines, Ltd.; Monargo Mines, Ltd.; Buffalo Rouyn Syndicate.; Kinojevis Syndicate; Gold Exploration Co. of Canada, Ltd.; and Sir Thomas Tait.

JOANNES TOWNSHIP

Notre-Dame Gold Mines, Limited.—A group of claims, known as T-5692 to 5706 registered in the name of Notre-Dame Gold Mines, Limited, is located contiguous to the central line in the northwest part of Joannes township. A number of buildings were put up on claim T-5701. This property has been surveyed and general prospecting carried on in the fall. The company reports the discovery of two veins. On claim T-5700, stripping and trenching has uncovered a quartz vein of irregular width varying from a few inches to two feet; chalcopyrite is said to be abundant. A second quartz vein has been found on claim T-5701, west of the first vein.

The presence of small amounts of chalcopyrite, galena and sphalerite is reported.

MONTBRAY TOWNSHIP

The Eplett-Metcalfe Mining Company, Limited.—Astride, between mile posts IV and V, on the boundary line of Montbray and Duprat townships is a group of claims held in the name of the Eplett-Metcalfe Mining Company, Limited. It consists of claims

A-6612 to 6615, 6617 to 6622, lying west of the boundary line, and of claims A-6616, 6623 and 6624 contiguous to the east. The company was incorporated at Quebec, in 1927, with a capital of $2,000,000, in one dollar shares. Dr. W. F. James who made a geological survey of the township in the summer of 1927 writes as follows of this property: *

"The Eplett-Metcalfe property consists of thirteen claims in Montbray and Duprat townships just south of the east-west centre line. The country rock consists of a rather acid lava with a small amount of basic lava intruded by irregular branching masses of dioritic rock correlated with the older gabbro. The older gabbro here takes the form of a sill dipping gently eastward, and overlying the acid volcanics. The older gabbro and volcanics are cut by a dyke of later gabbro which dips steeply to the west. A north south dyke of later gabbro, about 75 feet wide, cuts through the older formations and can be traced throughout the length of the property. The structure near the ore occurrence is of interest."

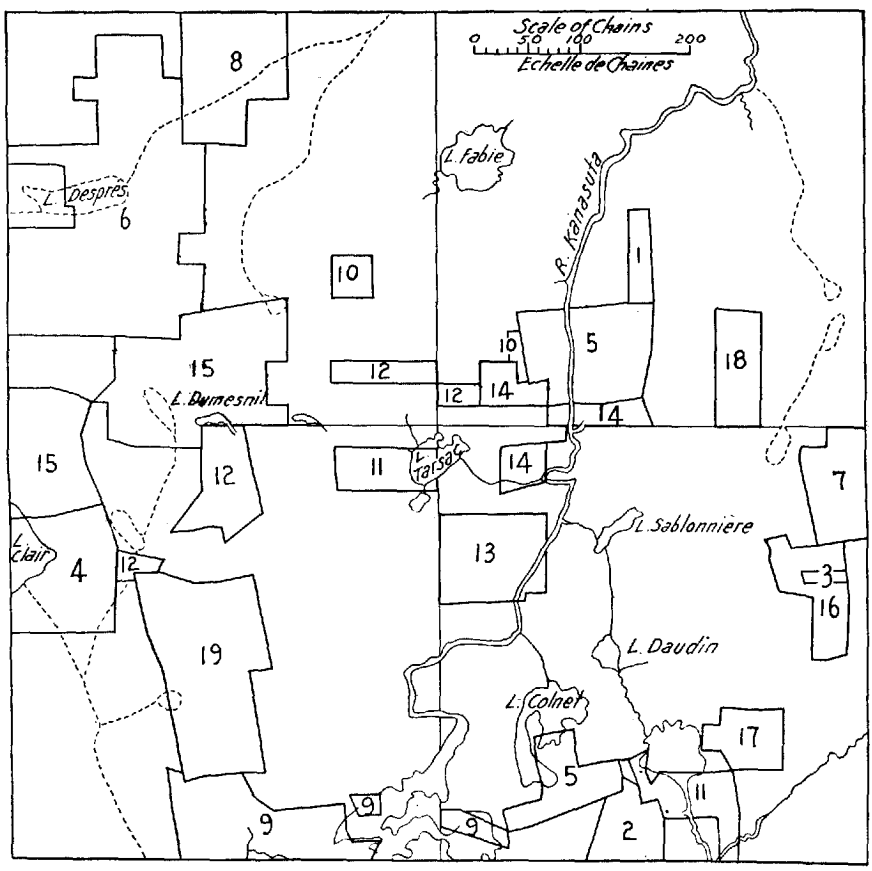
"The Eplett-Metcalfe property differs from all others so far examined, in that the sulphide minerals occur within a dyke of later gabbro. What was probably the principal occurrence has been obscured by the sinking of an inclined shaft near the west contact of the later gabbro dyke some five hundred feet northwest of the number 2 post of claim No. 6617. This shaft is full of water and no trace of minerals in place, near it, was observed. The shaft was said to be inclined following the contact of the dyke for a distance of about 60 feet. An examination of the dump showed chalcopyrite and pyrrhotite."

Oriole Mines, Ltd.—This company was formed in July, 1927, with a capitalization of $5,000,000, to explore and develop two groups of claims, situated in the western part of the township of Montbray. The first group comprises 39 claims, as follows: A-19361 to A-19383 and A-11108 to A-11123. The second is made up of 25 claims: A-15618 to A-15627 and A-9105 to A-9119.

During the summer, trails were cut, three log cabins were built on claim A-9113, and a large number of men were employed in surface trenching and test pitting. A large amount of this work was concentrated on a mineralized zone, on claim 9118, where pyrrhotite, chalcopyrite and pyrite were found in varying amounts.

* Advance notes transmitted by permission of the Director, Geological Survey of Canada.

MONTBRAY TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Buckingham Mines, Ltd.; 2.—Calartic Mines, Ltd.; 3.—Copper Hill Mines, Ltd.; 4.—Delmas Mines, Ltd.; 5.—Dunlop Consolidated Mines, Ltd.; 6.—Duprat Mines, Ltd.; 7.—The Eplett Metcalfe Mining Co., Ltd.; 8.—Lake Duprat Mines, Ltd.; 9.—Laval-Quebec Mines, Ltd.; 10.—Mineral Explorations, Ltd.; 11.—Monargo Mines, Ltd.; 12.—Montbray Mines, Ltd.; 13.—Norrington Development Co., Ltd.; 14.—Notre-Dame Gold Mines, Ltd.; 15.—Oriole Mines, Ltd.; 16.—Quebec Copper Exploration Co.; 17.—Robb-Montbray Mines, Ltd.; 18.—Rubec Mines, Ltd.; 19.—St. Anthony Gold Mines, Ltd.

In January, 1928, a diamond drill was brought in to the property.

Dr. W. F. James who visited the property last summer has prepared the following description: *

"The company devoted the latter part of last summer to line cutting, prospecting, the building of camps and the laying in of supplies. At the time the property was visited last year little surface work had been done except a hundred feet or so of shallow rock trenching on the original showing. The showing occurs on a knob of volcanic rock in which irregular fractures are filled with sulphides. In one place the rock is a breccia and sulphides, mostly pyrite, replace its matrix. Chalcopyrite mineralization is observed at intervals over the knob and at various points within the rock trenches, and pyrrhotite is locally conspicuous. Neither the dimensions nor the strike of the body had been determined in October, but since then it is reported that a diamond drill has been taken to the property and considerable surface work performed. No results are yet available. On a number of claims nearby in Ontario and Quebec slight mineralization of pyrrhotite and chalcopyrite has been found but no extensive ore-bodies have yet been traced. The locality near the intrusives in Trout lake basin seems to offer attractive possibilities for prospecting."

Robb-Montbray Mines, Ltd.—This company, capitalized at $6,000,000, was incorporated in December, 1927, to acquire one hundred per cent interest in ten mining claims, formerly under option to the Nipissing Mining Co., Ltd. These ten claims, A-4841 to A-4850, are situated in the south-east corner of Montbray township.

The work has been concentrated on three areas, known respectively as Nos. 1, 2 and 3. The first is in the south-east part of claim A-4847, the second is near the south-west corner of A-4843, and the third is to the north-west of No. 1, near the west line of the claim.

A report of the general manager of the Nipissing Mining Co., Ltd. gives the following information:†

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* Advance notes transmitted by permission of the Director, Geological Survey of Canada.

† H. Park, general manager. A report to the President and Directors, The Nipissing Mining Company, Limited, December 12, 1927.

"Deposit No. 1 is a replacement of schisted and brecciated rhyolite and at the surface consists of three occurrences of comparatively small length and width, the largest being 100 feet long and 20 feet wide, assaying $1.50 gold and 2% copper. Four diamond drill holes were put down, cutting the showings at a depth of 75 feet. Results from these holes were somewhat lower grade than those obtained at surface. Other trenching and dipneedle work discovered deposit No. 2, situated 1200 feet north of No. 1.

"Deposit No. 2 is similar to No. 1, except that the former is more consolidated and some sections are of higher assay. Incomplete diamond drilling indicates a somewhat pear-shaped deposit 80 feet deep by a width of 50 feet at the bottom, assaying 2.5% copper and 80 cents gold. Surrounding this occurrence are masses of lower grade material and pyrite. No. 2 was still being drilled when a more important discovery, No. 3, was made late in the fall of 1926, to which the drill was immediately moved. While some fair assays were obtained from deposits Nos. 1 and 2, the work done to date has not developed ore of commercial tonnage.

"The first discovery on deposit No. 3, 1000 feet northwest of No. 1, showed three feet of chalcopyrite assaying $15.00 gold and 11% copper. It was found at the bottom of a 12-foot pit, and as most of the area in the immediate vicinity was deeply covered with overburden, it was difficult to obtain exposures over any considerable distance. Results from this work indicated a mineralized zone of at least 500 feet in length. The most important outcrop is 125 feet distant from the discovery pit, the assays over a length of 30 feet and a width of 9.5 feet average $21. gold and 12% copper. A trench 150 feet from this outcrop shows disseminated copper over a width of 50 feet, the average assay being below commercial grade.

"Diamond-drill holes were put down to various depths vertically below the two best surface outcrops on deposit No. 3. Under the original discovery (three feet wide) the following results were obtained:

At	50	feet	depth	41″	$22.80	Gold	6.5% Copper
"	80	"	"	40″	17.80	"	16. % "
"	100	"	"	20″	10.60	"	10. % "
"	165	"	"	102″	.80	"	5. % "

"Under the second discovery (9.5 feet wide) the following results were obtained:

At	60	feet depth	23″	$29.80	Gold	16.% Copper.
"	165	" "	69″	37.40	"	2.% "

"A number of outlying holes were indeterminate, some showing values over narrow widths and some practically no values at all. One of these holes assayed $27.75 gold over a width of four feet, the core showing native gold and bismuth telluride.

"As general results from diamond drilling were not conclusive, it was evident that actual conditions as to tonnage and values could only be determined by considerable underground work.

"The essential plant was installed and shaft sinking near deposit No. 3 was started early in May, 1927, levels subsequently being established at 125 and 225 feet. Approximately 900 feet of lateral work has been done at the first level and 600 feet at the second level.

"Results obtained to date have been erratic, individual assays running from nil to several hundred dollars in gold over drift width, but the shoots have seldom exceeded 15 feet in length.

"Results at the 225-foot level approximate those at the 125-foot level. Some high assays in gold have been obtained, but there has been no continuity.

"The property has been mapped geologically. The rocks are pre-Cambrian in age, and in the general area consist of Keewatin rhyolite and basalt or andesite, cut by later diorite dikes. The mineralization occurs in the rhyolite where it has been much altered and disturbed by schisting and brecciation. Chlorite schist has been developed in the rhyolite in the disturbed zones, and the gold and copper are usually associated with this chlorite. The gold and copper are primary, the copper occurring as chalcopyrite and the gold in the native state. Deposits Nos. 1 and 2 are of the replacement type and are irregular in shape; whereas No. 3 deposit contains minor quantities of quartz and is suggestive of vein-like occurrence. Copper mineralization extends over a wide area at both levels, but not in commercial quantities.

"The discoveries to date occur in two parallel gossan zones, each about 2000 feet long and 500 feet wide. The larger part of these zones has been electrically prospected and while some added

indications were obtained, trenching and diamond drilling did not disclose anything of importance.

"While underground work, especially that of a vertical nature, has not been completed, it must be pointed out that values obtained to date at both levels have been spotty and in several cases drill holes have cut isolated pockets of high grade material. Notwithstanding high assays obtained here and there, the shoots encountered to date contain only a limited tonnage.

"A few holes have been drilled to depths of 300 and 400 feet and while results are not conclusive, no values of importance were encountered. There appears to be no geological reason why schisting and brecciation should not continue to a considerable depth and further work is justified in order to determine conditions not only at lower horizons but at other points along the strike."

The township of Montbray was staked completely last year. Many claims were taken up by development companies; besides those already mentioned the following had a few men doing surface work:—Buckingham Mines, Limited; Calartic Mines, Limited; Consolidated Mining and Smelting Co., Ltd; Copper Hill Mines, Limited; Delmas Mines, Limited; Dunlop Consolidated Mines, Limited; Duprat Mines, Limited; Lake Duprat Mines, Limited; Mineral Exploration Company, Limited; Monargo Mines, Limited; Montbray Mines, Limited; Norrington Development Company, Limited; Notre-Dame Gold Mines, Limited; Quebec Copper Exploration Company, Limited; Rubec Mines, Limited; St-Anthony Mines, Limited.

DUPRAT TOWNSHIP

Bedford Mines, Ltd.—This company was organized early in 1927 with a capitalization of $2,000,000, for the purpose of purchasing and exploring a group of nine claims situated to the west of the Amulet "A" group. This was formerly known as the O'Leary group, and was previously under option to the Consolidated Mining and Smelting Co. It takes in the following claims:—A-1949 to 1953, A-2372 to 2374 and A-3992.

Operations by this company, since March 1927, have been confined to the diamond drilling of six holes, aggregating 2,346 feet.

Capital Rouyn Mines, Ltd.—This company is capitalized at $4,000,000. The exploration of a group of eighteen claims, comprising A-19667 to 19675, A-9624 to 9627, A-9631 to 9633, and A-9641-9642, lying to the north of Flavrian lake, was undertaken during 1927. Some surface work was accomplished and the company reports that several quartz veins were exposed, in which chalcopyrite is found.

Coniagas Group.—A group of claims located in the south-west corner of Duprat township, held by persons closely connected with the Coniagas Mines, Limited, has been intensively prospected during 1926. More work was done last year. Dr. W. F. James, who visited the property in 1927, describes it as follows:—*

"The Coniagas Company has thoroughly prospected a large group of claims near the junction of the four townships, Montbray, Dasserat, Boischatel and Duprat. In addition to careful geological mapping, the work has included stripping and trenching, electrical prospecting and a prospecting shaft. The area investigated is underlain by both acid and basic volcanics intruded by masses of older gabbro and more acid intrusives. Sulphide mineralization was disclosed in several places and particularly near the intersection of the four township boundaries. Here a shear zone has been uncovered in a rhyolite breccia. The rock is chloritized in a manner very similar to the shear zone on the Nipissing (Robb Montbray) property in Montbray. The chlorite rock appears to have been replaced by pyrite and chalcopyrite, some of which is massive. The mineralization was exposed over an area about 10 feet by 150 feet. The strike of the zone seems to be closer to due south than on the Nipissing property, but the mineralization may be closely connected in origin. The breccia also seems to have originated in the same manner."

Consolidated Mining and Smelting Co.—During the year, a group of fifteen claims, lying to the west of Flavrian lake, was explored by this company. Camps were built and a magnetometric survey was made; some trenching and surface work was also accomplished and four diamond drill holes were put down, totalling 1,000 feet. Operations were discontinued in September.

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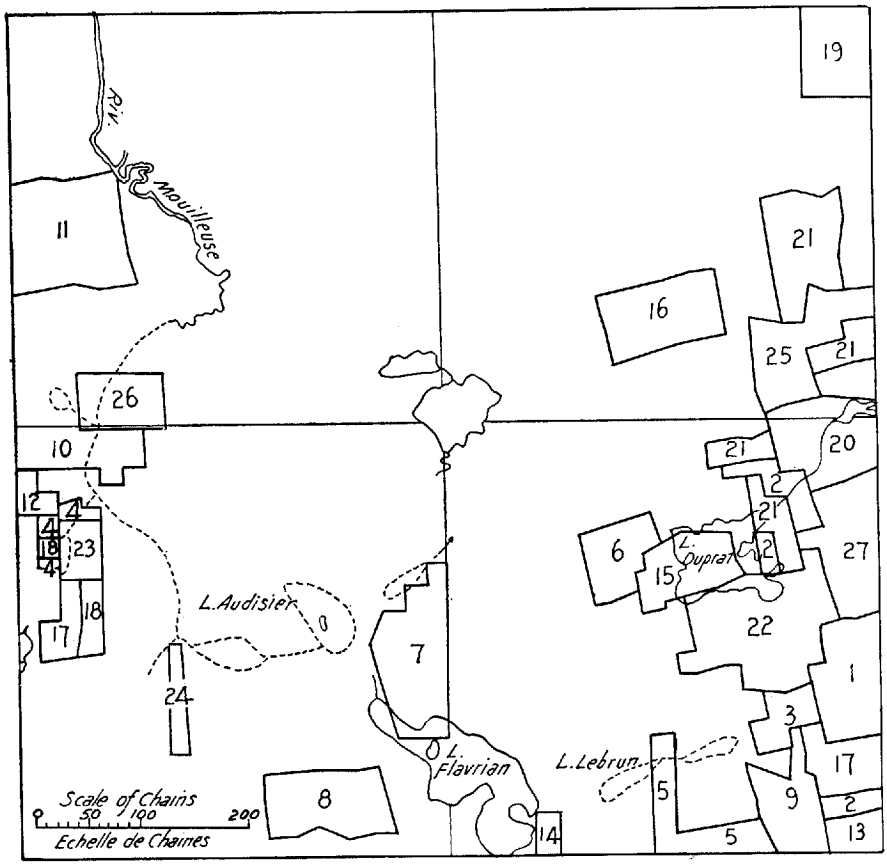
* Advance notes transmitted by permission of the Director, Geological Survey of Canada.

DUPRAT TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Amulet Mines, Ltd.; 2.—Area Mines, Ltd.; 3.—Bedford Mines, Ltd.; 4.—Boischatel Mines, Ltd.; 5.—Buckingham Mines, Ltd.; 6.—Buffalo Rouyn Mines, Ltd.; 7.—Capital Rouyn Mines, Ltd.; 8.—Consolidated Mining & Smelting Co., Ltd.; 9.—Corona Mines, Ltd.; 10.—Dasserat Rouyn Goldfields, Ltd.; 11.—Dunlop Consolidated Mines, Ltd.; 12.—The Eplett-Metcalfe Mining Co., Ltd.; 13.—Grover-Daley Mines, Ltd.; 14.—Hecla Consolidated Mines, Ltd.; 15.—Lake Duprat Mines, Ltd.; 16.—Laval-Quebec Mines, Ltd.; 17.—McDougall Mines, Ltd.; 18.—Montbray Mines, Ltd.; 19.—Norrington Development Co., Ltd.; 20.—North-Waite Mining Co., Ltd.; 21.—Quebec Copper Corporation; 22.—Rhyolite Rouyn Mines, Ltd.; 23.—Rouyn Kennecott Mines, Ltd.; 24.—Rubec Mines, Ltd.; 25.—Stadacona Rouyn Mines, Ltd.; 26.—Union Abitibi Mining Co.; Ltd.; 27.—Waite-Ackerman-Montgomery Mines, Ltd.

Corona Mines, Ltd.—This company is capitalized at $3,000,000. Operations have been confined to a group of twelve claims, situated in the south-east corner of Duprat township and comprising claims A-11461 to 11473.

Early in 1927, camps were built and an electrical survey was made by the Swedish-American Prospecting Corporation. This was followed by surface trenching, and the company reports that a heavily mineralized zone was opened up, in which disseminated chalcopyrite was present. This zone is to be further explored by diamond drilling; at the end of the year, tenders were called for this work.

Duprat Mines, Ltd.—The mining rights to two groups of claims, which this company held, have recently been merged with other holdings and transferred to the Rhyolite-Rouyn Mines, Ltd.

The Duprat Mines groups were situated in the south-east quarter of the township and comprised the following claims:—A-2070 to 2074, A-1807 to 1809 and A-1814 to 1816.

Operations were in progress in the early months of the year. An electrical survey was made by the Swedish-American Prospecting Corporation. and some surface work and diamond drilling performed. The company reports the finding of a mineralized zone of low grade material.

Stadacona Rouyn Mines, Ltd.—A group of fourteen claims, which lies on the Duprat-Dufresnoy boundary, to the north of the east-west centre line of Duprat township, is registered in the name of this company. This group comprises claims A-4677 to 4690, inclusive.

During the summer, a magnetometric survey was made of this area. Some trenching was accomplished and a diamond drill hole was put down to a depth of 290 feet. The drill was removed and no further operations were carried on during the remainder of the year.

Towagmac Exploration Co., Ltd.—In the second annual report of the Towagmac Exploration Company, the following information is furnished in regard to a group of claims in Duprat township, the mining rights to which are held by persons closely connected with this company:—

"The geological mapping and magnetic surveying of this

group of 60 claims, situated in the south-west quarter of Duprat township, has now been completed. In view of the large acreage-nearly four square miles—involved, comparatively little surface prospecting could be carried out this year before the season closed. One discovery, however, was made, a narrow vein of massive galena carrying 18 ounces of silver. This occurrence, as well as the remainder of the group, will be further investigated this coming year."

Waite-Ackerman-Montgomery Mines, Ltd.—This company was incorporated in June 1927, with a capitalization of 2,000,000 shares of no par value, to acquire and develop a group of twenty-eight claims, situated on either side of the Duprat-Dufresnoy boundary, north of Amulet "A" group. The claims are as follows:—A-3001, 3455 to 3457, 2743 to 2748, 2862 to 2871, and 2957 to 2964.

The property became prominent by a discovery, in the summer of 1925, of a spectacular surface showing of massive sulphides, assaying high in copper and zinc. Following this discovery, N. A. Timmins, Inc. secured an option on the property and an intensive development programme was carried out, which involved a large amount of trenching and the drilling of twenty-six diamond drill holes, aggregating approximately 10,000 feet. Early in 1927, the interest held by N. A. Timmins, Inc. was purchased by Noranda Mines, Ltd., and the Waite-Ackerman-Montgomery Mines, Ltd. was formed. This company is controlled by Noranda Mines, Ltd.

The present mine manager, Mr. R. V. Porritt, estimates the ore reserves, as indicated by diamond drilling, to be as follows:—*

"140,160 tons of copper ore averaging 7.46% copper and 2.47% zinc.

27,460 tons of mixed copper and zinc ore averaging 2.64% copper and 10.34% zinc.

288,150 tons of zinc ore averaging 11.52% zinc.

These figures aggregate to a total of 455,770 tons of ore averaging 2.64% copper and 8.67% zinc."

The ore-body strikes in a direction, 30 degrees north of east and dips at about 45 degrees in a south-easterly direction; the dip is rather difficult to determine accurately as the footwall is very irregular. The geology of this area is composed, for the most

* First Annual Report of Waite-Ackerman-Montgomery Mines, Ltd., 1927.

part, of acid and basic volcanics, of Keewatin age, which form high ridges. These are intruded in a few places by diabase and rhyolite dykes but no intrusives have been found in contact with the ore-body.

The following is taken from the mine manager's report:—

"The site for a shaft, to give access to the ore-body, was chosen at a point, 250 feet north-west of the ore-body. Sinking was in progress at the end of the year, a depth of 62 feet having been reached. The shaft has two compartments, each 4'6" x 5'.

"Sinking will be carried to 210 feet, with one level established at a depth of 185 feet. All ore now indicated can be extracted from this horizon.

"The Canadian National Railway spur to the mine was completed during the year; the Quinze Power Company also completed their power line to the property and at the end of the year, was supplying power.

"The following mine buildings were erected during the year:—

"A fifty-eight foot timber headframe, hoist and compressor-house, blacksmith and machine shop, boiler and pump house. A sub-station was built and necessary power lines erected."

The equipment on the property includes a five-drill compressor and induction motor, air-driven hoist, and drill steel sharpener.

The following companies also hold mining rights to claims in this township but operations have been confined to assessment work:—Boischatel Mines, Ltd.; Buckingham Mines, Ltd.; Buffalo Rouyn Synd.; Dasserat Rouyn Goldfields, Ltd.; Hecla Consolidated Mines, Ltd.; Lake Duprat Mines, Ltd.; Dunlop Consolidated Mines, Ltd.; Laval-Quebec Mines, Ltd.; Montbray Mines, Ltd.; North Waite Mining Co., Ltd.; Quebec Copper Corp.; Rouyn Kennecott Mines, Ltd.; Rubec Mines, Ltd.; Rhyolite Rouyn Mines, Ltd.; and Union Abitibi Mining Co.

DUFRESNOY TOWNSHIP

Allied Mines Syndicate.—This syndicate holds the mining rights to four groups of claims in Western Quebec, two of which are in Dufresnoy township, the two others in Rouyn and Boischatel townships respectively.

The first group, known as block 1, is composed of fifteen claims, A-11739 to 11753, inclusive, and is situated in the north-

east quarter of Dufresnoy township, east of Dufresnoy lake. This was prospected during the summer.

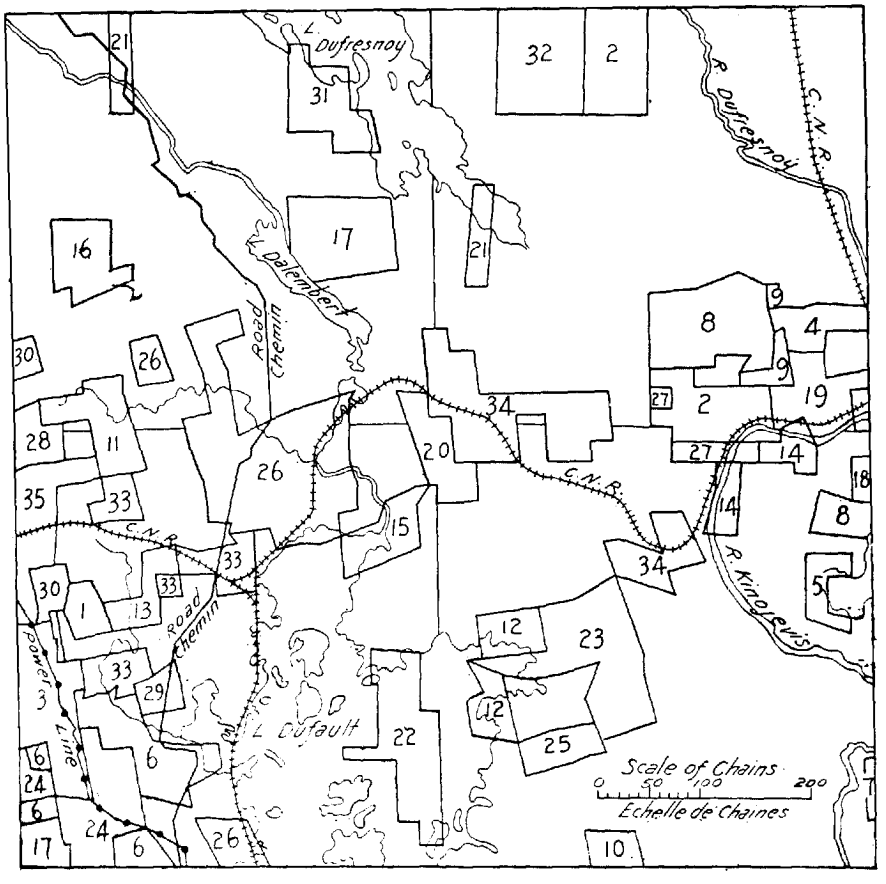
The second group takes in 15 claims situated near the east boundary of the township; it comprises claims A-13705 to 13719 inclusive. The camps, built early in the year, are at Mile 38, on the Taschereau-Rouyn branch of the C. N. Railway. Fifteen men were employed on these groups a part of the summer, and a magnetometric survey was made of the second group; some trenching was done on the north-west part of these claims.

Amulet Mines, Ltd.—Outstanding developments took place on this property during the past year; it has now won a place among the assured producing mines of the district. Formerly called "Amulet Gold Mines, Ltd." the name has been changed to "Amulet Mines, Ltd.", as the ore is essentially a zinc-copper ore, with some silver and small amounts of gold.

All operations during 1927 were centred on the exploration and development of several sulphides zones, on group "A", which lies on the boundary line between Duprat and Dufresnoy townships. Early in the spring, a zone of gossan, or iron oxide, which was discovered a short distance to the north-west of No. 4 shaft, was trenched, and ore was exposed in three places. These were known as the 8, 9 and 10 ore-bodies. Diamond drilling was immediately resorted to, and it was found that these three bodies were pipes or fingers from a large mass, which was then known as the 8–9–10 ore-body, and later called ore-body No. 4-1. A short distance to the north of ore-body No. 4-1, another body was discovered. This was trenched and diamond-drilled and was found to be a separate lens.

During the summer, the No. 4 shaft, which had been sunk the previous year, was de-watered, and some lateral work was accomplished on the 150-foot level, to develop the No. 4-1 ore-body and to carry out further exploration work. During the course of diamond drilling from this level, ore was struck at a short distance to the south of the shaft. There is a fault, in this area, which strikes east and west, between the shaft and the hoist-house, and it had been thought that this fault probably formed the boundary or southern limit of the No. 4 ore-area. This new ore-body, however, lies to the south of this fault. Diamond drills were then set up on the surface and the ore-body, which is a

DUFRESNOY TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Abbey Mines, Ltd.; 2.—Allied Mines Syndicate; 3.—Amulet Mines, Ltd.; 4.—Arglo Canada Mineral Explorers, Ltd.; 5.—Archean Mines, Ltd.; 6.—Area Mines, Ltd.; 7.—Astoria Rouyn Mines, Ltd.; 8.—Clericy Mines Co., Ltd.; 9.—Copper Hill Mines, Ltd.; 10.—Don Rouyn Gold Mines, Ltd.; 11.—Dubec Mining Co.; 12.—East Bay Copper Company, Ltd.; 13.—Federal Investment Co.; 14.—Frontenac Copper Mines, Ltd.; 15.—Gilbec Mines, Ltd.; 16.—The Gold Exploration Co. of Canada, Ltd.; 17.—Grover-Daley Mines, Ltd.; 18.—Harvie Mining Co., Ltd.; 19.—Harburn Mines, Ltd.; 20.—Hecla Consolidated Mines, Ltd.; 21.—Laurier Mines, Ltd.; 22.—Les Mines Lac Dufault, Ltée.; 23.—Macot Mines, Ltd.; 24.—McDougall Mines, Ltd.; 25.—Montreal-Rouyn Mines, Ltd.; 26.—Newbec Mines, Ltd.; 27.—Norrington Development Co., Ltd.; 28.—North-Waite Mining Co., Ltd.; 29.—Notre-Dame Gold Mines, Ltd.; 30.—Quebec Copper Corporation; 31.—Rada Rouyn Mines, Ltd.; 32.—Rubec Mines, Ltd.; 33.—Stadacona-Rouyn Mines, Ltd.; 34.—United Copper Syndicate, 35.—Waite-Ackerman-Montgomery Mines, Ltd.

flat lying lens, was intersected by vertical drill holes at 100-foot intervals. This drilling was in progress at the end of the year.

During 1927, eight surface showings were discovered in the No. 4 ore-area, including these three commercial bodies. All of these bodies are irregular in outline and of the flat-lying type, varying in thickness from 10 to 125 feet. In their order of importance, they carry values in zinc, copper, silver, gold and lead. Diamond drilling to the amount of 14,046 feet, was done on the property, in 1927, and at the end of the year, the total length of lateral workings, on the 75 and 150-foot levels, was 1,325 feet.

In the Annual Report for 1926,* a detailed description of other ore occurrences, found in that year, includes an estimate of ore reserves in the No. 2 ore-area, which lies to the south-east of No. 4 ore-area. The presence of 160,448 tons of ore is indicated, having a gross value of $3,391,870. This has been appreciably increased during 1927, by the quantity of ore developed in the No. 4 ore-area, but no figures are available for publication at the present time.

Copper Hill Mines, Ltd.—At the end of 1927, the mining rights to five claims lying near the Dufresnoy-Clericy boundary, were registered in the name of this company. These claims are as follows:—A-14934 and A-16020 to 16023. It is also reported that a group of five claims lying to the east of this group were under option to this company, during the past year; these comprise A-7954, 7955, 8433, 8434, and 8435.

Camps were erected, early in the year, on claim A-7955 and diamond drilling was commenced. Nine holes, aggregating over 2,000 feet were put down. A large amount of deep trenching was done and a 7 ft. by 9 ft. shaft was sunk to a depth of 58 feet, on the east side of claim A-8434. This shaft was put down on a shear zone, which is fairly well mineralized with pyrite and chalcopyrite.

A few hundred feet to the north of this shaft, there is an outcrop of rhyolite which is heavily mineralized with pyrite, and which is said to assay $2.80 in gold across 80 feet.

In the fall, an electrical survey was conducted over this area by the Radiore Company; this was followed by diamond drilling.

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* Quebec Bureau of Mines. Annual Report on Mining Operations in the Province of Quebec during the year 1926, p. 125.

Dubec Mining Co., Ltd.—This company commenced operations in April, 1927, on a group of eight claims, comprising A-4001 to 4005 and A-3469 to 3471, lying on the east-west centre line near the west boundary of Dufresnoy township. A magnetometric survey was carried out and a gang of men were engaged in surface stripping and trenching during the summer months. Late in the year, an electrical survey was made by the Radiore Company.

Grover-Daley Mines, Ltd.—In 1927, exploration work, involving a large amount of trenching, was continued on the claims of this company, which lie on the boundary line between Duprat and Dufresnoy townships and comprise M. L. 1767, 1770, 1771 and A-16568. The company reports that scattered and erratic occurrences of copper ore were located but that no continuity of values were shown.

The mining rights to claims A-14047 to 14057 and 13720 to 13724, which are situated to the north-east of lake Dalembert (Sill's lake), are also held by this company. These were prospected during the summer and a dip-needle survey was made.

McDougall Mines, Ltd.—This company holds two groups, comprising A-1431 to 1437, T-605, A-2022 to 2028, 2221, 2222, A-1677 and 1678, which are situated to the south of the Amulet "A" group, on either side of the Duprat-Dufresnoy boundary.

Some diamond drilling was done on these claims in 1926. In March 1927, drilling was resumed and was in progress throughout the greater part of the year. Five shear zones, in which chalcopyrite occurs in association with other sulphides, have been found. These are all near the Duprat-Dufresnoy boundary line.

The strike of the veins is nearly east and west and they dip at a steep angle (75 to 85 degrees) to the north. On vein No. 2, near the east side of claim A-1433, an inclined shaft was sunk to a depth of 120 feet, and at 100 feet, over 850 feet of lateral work was accomplished. A crosscut to the north encountered good copper ore, across a width of four feet, a short distance from the shaft. This vein was drifted on to the west in this material for forty or fifty feet; the vein then narrowed down and values diminished. The east drift was driven through a gabbro dyke; crosscuts were driven north and south to intercept veins exposed on the surface or located by diamond drilling. Underground work was in progress at the end of the year.

A set of camps was put up, late in the fall, on claim 1433, together with a hoist house and blacksmith shop. Another set of camps, comprising two log cabins was built on the east group, in Duprat township, but very little work was done here.

Newbec Mines, Ltd.—This company is a consolidation of Norbec Mines, Ltd., Rouyn Gold Pan and the McLeod claims. The mining rights to the following claims in Dufresnoy township, are registered in the name of this company:—group 1, comprising A-2754 and 2755; group 2, comprising T-1290 to 1293, A-2749 to 2753, 2181 to 2185, 3077, 1413 to 1417, 1171 to 1174, 12146 to 12150, and 11734 to 11738; group 3, comprising A-1670 to 1674.

During 1927, interest was centred on group 2, which lies in the centre of the township. Prospecting, in previous years, resulted in the finding of some interesting mineralized zones, but very little work had been done on them, with the exception of a small amount of diamond drilling in three holes.

The rocks of this area are Keewatin lavas, intruded by granite, gabbro and diorite. The granite is part of a large mass, which lies to the east, known as the Dufault batholith. A considerable amount of trenching and test pitting was done during the summer of 1927. The old Norbec showing, which is in the centre of claim A-1291, described by Dr. Cooke, in Summary Report 1925, was blasted into, and at a depth of fifteen feet, fairly massive sulphides, carrying fair amounts of chalcopyrite, were exposed across the width of the pit. At the end of the year, this pit had reached a depth of 22 feet.

A total of 1655 feet of diamond drilling in 7 holes was completed during 1927. Four of these holes were drilled to determine the extent of this zone to the north of this, on claims formerly held by the Gold Pan Syndicate. Massive pyrite occurs across a width of six feet in this latter zone.

The following organizations also have interests in Dufresnoy township:—Astoria Rouyn Mines, Ltd.; Abbey Mines, Ltd.; Anglo-Canadian Minerals Exploration; Archean Mines, Ltd.; Clericy Mines, Ltd.; Don Rouyn Gold Mines, Ltd.; East Bay Copper Synd.; Federal Investment; Frontenac Copper Mines, Ltd.; Gilbec Mines, Ltd.; Harburn Mines, Ltd.; Harvie Mining Co., Ltd.; Hecla Consolidated Mines, Ltd.; Laurier Mines, Ltd.; Les Mines Lac Dufault, Ltée.; Macot- Mines, Ltd.; Montreal Rouyn Mines, Ltd.; Norrington

Development Corp.; Notre Dame Gold Mines, Ltd.; Quebec Copper Corp.; Riada Rouyn Mines, Ltd.; Rubec Mines, Ltd.; Stadacona Rouyn Mines, Ltd.; United Copper Synd.

CLERICY TOWNSHIP

Clericy Mines, Ltd.—This company holds mining rights to the following claims, in two groups, in Clericy township: A-12751 to 12762, 11137, 11139, 16334, 16316 to 16318 and A-2151 to 2155. These groups are situated in the south-east quarter of the township and are reached, in summer, by canoe via the Kinojevis and the Clericy rivers.

Early in the year, camps were erected and some trenching was done on claim 16317. On this claim, narrow quartz veins occur in shear zones in the Keewatin lavas. Coarse pyrite is present, both in the veins and wall-rock, and a small amount of chalcopyrite was also observed. During the summer, a shaft was sunk to a depth of 46 feet, and preparations were made for the installation of light mining equipment. Operations, however, were discontinued in the fall.

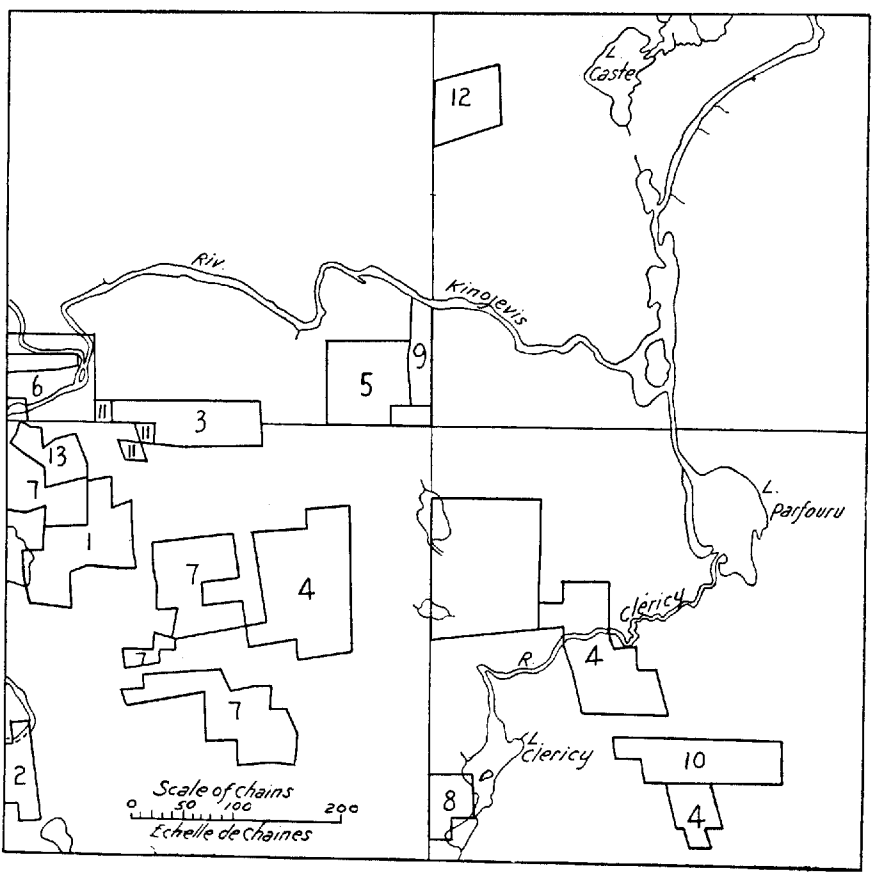
Harvie Mining Co., Ltd.—The mining rights to a group of claims, which lies on the Dufresnoy-Clericy boundary, comprising claims A-4283 to 4287, 2513 to 2517, 15062 and 15063 are held by this company. These claims, with the exceptions of 15062 and 15063, were formerly held by the Archean Mines Development Co., Ltd., and were transferred to the Harvie Mining Exploration Co., Ltd., in December 1926, and, at the end of 1927, to the Harvie Mining Co., Ltd. The mining rights to fourteen claims, which lie to the south-east of this group, have been retained by the Archean Mines Development Co., Ltd. These comprise the following:—A-2503, to 2512, 15060, 15061, 5239 and 5244.

During 1927, a large amount of work, involving trenching, diamond drilling and underground exploration was performed. Early in the year, the No. 1 shaft, on claim 2509, was continued to a depth of 145 feet and a second level was opened up at 125 feet from the surface. The total lateral work at the end of the year, amounted to approximately 950 feet, 120 feet of which was done on the 50-foot level and the remainder on the 125-foot level.

Starting in a hillside, on claim 2517, a tunnel was driven in

an easterly direction for a distance of about 820 feet to crosscut some mineralized zones which were exposed on the higher ground. Some diamond drilling was done from the face of this tunnel.

CLERICY TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Archean Mines, Ltd.; 2.—Astoria Rouyn Mines, Ltd.; 3.—Clericy Center Mines, Ltd.; 4.—Clericy Mines, Ltd.; 5.—Colonial Metals Exploration Co., Ltd.; 6.—Frontenac Copper Mines, Ltd.; 7.—Harvie Mining Co., Ltd.; 8.—Internos Mining Syndicate; 9.—Jay Copper Gold Mines, Ltd.; 10.—Lapona Copper Mines, Ltd.; 11.—Laurier Mines, Ltd.; 12.—Richburn Mining Co., Ltd.; 13.—Windfall Rouyn Mines, Ltd.

On claim 2515, to the north-east of this tunnel, a quartz vein is exposed, in which gold values are reported. This vein strikes in a north-westerly direction and dips at an angle of about 45 degrees. A shaft was sunk to a depth of 145 feet and over 380 feet of lateral work was accomplished on the 100-foot level. In crosscutting from the shaft, the vein was encountered and at this point, it was found to have a width of five feet, and nearly a foot of massive pyrite was present in the hanging wall.

In October, 1927, a diamond drill was set up, on claim 2505, to drill a mineralized zone which had been previously exposed by a test pit. At a depth of 40 feet, along the inclined hole, high grade copper ore was encountered. Surface stripping revealed the outcrop, which lies between the drill and the mineralized zone referred to and formed a new discovery. Other diamond drill holes were put down and, early in 1928, the sinking of a shaft was commenced on the outcrop.

The Harvie Mining Co., Ltd. also holds mining rights to two other groups in this township, comprising the following claims:—A-16608 to 16616, 13657, 13658, 11723, 10387 to 10391 and 16459 to 16468. These groups lie in the south-west quarter of the township.

Windfall Rouyn Mining Co., Ltd.—This company was organized during the summer of 1927, with a capitalization of 3,000,000 shares of no par value, to purchase and explore a group of eight claims, situated on the boundary line between Clericy and Dufresnoy townships, south of the Kinojevis river. These claims are as follows:—A-4279 to 4282 and A-4288 to 4291.

Previous surface work had exposed a mineralized zone on claim 4279. This is well mineralized with pyrrhotite, and along fracture planes this sulphide is partially replaced by chalcopyrite. A pit was sunk to a depth of 22 feet on this outcrop.

On claim 4289, deep trenching exposed a heavily mineralized shear zone in Keewatin lavas, throughout which, a coarsely crystalline white pyrite was disseminated. This zone strikes in an easterly direction. It is 200 feet wide in places, and is said to have been traced for a distance of 2,000 feet.

Late in the year, a cable bridge was constructed over the Kinojevis river at Clericy station, and a road was cut through to the property, a distance of half a mile. A very good set of camps

was built on claim 4279. An electrical survey was made by the Radiore Company, and diamond drilling was commenced early in December.

The following organizations also hold mining rights to claims in this township:—Astoria Rouyn Mines, Ltd.; Clericy Center Mines, Ltd.; Colonial Metals Exploration Co., Ltd.; Frontenac Copper Mines, Ltd.; Jay Copper Gold Mines, Ltd.; Lapona Copper Mines, Ltd.; Laurier Mines, Ltd.; Richmond Mining Co., Ltd.; Syndicat Minier Internos.; Windfall-Rouyn Mines, Ltd.

HEBECOURT TOWNSHIP

The staking of a large tract of land for the Consolidated Mining and Smelting Company, Limited, early in the year, has attracted many prospectors into Hebecourt during the summer of 1927. Before the end of the year many claims had been recorded in this township; and two groups had been transferred to companies, one, in the south-west quarter, to Acadia Exploration Company, Limited, and the other, in the south-east section, to Kamiskotia Rouyn Syndicate.

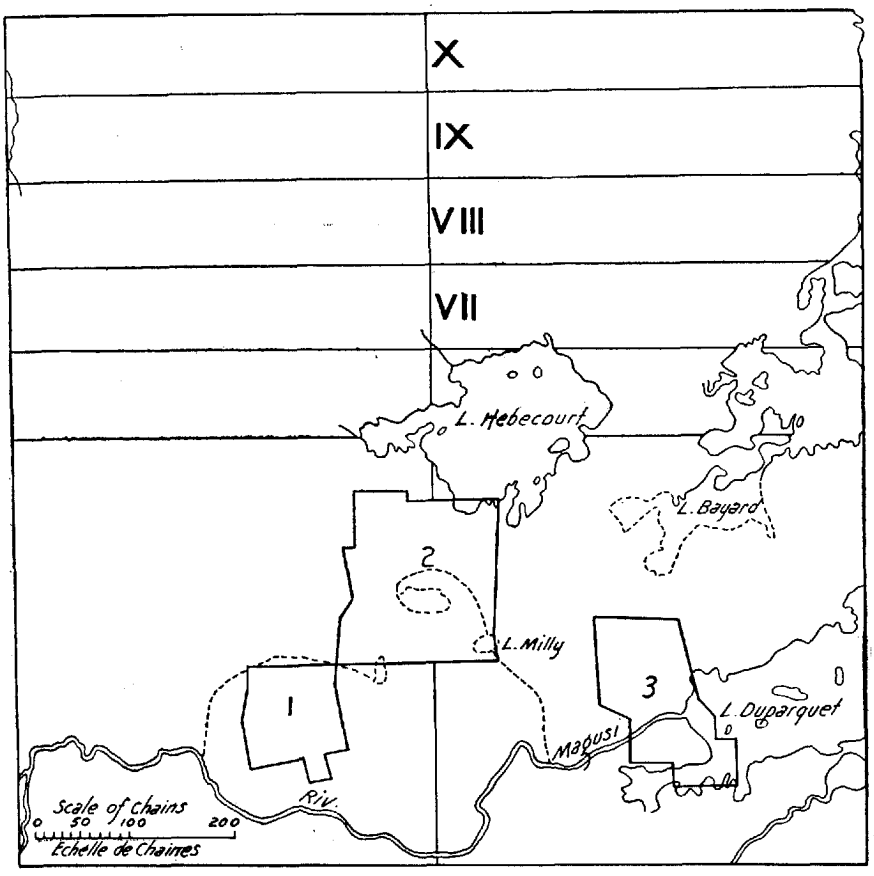
The Consolidated Minining and Smelting Company's group consisted of 76 forty-acre claims surrounding lake Milly or Romano. It was prospected during the first half of the year but work was not continued throughout the summer, and the claims were allowed to lapse. Dr. W. F. James who visited the township in 1927 has submitted the following notes:*

"During the work a small amount of pyrite and chalcopyrite mineralization was noted in the area about the contact between the volcanics and the granite mass within the basin of Milly lake. To the west of the Consolidated claims a small amount of surface work was performed on the Romano claim, exposing a mineralized zone, 10 chains long and from 30 to 60 feet wide, carrying mostly disseminated pyrite, with a few very small stringers of chalcopyrite. To the west of Hebecourt lake a quartz-chalcopyrite occurrence was discovered in a shear zone on Manion claims within the Keewatin greenstones which are there intruded by some masses of

* Advances notes transmitted by permission of the Director, Geological Survey of Canada.

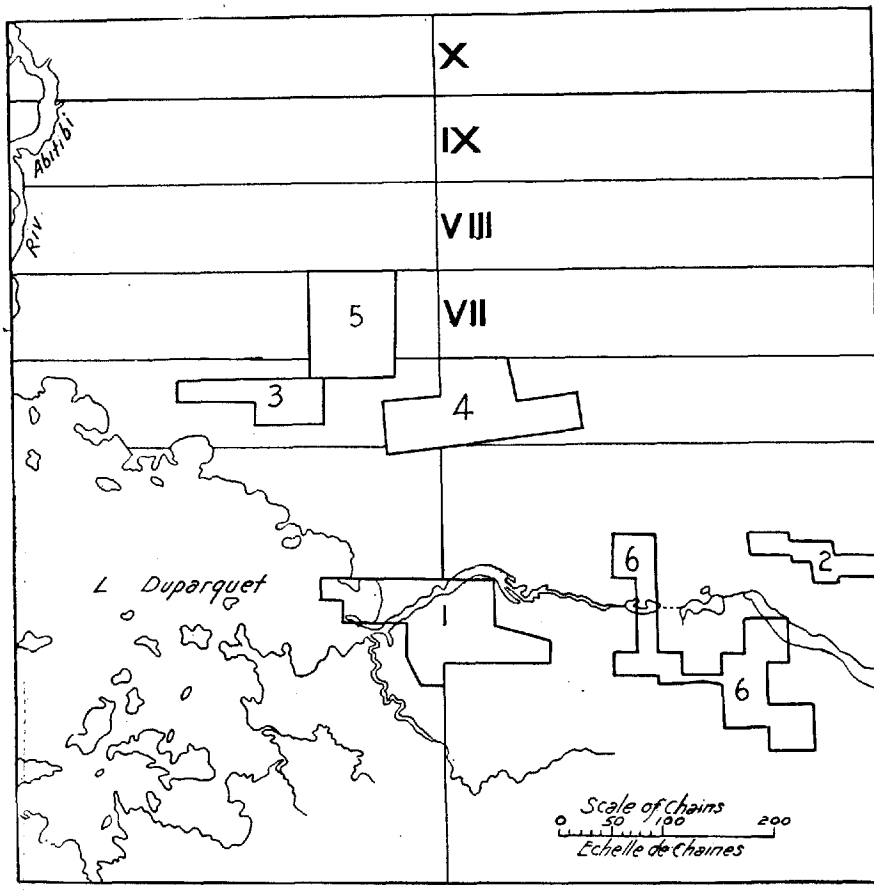
older gabbro. Just to the southeast of Hebecourt lake a sphalerite-chalcopyrite occurrence is being developed on the Sellors claims."

HEBECOURT TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Acadia Exploration Co.; 2.—Consolidated Mining & Smelting Co. of Canada, Ltd.; 3.—Kamiskotia Rouyn Syndicate.

DUPARQUET TOWNSHIP

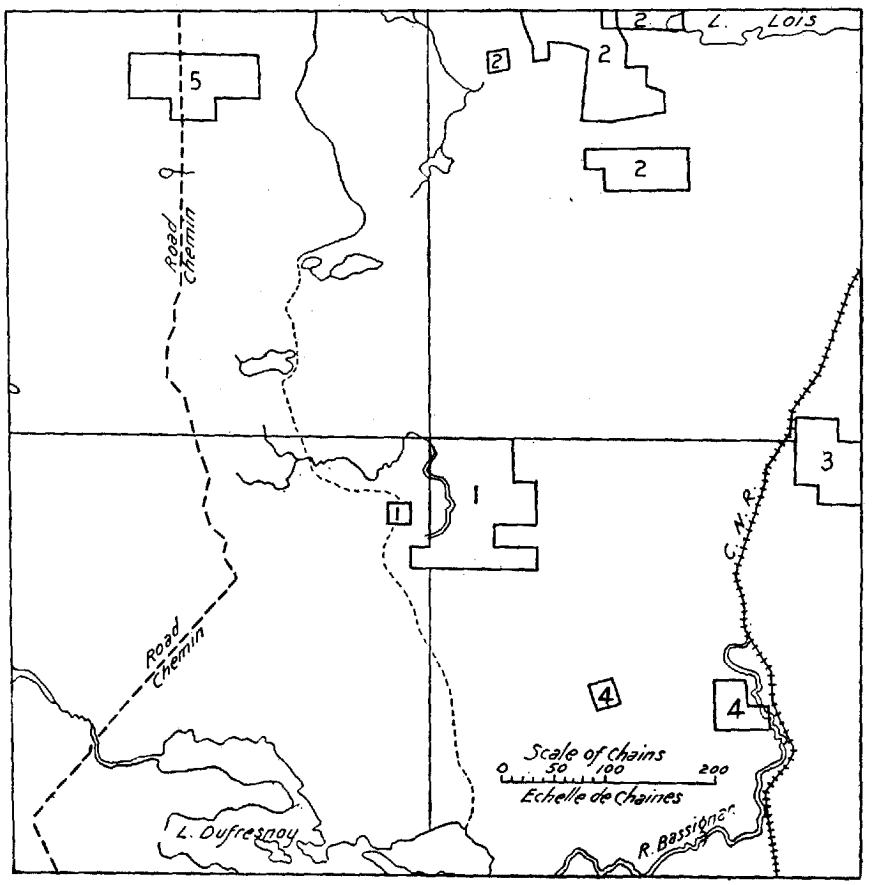


Sketch-map showing the location of some mining properties:—1.—Albian Copper & Gold Mines, Ltd.; 2.—Anglo-French Exploration Co., Ltd.; 3.—Consolidated Mining & Smelting Co., of Canada, Ltd.; 4.—Duparquet Mining Co., Ltd.; 5.—Rex Copper Mines, Ltd.; 6.—Syndicat Minier Union de Rouyn, Ltée.

DESTOR TOWNSHIP

Destor Mines, Ltd.—This company holds mining rights to the following claims in the township of Destor:—A-10078, 704, 705, 24291, 24292, 24293, 3965, 3966, 5368, 5369, 21712, to 21715, 21992 to 21996, 25458 to 25466, R-19 and R-20. These lie in the north-east quarter, close to the north boundary of the township.

Early in 1927, the company held other claims to the west of



Sketch-map showing the location of some mining properties:—1.—Acadia Exploration Co.; 2.—Destor Mines, Ltd.; 3.—Don Rouyn Gold Mines, Ltd.; 4.—Lepine Gold Mines, Ltd.; 5.—Makamik Mines, Ltd.

the above group, where some diamond drilling and trenching was performed. Most of this work was concentrated on zones, described in the Annual Report for 1926*. No new discoveries were reported.

The claims which are now held by the company were electrically surveyed, early in 1928, by the Radiore Company.

Makamic Mines, Inc.—During 1927, the Makamic Mines, Inc., which is capitalized at $5,000,000, held an option on the mining rights to a group of 14 claims, situated in the north-west quarter of Destor township. The group comprises the following: T-1411, 1134, 1135, A-10587 to 10591, 2179, 2180, 4627, 4628, and 14093. Early in 1928, the option on these claims was relinquished by the company.

The claims are mostly underlain by acid Keewatin lavas and a large boss of granodiorite outcrops on the north section of the group. A number of large lenses and veins of milky quartz are found in the sheared rhyolite. These contain pyrite and pyrrhotite in small amounts. A narrow shear zone, containing massive chalcopyrite and pyrite, is exposed on claim 10589. This strikes east and west and dips vertically. Work accomplished during 1927 consisted of a shaft sunk to a depth of 30 feet; of over 2,000 feet of diamond drilling; and some deep trenching. Operations were discontinued in the summer of 1927.

Amongst the other mining companies holding mining rights in this township are: La Compagnie des Mines D'Or Lépine; Acadia Exploration Co., Ltd.; and Don Rouyn Gold Mines, Ltd.

DESMELOIZES TOWNSHIP

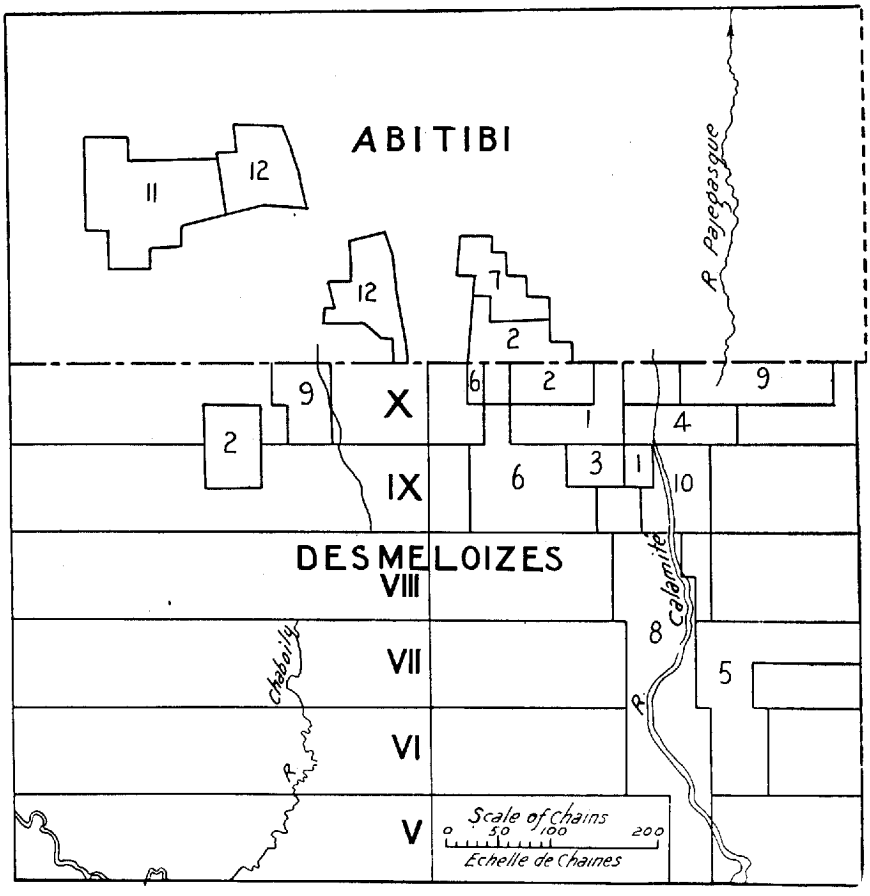
Abana Mines, Ltd.—Preparations were made for the resumption of operations on this property, in March 1927. At that time, the two compartment shaft was 120 feet in depth. Sinking of this shaft was resumed in May, and, by September, it had attained a depth of 330 feet. Stations were cut at the 100, 200 and 300-foot levels.

From the station on the 300-foot level, a crosscut was driven

* Quebec Bureau of Mines, Annual Report on Mining Operations in the Province of Quebec during the year 1926, p. 136.

to the north-east, a distance of 35 feet, and, from this point, drifts were driven to north-west and south-east, along the strike of the ore zone. The north-west drift is 34 feet in length. By February, 1928, the south-east drift had been driven for a distance of 385 feet, with drifting still in progress. Four crosscuts, spaced at

DESMELOIZES—ABITIBI SECTION



Sketch-map showing the location of some mining properties:—1.—Abana Mines, Ltd.; 2.—Abbey Mines, Ltd.; 3.—Abondé Mines, Ltd.; 4.—Alamac Mines, Ltd.; 5.—Albain Mines, Ltd.; 6.—Demara Mines, Ltd.; 7.—Dorval Mining Co., Ltd.; 8.—Dupuy Mines, Ltd.; 9.—Garwar Quebec Mining Co., Ltd.; 10.—Laval-Quebec Mines, Ltd.; 11.—Midland Base Metals Corporation; 12.—National Base Metals Corporation.

100-foot intervals, were driven to the north-east. Crosscut No. 1 is opposite the shaft, and Nos. 2, 3 and 4 are 100, 200 and 300 feet, to the south-east, respectively. No. 3 crosscut was also driven to the south-west, for a distance of 90 feet.

The ore-bodies, on this property, are composed of high grade zinc and copper sulphides. Like most deposits of a replacement type, they are very irregular, and, up to the present, only a limited amount of information has been obtained in regard to their size, shape and distribution of the valuable sulphides. They appear to strike about N. 60°W., and to dip to the north-east at about 85 degrees, following the planes of shear in the wall-rock, a highly altered volcanic schist. A diabase dyke, varying in width from 30 to 40 feet, parallels the ore zone, on the south-west side. At a depth of 40 feet, in the shaft, the No. 1 ore-body is 10 feet 6 inches in width and is of low grade. This ore-body dips out of the shaft to the north-east, between the 100 and 200-foot levels, and a second ore-body comes in on the south-west side. On the 200-foot level, this No. 2 ore-body is 15 feet in width and carries higher values in copper and precious metals: it dips out of the shaft between the 200 and 300-foot levels.

Lateral work has been confined to the third level. At this horizon, a width of 16 feet of massive zinc ore, low in copper, was encountered in No. 1 crosscut, at a distance of 25 feet from the shaft. This was followed in the drift for a total lenght of over 350 feet. At No. 2 crosscut, it is 9 feet wide, and from No. 2 to No. 4 crosscut, it has an average width of 5 feet.

To the north of the drift, in No. 2 crosscut, there are two mineralized zones. The south zone has a width of 20 feet, parts of which are massive sulphides. The north zone is 8 feet in width and is entirely composed of massive sulphides, carrying high copper values. In the north part of No. 3 crosscut, these two zones appear to have united to form a band 19 feet in width, of high grade copper ore. In No. 4 crosscut, there is sulphide mineralization exposed across a width of 54 feet, exclusive of the zinc body previously described. About 30 feet of this mineralization is reported by the company to be of commercial grade, averaging in the neighbourhood of $17. per ton, in zinc, copper and precious metals.

At a distance of 365 feet from the shaft, the south-east drift enters a diabase intrusion, which cuts across the ore zone in a

north-easterly direction. It is reported that ore was found by diamond drills, on the south-east side of this intrusion, so the drift has been continued, and it is expected that this ore will be encountered.

From diamond drilling and underground work, the company estimates that 325,000 tons of ore, of an average value of about $26. per ton, has been partially blocked out. This ore is in the ratio of about two of copper to one of zinc.

During the year, the government road was continued to the property. In December, preparations were made to install heavy mining equipment and to erect a concentrator. Electric power will be furnished by a generator connected to a 550 h.p. Diesel engine.

Abbey Mines, Ltd.—This company was organized in 1927, with a capitalization of 3,000,000 shares of no par value, to explore and develop two groups of claims, known as groups 1 and 2, in the north of Desmeloizes township and extending into the unsurveyed district, to the north. Group 1 comprises the following:—range X, north half lots 38 to 43, in Desmeloizes township, and mining claims A-4146 to 4150 and A-9715 to 9719, in the unsurveyed district. Group 2 is in Desmeloizes township, and consists of the following:—range IX, north half lots 16 to 19; and range X, south half lots 16 to 19.

During the summer, substantial camps were built on group 1 and an electrical survey was made by the Radiore Company. Some trenching was done and diamond drilling was commenced in August. Towards the end of the year, a second drill was brought in to the property.

Very little work was done on group 2. A camp was built and a part of this area was electrically surveyed.

Dupuy Mines, Ltd.—This company was organized in 1926, with a capitalization of $1,000,000. It holds the mining rights to the following lots in this township:—range V, lots 49 to 51; range VI, lots 46 to 51; range VII, lots 46 to 50; range VIII, lots 45 to 49 and south half of lot 50.

Temporary camp buildings were erected and an electrical survey was conducted over this area, by the Radiore Company.

La Reine Mine, Ltd.—This company was organized in 1927,

with a capitalization of $5,000,000, to develop a group of mining claims in the centre of this township. In February, 1928, these had not been transferred to the company, but it is understood that they include the north half of lots 25, 26, 27 and 28 in range V; and the south half of lots 23 to 31 in range VI.

As active operations were started late in the fall, only a small amount of work was completed before the end of the year. Camps were built, some surface stripping and trenching done; early in 1928, a diamond drill was purchased.

The property is underlain by very much altered graphitic rocks, intruded by gabbro, syenite and granite. It is reported that low tin assays have been obtained in this material. Trenching has also revealed narrow rusted shear zones in which pyrite, sphalerite, chalcopyrite and galena occur in small amount.

Laval-Quebec Mines, Ltd.—The mining rights to the following are now registered in the name of this company:—range IX, south half lot 47 and lots 48 to 51; range VIII, north half lot 50 and lot 51. During the summer of 1927, the south half of lots 46 to 53, in range X, were held under option. These groups were electrically surveyed by the Radiore Company and several diamond drill holes were put down. Towards the end of the year, operations were discontinued.

The following companies hold mining rights in this township, and data are given in regard to holdings.

Alamac Mines, Ltd.—Organized 1927. Capitalization $3,000,000. Properties comprise the south half of lots 46 to 53 in range X.

Demara Mines, Ltd.—Organized 1927. Capitalization $3,500,000, range IX, lots 35 to 41 and the south half of lots 42 and 43; range X, south half of lots 36 and 37 and the north half of lot 35.

Garwar Quebec Mining Co., Ltd.—Organized 1927. Capitalization $100,000. Two groups in range X, comprising lots 22, 23 and 24 and the north half of lots 21 and lots 50 to 60.

Abonde Mines, Ltd.—Organized 1927. Capitalization $3,000,000. This company holds the north half of lots 42 to 45 in range IX. A camp was built in the fall and a Radiore survey was completed.

In the unsurveyed district to the north, the following companies hold mining rights to claims:—

Dorval Mining Co., Ltd.—Organized 1927. Claims A-4096 to 4106.

National Base Metals Corporation.—Organized 1927. Capitalization $300,000. Hold two groups comprising A-16434 to 16438, 16449 to 16458, 16981 to 16990, 18740 and 18751 to 18755, known as the Arno mine. A camp was erected in the fall and an electrical survey was made of both groups by the Radiore Company.

Midland Base Metals Corporation.—Organized 1927. Capitalization $300,000. Hold a large group near the Ontario boundary comprising A-20565 to 20589. This is known as the Melnor Mines group. It was electrically surveyed, early in 1928.

GUYENNE TOWNSHIP

Porcupine Crown Mines, Limited.—The mining rights on lots 1 to 6 in range IX, Guyenne township, are held by Porcupine Crown Mines, Limited. Prospecting work has been carried on, in the last two years, on lots 2, 3 and 4.

The first discovery was made in 1926 north of the camp near the south boundary of lot 3. Stripping and trenching showed up a mineralized break which was diamond drilled during the first months of 1927. The company reported conditions disclosed by the drilling as decidedly interesting. The work proved a mineralized zone from four to eight feet wide over a length of 1,200 feet in a direction N. 70° W. magnetic. Portions of the drill cores gave good values in zinc, lead and a little gold. In the fall of 1927, a second drilling contract for another 2,000 feet was undertaken by a well known firm. At the completion of which all work was suspended for an undetermined period.

Guyenne Mining Company, Limited.—This company had a gang of men doing assessment work this summer on their property in range VIII. Stripping and rock trenching were done near the north boundary of lots 4, 5 and 9. Some mineralized zones have been encountered which showed narrow bands of massive pyrite. Elsewhere the pyrite is disseminated in a green schist.

CADILLAC TOWNSHIP

The O'Brien Mine.—Development which had been suspended early in the fall of 1926 was resumed in July 1927. After the underground workings had been de-watered, the main crosscut, east of the shaft, was continued towards the north for 60 feet and number 4 vein was drifted on for a distance of 280 feet towards the east. A certain amount of stoping was done on a pocket of very rich gold-bearing quartz found in this vein. The following is an extract from a report by W. F. James and J. B. Mawdsley who visited this property in 1925.*

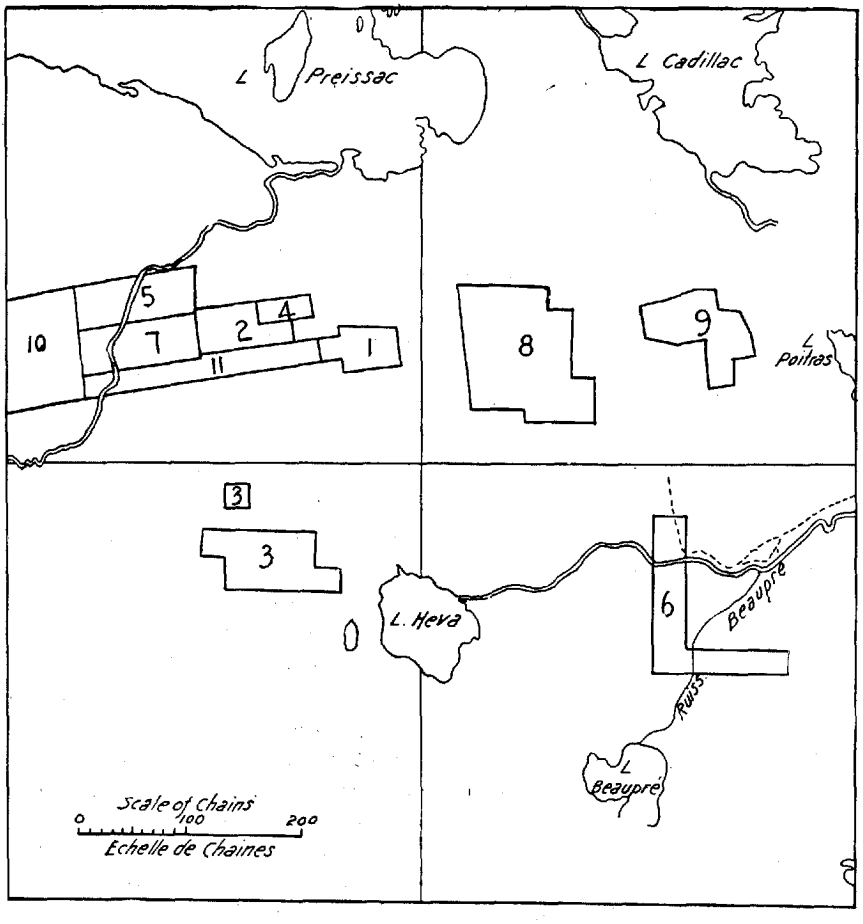
"The O'Brien claims are in Cadillac township just to the west of the Thompson claims. The southwest group of ten claims, Nos. 1488 to 1497, lies east of Blake river about half a mile north of the east-west centre line of Cadillac township. These claims were staked by the O'Brien Company during the early summer of 1924 and shortly after development work was begun. A winter road was cut from the main road leading from Amos to La Motte and several camp buildings have been erected. An air hoist and motor compressor have been installed. After preliminary trenching and stripping, underground work was begun and late in the summer of 1925 there was completed an 87-degree shaft 110 feet in depth, a drift along the vein 320 feet in length, and a crosscut extending 265 feet northward from the bottom of the shaft. During the winter of 1925-26 and the summer of 1926 twelve diamond drill holes were bored aggregating approximately 6,000 feet."

"The veins on which work has been done outcrop on a low, rocky ridge a few hundred feet north of the La Motte trail. The ridge dips sharply northward beneath the deep drift lying in a depression which appears to be the extension of the drift-filled valley in which is a stream flowing eastward across the Thompson property to join Blake river. The drift-filled depression is considered to be the location of a fault with a general east-west strike. The reasons for this opinion and the significance of this feature will be discussed later. The outcropping strata are Temiskaming sediments, porphyry dykes or sills, and greenstone bands. The general strike of the bands of sediments, the dykes, and the greenstone bodies is about east-west. The southern part of the claims is underlain by altered, banded sediments which vary in colour from grey to

* W. F. James and J. B. Mawdsley. Geological Survey of Canada, Summary Report, 1925, p. 71c.

greenish. With them are two bands of greenstones. To the north the sediments are cut by a 15-foot dyke of porphyry in which one inclusion of the sediments was noted. The porphyry is apparently intrusive, though no appreciable decrease in grain could be ob-

CADILLAC TOWNSHIP



Sketch-map showing the location of some mining properties:—1.—Boischatel-Quebec Mines, Ltd.; 2.—Cartier Malartic Mines, Ltd.; 3.—Dorval Mining Co., Ltd.; 4.—Huronian Belt Co., Ltd.; 5.—La Reine Mine, Ltd.; 6.—Norrington Development Co., Ltd.; 7.—O'Brien Mine; 8.—Pandora Syndicate; 9.—Rubec Mines, Ltd.; 10.—Thompson Cadillac Mines, Ltd.; 11.—Valco Mines Co., Ltd.

served near its contact with the sediments. The porphyry which is much sheared, has feldspar phenocrysts in a feldspathic, green groundmass and has the composition of a diorite. A conglomerate band lying north of the porphyry, is from 5 to 80 feet wide, and has a medium-grained arkosic groundmass with pebbles up to 5 inches in length, some of which are of granitic rock. Some of the pebbles are little sheared, whereas others, often adjacent, are squeezed and drawn out parallel to the direction of shearing. Some pebble-like bodies of a coarse, porphyritic rock appear to have originated as injections from the intrusive porphyry bodies nearby. North of the conglomerate is a band of porphyry 50 feet wide. Near its southern contact the porphyry is highly sheared and is fine-grained, but the grain coarsens a few feet to the north. The feldspar phenocrysts make up about 30 per cent of the rock. Within the porphyry body also the rock is much sheared and the phenocrysts are oriented in the direction of shear. The porphyry is much oxidized and carbonated, and holds a small vein of dark, glassy quartz from 6 to 24 inches wide. North of this porphyry is a band of dark, igneous, massive rock ranging in grain from fine to coarse, and having the composition of a diorite or basalt. This band varies in width up to 70 feet and is cut by a dyke of porphyry from 10 feet to 20 feet wide. North of this basic rock is the shallow valley presumed to be the locus of a large fault."

"The underground workings reveal essentially the same succession of strata as are visible on the surface. Vertically beneath the northernmost outcrop of the basic igneous rock (diorite or basalt), is a layer of fault gouge from 1 foot to 2 feet wide. North of this is a width of 150 feet of much contorted talc-chlorite schist, presumably produced by the intense shearing of the basic rock. A uniform width of this schist was encountered in every drill hole. North of this highly sheared zone the diamond-drill holes are reported to show igneous rock similar to that just south of the shear zone. Drilling in the schist showed the presence of several narrow, dyke-like bodies of porphyry, all somewhat sheared, but one small body little or not at all sheared was reported in the crosscut passing through the sheared zone."

"Five principal veins are disclosed by surface and underground work and by diamond drilling. The No. 1 vein, which has a known length of 1,400 feet, lies almost entirely within the conglomerate

band. Its strike is slightly undulating, but corresponds fairly closely with that of the conglomerate. Its dip is 87 degrees north. Its width is irregular, ranging from 15 feet to a few inches. Its greatest width occurs at the contact of the conglomerate and the greenstone lying to the south of it. The quartz of the vein is dark and glossy in general, though some sections of white quartz occur within the dark quartz. Coarse, free gold occurs scattered through the quartz at intervals over its entire length. Arsenopyrite is the commonest mineral within the quartz, though some pyrrhotite was seen and a little chalcopyrite is reported to occur. The shaft and main drift have been cut in this vein."

"No. 2 vein is of no importance. It is about one foot wide and cuts the greenstones near the south of claim 1492. No. 3 vein lies north of the northernmost body of porphyry and is also unimportant."

"No. 4 vein occurs within the porphyry 80 feet north of the shaft. It has been uncovered intermittently over a length of about 1,200 feet and follows the strike of the porphyry body. The width of the vein varies between 6 and 24 inches. In one section about 60 feet long it carries a large amount of coarse, free gold in small fissures within the quartz. The adjoining country rock is sheared and near the vein carries some free gold."

"No. 5 vein has been encountered only by diamond-drill holes in the sheared zone. The indicated width is between 9 feet at a point 340 feet northeast of the shaft to a mere stringer towards the eastern boundary of the claim. The vein matter is quartz or silicified rock and is mineralized with coarse arsenopyrite."

"Values so far encountered are interesting, but erratic. To the north of the zone carrying considerable free gold, evidence of a considerable fault has given the property an attractive speculative value. Diamond-drill holes have been so placed as to pierce this fault zone and assays of sections of the core indicate that within the sheared zone there occur quartz lenses or mineralized zones in which values are found. As in the mineralized veins to the south, values, in some cases considerable, occur, but as yet do not seem to be consistently disposed as to warrant the opinion that a workable body of ore has been located."

Thompson-Cadillac Mining Company, Limited.—This company was organized in 1927, with a capital of $20,000. It has taken over the claims previously registered in the name of Thompson-Cadillac Mines, Limited.

As stated in last year's report two shafts have been sunk on this property. The east one is known as No. 1, and the west one exactly south of the camp as No. 2. No further work was done on shaft No. 1 in 1927, which is 35 feet deep. But shaft No. 2 was sunk to a depth of 108 feet. Twelve feet of crosscutting and 15 feet of drifting was also done on the 100-foot level. The shaft is a two-compartment, 9 by 6 feet outside the timbers. An intensive development programme has been outlined for 1928, which will consist in sinking shaft No. 1 from 35 to 315 feet with levels at 150 and 300 feet respectively. The collar has been constructed for a three compartment shaft; a substantial headframe has been built over it. Two 60 h.p. locomotive-type boilers have been installed, and power from these will be used to drive an Ingersoll Rand air compressor with a capacity of 528 cubic feet and a 8 by 10 Ingersoll Rand reversible hoist..

The following notes are taken from a report by W. F. James & J. B. Mawdsley after an examination of the property in 1925.*

"The group was staked in the early part of the summer of 1924 and later was given under option to the Victoria Syndicate and a small amount of development work carried out. During the winter of 1924-25 further work was performed by the Anglo-French Company. By September, 1925, a considerable amount of trenching and other surface work had been completed. Bedrock is now exposed by trenching over a length of about 1,500 feet from east to west and for a distance of about 300 feet from north to south. The overburden is heavy and it has been necessary in many places to dig the trenches to a depth of from 6 to 10 feet before encountering bedrock. In the areas of heavy mineralization, pits have been sunk into the rock for depths of from 6 to 10 feet."

"The mineralized areas lie within Temiskaming rocks, about two miles south of the Temiskaming-Keewatin contact. The rocks of the vicinity consist of finer sediments with conglomerate and

* W. F. James and J. B. Mawdsley. Geological Survey, Summary Report, 1925, pages 74c and 76c.

narrow bands of porphyry and what appear to be greenstones interbedded with the sediments."

"The zone of mineralization has been traced on the property over a length of 900 feet. It is confined to the northernmost band of porphyry. It has a width of 2 to 6 feet and is almost continuous over the length of 900 feet. The porphyry along the zone is sheared and carbonated and mineralized with sulphides and arseno-sulphides. Within the zone are lenses and stringers of quartz. In the eastern part of the mineralized zone, the quartz attains a width of 4 feet and holds this width for approximately 50 feet along the strike. The quartz is usually dark and glossy, but white quartz is also found. Associated with the quartz lenses and stringers are pyrite, arsenopyrite, and a little pyrrhotite. Free gold occurs within the quartz, locally in considerable amounts. The richest showings are at the west and east ends of the mineralized zones. The rich deposit of the eastern end is located where a minor fault cuts across the vein. In the fault gouge dendritic masses of gold have been deposited. The free gold seems to be confined chiefly to the quartz. No other mineralized zone than that just mentioned has been so far located."

"The location by diamond-drilling of a fault zone 300 feet wide intruded by a porphyritic rock and within 250 feet of a well mineralized zone is of considerable interest and indicates that the property is one which merits the expenditure of a considerable sum to determine its value."

MALARTIC TOWNSHIP

Lartic Mines, Limited.—During 1927, the mining rights on the north half of lots 2 to 8, range III, and lots 1, 2 and 3, range IV of Malartic township, as well as claim A-5173 in Cadillac have been transferred from the Lartic Mining Corporation, Limited, to Lartic Mines, Limited.

During the year the company sank a vertical shaft, to a depth of 50 feet, on a sheared zone. This zone, 400 feet in length with a maximum mineralized width of 40 feet, had been exposed by trenching the summer before. It strikes N. 60° W. magnetic. The mineralization consists of pyrite, pyrrhotite and arsenopyrite with quartz replacing the greywacké. The Lartic Mines, Limited, is capitalized at 3,000,000 shares of no par value.

FOURNIERE TOWNSHIP

Malartic Gold Mines, Ltd.—This company was organized in 1927, with a capitalization of $3,000,000, for the purpose of purchasing and developing a group of five claims in, and near the north boundary of Fournière township, and comprising M.L.2128, 2129, 2130, 2132 and 2134.

In 1926, these claims were optioned to the Porcupine Goldfields Development and Finance Co., Ltd., and, at this time, a large amount of trenching was accomplished and 5350 feet of diamond drilling was done in 18 holes.

No further work was done on these claims, until the fall of 1927. During the months of September and October, supplies and mining equipment were brought in to the property and the erection of a headframe, hoist house and other buildings was proceeded with. In November, the sinking of a two-compartment, vertical shaft was commenced near the south-east corner of claim 2129. By February, 1928, a depth of 155 feet had been reached, with a level at 130 feet, and over 450 feet of lateral work had been accomplished.

The rocks in the vicinity of the shaft consist of a medium grained greywacké, intruded by bosses and dykes of syenite porphyry. In places, this greywacké is highly silicified, and it is in this material that the gold values have been found. It is of a dark blue colour. Secondary quartz, light in colour, is present in small veinlets.

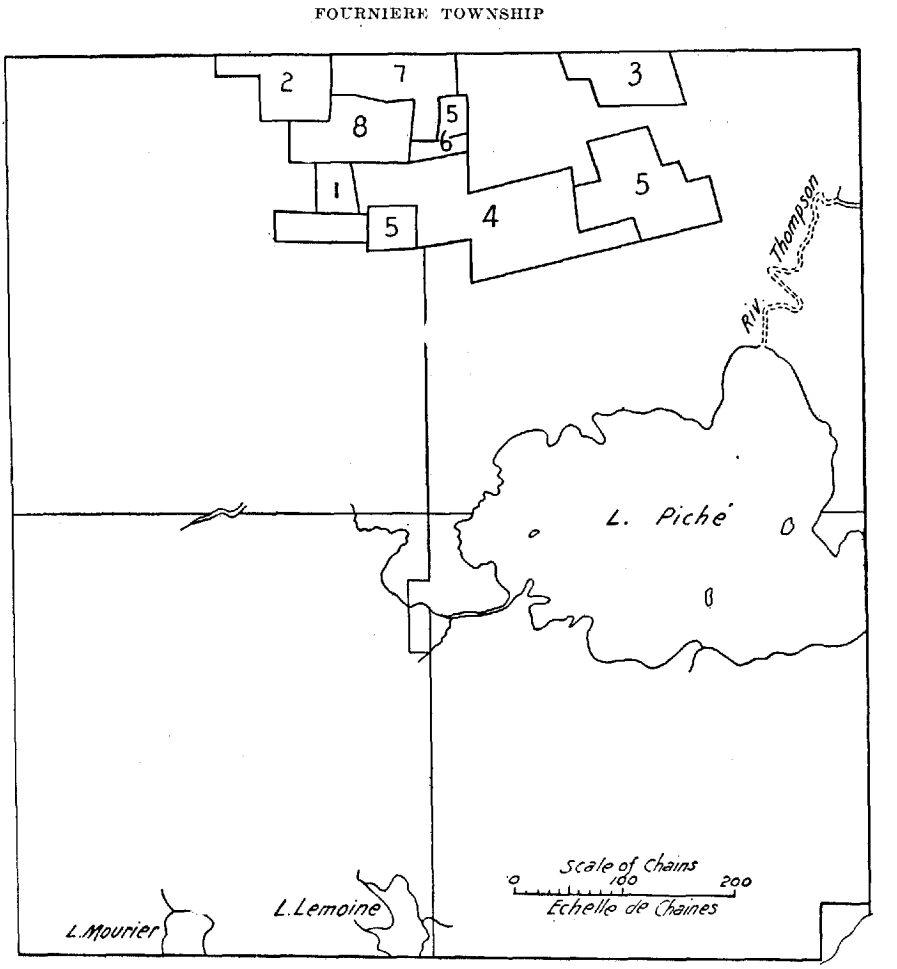
The equipment on the property, at the end of 1927, included two 60 h. p. locomotive-type boilers, a 750 cu. ft. compressor, and a 6" x 8" reversible steam hoist.

W. F. James and J. B. Mawdsley, who visited the property in 1925, report on it as follows: *

"Two principal ore-bodies have been found. The principal showing is the No. 1 vein, 300 feet northeast of the No. 4 post of the Matthews claim, (M.L. 2129). No. 1 vein strikes about 10 degrees north of west and has a dip that varies from 65 degrees north at the east end, to vertical towards the west end. It is ex-

* W. F. James and J. B. Mawdsley. Geological Survey, Summary Report, 1925, p. 71c.

posed for about 100 feet and contains quartz lenses varying in width from 5 feet to a few inches. The country rock is coarse and fine-grained sediments, containing some quartz stringers, and is in places somewhat sheared. A narrow dyke of porphyry parallels



Sketch-map showing the location of some mining properties:—1.—Abbey Mines, Ltd.; 2.—Cartier Malartic Gold Mines, Ltd.; 3.—Crewoken Mining Company; 4.—Fournière Gold Mines, Ltd.; 5.—W. D. Gouldie; 6.—Huronian Belt Co., Ltd.; 7.—Kennedy-Staden; 8.—Malartic Gold Mines, Ltd.

the vein about 40 feet to the south. The vein is about parallel to the strike of the sediments and either follows a shear zone or a series of beds that were easily replaceable by the siliceous solutions carrying the ore. The quartz is rather granular and is of glassy appearance. Free gold as well as pyrite, galena, and chalcopyrite occurs in the quartz. Some mica flakes form rosettes within cavities in the quartz. The country rock adjacent to the vein is mineralized, so that including the quartz there is present a mineralized body with a width of about 6 feet and a length of about 100 feet. Assays of samples from the surface indicate that the mineralized body will produce ore that may be mined at a profit. A diamond-drill hole, located north of the vein, intersected at depth a small section of ore that is considered to be the downward extension of this vein. The vein is cut by small, transverse fault-planes along which movement has been slight."

"On the strike of this vein, just to the west, the sheared country rock has been considerably replaced and is heavily mineralized by pyrite. Two hundred feet to the west and on the same strike, is a much replaced zone, in places almost pure quartz with some feldspar and a high pyrite content. The sediments here are cut by small stringers of quartz which carry segregations of coarse mica flakes. The greatest width of mineralized rock is 25 feet and the known length 120 feet."

"The No. 2 vein lies 400 feet northeast of the main showing of No. 1 vein and 700 feet northeast of No. 4 post of the Matthews claim. It differs from the No. 1 vein in having no wide bodies of quartz. The mineralized part consists of quartz and altered greywacké up to 21 feet wide and with an average width of about 15 feet and a known length of about 100 feet. The mineralization is the same as in the No. 1 vein."

DUBUISSON TOWNSHIP

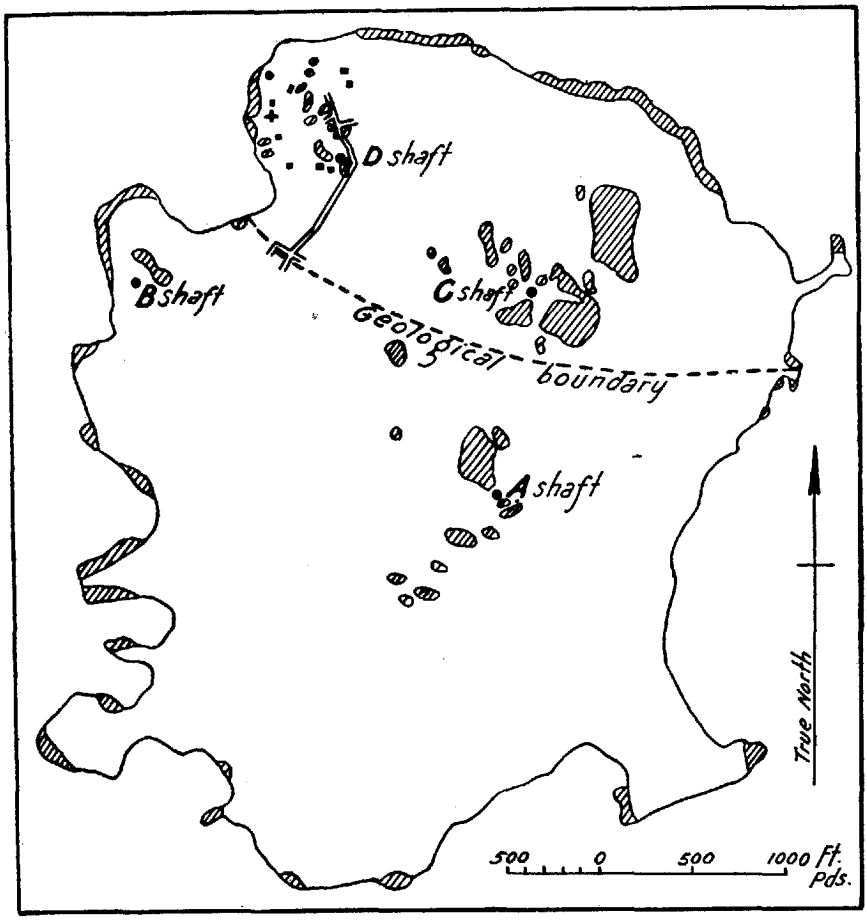
Siscoe Gold Mines, Ltd.—Operations were resumed on this property in February, 1927, and have been in progress since that time. During the year the equipment was removed from the "D" shaft, where underground work was undertaken in 1926.

Since, the "C" shaft, which had been sunk to a depth of 100 feet, some years ago, has been continued to a depth of 510 feet.

About 1000 feet of lateral work has been accomplished on the first and second levels, at 170 and 270 feet, respectively, and a station has been cut on the third level, a depth of 400 feet. The shaft follows the "C" vein, which dips to the west at an angle of approximately 38 degrees, and these measurements are taken along the incline.

For the length of the shaft, the vein has an average width of

SISCOE ISLAND



Siscoe island, lake DeMontigny, showing outcrops (pattern of ruling); those north of the geological boundary are granodiorite; those south, volcanics.

about three feet and it is reported that a small tonnage of ore has been blocked out.

The following description is reproduced from the Summary report of the Geological Survey for 1926, Part C:— *

"Work on Siscoe island consists of much surface stripping and trenching, most of which was done several years ago, a great deal of diamond drilling, the records of which were not available, shaft sinking, and underground work. Four shafts, called A, B, C, and D shafts, have been sunk and are located as shown on the accompanying plan. The principal shaft, D, is inclined about 57 degrees toward the east and reaches a vertical depth of about 75 feet. The shaft is equipped with a hoist, compressor, and other mining equipment. About 1,500 feet of underground workings have been cut and furnished with light tracking for a small tram. The A, C and B shafts are vertical and 45,100, and 30 feet deep respectively."

"Within the volcanics and intrusives occur many veins which may be grouped into two classes. Those of the older set are small and close spaced in zones, a good example of which may be seen near the main or D shaft. Here, the veins are small, somewhat irregular, strike a few degrees east of north, and dip about 45 degrees to the east. They cannot be followed over any great length. The surface near D shaft is now largely covered by buildings and rock piles, but Bancroft in 1919 noted, within an area of 470 by 150 feet, a very large number of irregularly disposed small stringers. The stringers attain widths of 18 inches, but are generally much narrower. They contain white quartz and free gold with considerable tourmaline. The wall-rock is carbonated and carbonates occur within the vein. Some of these small veins carry only carbonates and tourmaline. The carbonate seems definitely to be of thermal origin. The veins of this type are roughly at right angles to the contact of the granodiorite and probably fill fissures that formed shortly after its intrusion. In the underground workings a large number of similar fissure veins are present. The inclined D shaft is now timbered, but it is reported that veins of this type appear in the walls and that the quartz and the adjacent country rock carry considerable sulphides and some

* W. F. James and J. B. Mawdsley, Geological Survey. Summary Report, 1926, p. 66-71c.

free gold. Assaying indicates that gold is associated with these sulphides. A mill-run of about 8 tons of selected ore from this zone yielded over $39.00 a ton. Two large samples of rock from a lower part of the shaft yielded $2.50 and $1.85. Values have not been reported from small stringers forming a part of this zone, encountered in the lower workings, where the stringers, though of similar character, seem to be less numerous than on the surface and in the upper parts of the shaft."

"To the north of D shaft some old pits are now full of water, so that no adequate idea could be formed of a vein explored by these pits. At one place it seems to be about 4 feet wide, but is said to be 9 feet wide in a pit a short distance east. From the location of points designated by Mr. Siscoe, the vein has a strike of north 70 degrees east. The vein quartz is blue-grey and carries some pyrite, chalcopyrite, and free gold. A considerable fault with a strike almost parallel to that of the vein appears in the underground workings, but the connexion, if any, between vein and fault, is not known."

"Near the north end of the D shaft underground workings, large veins are cut east and west of the main workings. West of the workings, at the end of a small crosscut, are a number of small, easterly dipping quartz veins, and one vein about 2 feet thick. These veins belong to the class striking slightly east to north and dipping east. The country rock is fine-grained granodiorite, much altered and mineralized with pyrite cubes. The quartz is grey, glassy, and contains pyrite cubes. Tourmaline veins up to 3 inches thick cut veins and country rock. The latest fissures are less than one-half inch wide and filled with calcite or pyrite."

"East of the main workings is an irregular drift following a vein about 2 feet thick. The general strike of the vein is about northeast, with a dip of about 60 degrees to the south. Near the eastern end of the drift the vein is cut off by a small fault whose plane strikes about north 70 degrees east and dips 73 degrees north. Later work is reported to have recovered the vein about 10 feet to the north of the drift. The vein cuts a fine-grained, silicified phase of the granodiorite, which carries pyrite in considerable amount. Good values are reported from the country rock where it is mineralized near the vein. The vein quartz is greyish and holds tourmaline and some pyrite. Free gold is said to have been noted during the work in the drift."

"A vein designated K, appears underground near the south end of the D shaft workings. It lies within a zone of highly metamorphosed talc chlorite schist near the contact of the intrusive and the volcanics, in a shear zone developed along the contact. On the accompanying sketch map this contact zone is included within the boundary of the granodiorite mass. The dip of the vein is about vertical; and the strike, as measured by the direction of the drift, about east 27 degrees south. Where intersected by the main crosscut, it has a width of 2½ feet. Drifting has followed the vein in both directions from this point. In a southeast direction, the vein narrows within a length of 20 feet to a width of one foot, where it pinches out for a distance of 10 feet. It is again picked up on the same strike with a width of 4 inches, and in the remaining 40 feet of the drift attains a width of 16 inches. In a northwest direction from the main crosscut the drift follows the vein for a distance of 105 feet. West of the crosscut the vein narrows rapidly and in the face of the drift is 4 inches wide. On the southern wall of the drift 20 feet from the face, another similar vein runs parallel to the K vein for about 40 feet. It varies in width from 3 to 9 inches. K vein is formed of glassy white quartz separated by thin seams of chloritic material into sections 1 to 2 inches wide, running parallel to the vein walls. Pyrite occurs in the white quartz, but seems to be chiefly associated with the chloritic partings. A very small amount of chalcopyrite occurs in fine fissures in the vein quartz. Some fragments of chloritized country rock occur within the vein. The country rock is the highly sheared talc and chlorite schist mentioned as being present near the contact of the dioritic intrusive and the volcanics. Near the vein the wall-rock is mineralized with coarse pyrite. Good values are reported from the vein and adjacent wall-rock, but it is not known over what widths the values occur."

"Though no evidence of displacement has been detected, it appears that the band of highly altered schist is a shear zone developed in a contact fault. The vein may well be expected to be found intermittently along the length of the fault. In the crosscut to the south of K vein are found some zones of gouge and some slickensided surfaces that indicate very irregular crumpling and faulting. The intrusion of some dyke-like masses of feldspar

porphyry seems to have been influenced by the lines of weakness provided by the faults."

"The A vein located in the central part of the island cuts Keewatin volcanics. A vertical shaft (A shaft), reported to be 45 feet deep, has been sunk on the vein. The shaft was full of water when visited. The vein is visible on the surface for about 50 feet east of the shaft and strikes north 65 degrees east and dips 80 degrees south. It has a width of from 1 to 2 feet, is irregular, and encloses many fragments of greenstone. The vein matter is sugary quartz, with considerable coarse pyrite and tourmaline, and some chalcopyrite. The sulphide is confined chiefly to fissures in the vein quartz. This vein when sampled by Prof. Bell and Mr. J. A. Dresser showed an average value of $26.50 a ton over a width of 13 inches, the samples being taken at points 9 and 14 feet below the surface. In the shaft 34 feet below bedrock the vein has a width of 12 inches, and an indicated value of $2.80 a ton. As shown by a sample of a 9-inch width, the vein at 29 feet below surface showed values of $13.60 and $3.10 a ton."

"B shaft which was full of water at the time of the visit has been sunk to a depth of 30 feet on a porphyry dyke adjacent to which is a 1-foot quartz vein. A sample of the dyke taken by J. A. Dresser gave 0.80 a ton in gold across 4½ feet; a sample of the country rock near the vein gave values of $2.40 a ton over a width of 4 feet."

"An inclined shaft (C shaft), 100 feet deep, has been sunk on the C vein, following approximately the dip of the vein. At the time of examination of the property the shaft was full of water, but it is reported that work in the shaft has been begun. The vein cuts the coarse intrusive granodiorite, strikes a little east of north, and dips 35 degrees to the west. It probably belongs to the same group represented by the numerous small fissure veins in the vicinity of D shaft. The vein has been exposed for a length of 200 feet, is as a rule about a foot wide, and is said to be 22 inches wide at the foot of the shaft. The vein is marked by partings of tourmaline parallel to the vein walls. Sulphides are not present in any appreciable quantity. J. A. Bancroft who examined it in 1919 reports that free gold occurs in nests within the tourmaline. His sampling of the surface of the vein showed values ranging from 80 cents to $33 a ton across the width of the vein. A later com-

plete sampling by J. A. Dresser and John Bell, of the vein for the depth of the shaft, showed an average value of $17.50 over a width of 16.1 inches of vein material."

"It seems probable that the tourmaline partings are contemporaneous with tourmaline stringers adjacent to the vein and those in the vicinity of D shaft. Cooke notes slickensided surfaces in the tourmaline fissures. Cross-fractures normal to the vein walls are filled with quartz and tourmaline."

"On the strike of C vein, some 750 feet to the south, a similar white quartz vein outcrops, but occurs in the Keewatin volcanics. The vein is very short."

"The Siscoe property is of interest in that it shows quite definitely the relation of gold mineralization to the granodiorite intrusive which is of widespread occurrence in the district. There is, therefore, a possibility that zones of similar mineralization may be found in association with the intrusive, in addition to those discovered, which have already undergone some development. The present work on the Siscoe proprety has disclosed several small bodies of high grade ore. The chief problems seem to be: the mining on a small scale of these high grade sections without too much dilution of low grade material or waste; and the economical treatment of the ore mined. If such work can be carried on profitably, there is the additionnal prospect that other ore-bodies may be discovered in the course of the work."

DALQUIER TOWNSHIP

Jay Copper Gold Mines, Limited.—The two-compartment vertical shaft which was sunk to 213 feet in 1926 was deepened to 518 feet during 1927. Levels were opened at 300, 400 and 500 feet. At the end of the year the total length of the lateral workings on the five levels was about 3,000 feet; most of it was confined to the second level where two long crosscuts were driven; one to the south-west and the other to the north-east. The workings are on lot 44, range II, Dalquier township.

Vein No. 1 was the only one drifted on. On the surface this showed the best mineralization. The ore shoot was seven feet wide

Fisher-Quebec Gold Mines, Ltd.—Headframe and surface plant, Landrienne township.

Jay Copper Gold Mines, Ltd.—Headframe and hoist-house, Dalquier township.

and about 70 feet long. This vein has been drifted on at each of the four upper levels, respectively, for 45, 200, 80 and 160 feet. The mineralized zone is in a quartz porphyry very much altered to a sericite schist. The most schisted portions have a general strike of N. 50° W. with a dip of 85° to the north. Along these are thin irregular bodies of white quartz and some more or less scattered filaments and bunches of chalcopyrite disseminated over a maximum width of eight feet. The richer sections take the shape of thin lenticular bodies. In January, 1927, the Jay Copper Gold Mines, Limited, made a test shipment of one carload of ore to the American Metal Company, Carteret, N. J. This ore was obtained from the second level on vein No. 1. This shipment consisted of 32 tons of ore said to have yielded five per cent in copper and four ounces of silver, or a value, at current metal prices, of $15.20 per ton.

LANDRIENNE TOWNSHIP

Fisher Quebec Gold Mines, Limited.—The mining rights on the following lots are now held by Fisher Quebec Gold Mines, Limited: lots 55 to 61, range V, Landrienne township, known as group A; and lots 4 to 8, range III, Barraute township, known as group B. These lots have been prospected in the previous two years by the Fisher Quebec Prospecting Syndicate, Limited. An account of their work was given last year. (1)

During 1927, it has been the policy of the company to develop group "A". New buildings were added to the camp. Machinery was installed and a shaft sunk on lot 59, range V. It had reached a depth of 215 feet and lateral work had started on the 200-foot level in February, 1928. The shaft is 7 by 10 feet outside the timbers, and is divided into two compartments. The headframe is covered with asphalt-slate roofing. In the hoist house is an Ingersoll-Rand 10 x 12 reversible hoist with a four-foot drum. A 650-cubic foot Sullivan steam-driven air compressor has been installed. The buildings are electrically lighted; the current being supplied by a 75 k. w. direct current generator driven by a 12 h. p. steam engine. Steam is generated by a 125 h.p. boiler. Carpenter, machine and blacksmith shops complete the surface equipment.

(1). Report on Mining Operations in the Province of Quebec during the year 1926, page 142.

The following extracts are taken from the report by W. F. James & J. B. Mawdsley: (*)

"Initial prospecting was begun in 1924 when large boulders of quartz carrying free gold were found on the property. Development work has been concentrated chiefly on lots 59 and 60, range V, Landrienne township. The work consists of shaft sinking, trenching, and diamond drilling. The shaft has reached a depth of 25 feet and is 7 feet by 9 feet. Diamond drilling to the present has amounted to about 2,000 feet. The trenching has exposed a considerable amount of rock. In some places the drift cover penetrated was 15 feet deep. The principal workings are in an area about 1,000 feet square on the western edge of a ridge largely covered with moraine and rising some 40 feet above the muskeg country that borders it on the north and west."

"Within the larger carbonated mass are a number of shear zones with an east-west strike and a steep dip. They seem to be intensely sheared sections of large zones that cannot be traced continuously across the property. The largest shear zone in the vicinity of the shaft is about 8 feet wide and within it are lenses and irregular bodies of quartz up to several feet wide and a few feet long connected by narrow stringers of quartz. The quartz carries large masses of chalcopyrite associated with pyrite. Carbonate is also a gangue mineral. The rock is intensely sheared near the edges of the quartz-bearing zone and east of it along its strike. The schist is said to carry good values in gold. Four other shear zones, narrower but similar in character, were noted in the altered dacite. In a few instances, flat-lying quartz veins, 3 inches to 12 inches wide, were noted. In the southern part of the rock area, in a rock cut, a vein forms a small saddle of which the north limb follows the schistosity and the south limb dips 35 degrees south and cuts the schistosity. As on other claims in the neighbourhood, the mineralization is later than the shearing, but tends to follow the strike, though not the dip, of the planes of shearing. The operators report values up to $14.16 in gold per ton over 3 feet of mineralized schist near the shaft, and up to $29.75 over 3.6 feet of mineralized quartz. A $50 assay is reported from a picked sample

* W. F. James and J. B. Mawdsley. Geological Survey, Summary Report, 1926, page 61c.

of chalcopyrite in the shaft and $27.10 per ton over a width of 2.5 feet in the bottom of the shaft."

BARRAUTE TOWNSHIP

Cummings-Trudel Mining and Development Company, Limited. —The mining rights on lots 8-9-10, range II, Barraute township held last year by Continental Gold Mines Syndicate were transferred to Dorval Mining Company, Limited, and later to Cummings-Trudel Mining and Development Company Limited. The following geological description of the property is given by Dr. W. F. James and Dr. J. B. Mawdsley: *

"The claims of the Continental Gold Mines, Limited, are in Barraute township, range II. The lots on which the principal work has been done are numbers 8, 9 and 10. The country is quite low and the outcrops are low and flat, but over considerable areas the rock is covered by a relatively thin coating of drift. The area explored is about 1,500 feet square and sections between natural outcroppings have been exposed by a number of shallow trenches, aggregating more than 2,000 feet in length; most of the work has been concentrated on lot 9. The country rock is chiefly volcanics, with some acid dykes of rhyolitic composition that may be associated with the porphyry intrusions that occur in the general district, and some basic irregular dykes identical in composition and appearance with the andesite and basalt lava flows. In one locality adjacent to the largest vein the andesites are pillowed and associated with fragmental beds similar in mineral composition. The acid volcanics are rhyolitic, the bulk of them are acid porphyritic flows, but undoubtedly some of the more sheared and altered varieties are tuffaceous in origin."

"The rocks are highly sheared in a general direction east 20 degrees south and dip 45 degrees north. About 80 per cent of the exposed rocks are carbonated, an alteration that has probably been contemporaneous with the injection of the quartz veins and other mineralization. The rhyolite seems to have been more extensively carbonated than the more basic volcanics. The intrusive acid dykes seem to have been little carbonated."

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* W. F. James and J. B. Mawdsley, Fiedmont and Dubuisson map areas, Geological Survey of Canada. Summary Report 1926, page 63c,

"The veins are numerous, but most are small. The principal vein has been exposed for slightly more than 260 feet and strikes roughly east 20 degrees south and dips south across the dip of the shearing planes of the rocks, which have a parallel strike but a dip of about 35 degrees to the north. The vein is about one foot wide and at its western end forms a facing on the southern edge of the rock outcrop. It appears to have formed in a fault-plane parallel to the strike of the schist, but of opposite dip. A few cross stringers, 5 or 6 inches wide, extend from the vein into the country rock. The vein material is glassy white quartz, containing tourmaline, a small amount of pyrite, and some chloritized greenstone fragments. Values up to $27.50 are reported from assays of grab samples of the vein material. The wall-rock near the vein is highly carbonated and is mineralized with pyrite, some of it in cubes one-quarter inch in diameter. A short distance to the west is a 2-inch quartz tourmaline vein that is almost flat and outcrops at intervals over an area of several hundred square feet. In the western trenches at least four veins are disclosed and range in width between 6 inches and 2 feet. These veins have been exposed only over short lengths, and from the work done, their full lengths have not been established. In addition there have been uncovered many small, narrow veins. Carbonate and sulphide mineralization on the walls of these veins has been intense. High assays up to $127 have been reported from grab samples of vein matter and wall-rock taken at several points. Free gold is associated with some of the vein matter. None of the veins so far examined appears to constitute a deposit of workable size, but the mineralization is promising."

Fisher Quebec Gold Mines, Limited.—Group B of this company comprises lots 4 to 8 range III of Barraute township. It has been prospected by the Fisher Quebec Prospecting Syndicate, Limited, and transferred to the company in 1927. The geology of the group has been described by W. F. James and J. B. Mawdsley as follows:*

"The most easterly workings of the Syndicate are on lot 9, range III, Barraute township, just west of the Gillies workings and 1,000 feet south of the north boundary of the range. They con-

* W. F. James and J. B. Mawdsley, Geological Survey, Summary Report 1926, page 62c.

sist of preliminary, irregular surface stripping and have disclosed areas of sheared carbonated greenstone. About 300 feet west of the east boundary of the lot is a quartz vein, designated as No. 9, which for the most part strikes and dips with the schistosity of the rock (north 15 degrees east, dip 55 degrees north), though locally it is oblique to the shearing. It has been exposed over a length of 30 feet and has a width of 10 inches to 3 feet. The vein quartz is glassy white and carries some pyrite and tourmaline. The wall-rock is highly carbonated andesite, with some pyrite mineralization. Free gold has been found in the vein. Ten feet, to the south is a nearly flat-lying vein 6 inches wide. It strikes approximately north-south and dips about 10 degrees west. The vein is of glassy white quartz containing tourmaline, pyrite, and chalcopyrite. The foot-wall is slightly sheared and contains about 20 per cent of pyrite, in coarse cubes. Good assays are reported from samples taken over a width of 2 feet."

*Gillies Claim.**—"Work on lot 10, range III, Barraute township, is being carried on by the Gillies interests. Stripping and trenching amount to about 350 feet and the workings lie north and south about 1,000 feet south of the northern boundary of lot 10. The workings at the time of examination were partly filled with water. The country rock in the trenches is greenstone, most of which is sheared parallel to a plane striking east 15 degrees south and dipping 55 degrees north. Some of the andesite shows poorly developed pillows. The rock is considerably altered to carbonate and in the vicinity of quartz veins, carries large cubes of pyrite. About 800 feet north of the workings near the cabin is an outcrop of a quartz porphyry strongly sheared and similar to many seen along the railway in the vicinity. The rock is probably of volcanic origin, though its relations have not been clearly determined.

Three veins were exposed in the workings. At the north end of the property is a flat-lying vein 4 inches thick, with a slight dip towards the west. Thirty feet south is a 3-inch vein striking east and west and containing free gold; farther south again is a third vein 10 inches thick. The vein material consists of quartz, glassy white to colourless, containing pyrite, chalcopyrite, tourmaline,

* F. W. James and J. B. Mawdsley, Geological Survey, Summary Report 1926, p. 66c.

carbonate, and inclusions of chloritized country rock. It is reported that samples showed some values."

The Venus Gold Mines, Limited.—A group of claims covering lots 11 to 16, range II; 14 to 19, range III; and 13, 14, range IV, of Barraute have been transferred to The Venus Gold Mines, Limited, a company incorporated in 1927 with a capital of $5,000,000 in one dollar shares.

This company was organized to develop the Ephraim Foisie discovery on lot 13, range II, which has been described in the annual report of the mining operations for the year 1925.*

During 1927, the company put up a set of buildings on lot 14, range II. The camp is a short distance south of the C. N. R. at a point about four miles east of Fisher station. A 22-foot dirt road has been opened for a length of three miles to give access to the property from the public highway. Considerable stripping and rock trenching was done A number of test pits have also been excavated. This work has exposed a number of quartz veins. These are now being examined in depth by diamond drilling. Before the end of January, 1928, four holes had been put down at angles of 45° and 30° alternately dipping to the south and the north. Each of these holes is nearly 500 feet long.

The property was examined in 1926 by W. F. James and J. B. Mawdsley who reported on it as follows: **

"The initial work on the property was begun early in the season of 1925."

"The principal rock area lies about 1,000 feet south of the line between ranges II and III. The largest natural outcropping is on the northern edge of a ridge that is but thinly drift covered and on which a few natural outcrops and considerable stripping have exposed a large section of rock. The rocks are chiefly volcanics of medium to basic composition, in which some pillowing is developed. Shearing in a direction east 20 degrees south and dipping 60 degrees north has been impressed on the rocks that are locally carbonated. Some acid porphyritic rocks of doubtful origin occur

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* Report on Mining Operations in the Province of Quebec during the year 1925. Page 149.

** W. F. James and J. B. Mawdsley. Fiedmont and Dubuissson Map-Areas, Geological Survey, Summary Report 1926, page 64c.

within the greenstones, and are sheared to the same extent as the greenstones.

"In all, seven veins were examined in the surface workings. The largest vein lies in the northern edge of the outcrop. It occurs in the form of a saddle with a strike of about east 20 degrees south, and pitches at about 15 degrees towards the east. The surface of the outcrop coincides practically with the top of the saddle which has locally been truncated to show the north and south limbs with dip 45 degrees north and 45 degrees south respectively. The thickness of the limbs is about 18 inches, but the crest in one place measures 4 feet. The vein has been exposed over a length of 60 feet to where, in the east, it pitches beneath the rock. The limbs diverge towards the west and their length has not been traced. The vein is composed of glassy white quartz containing tourmaline, ferruginous carbonate, pyrite and chalcopyrite. The pyrite occurs in cubes up to one inch in size. Free gold occurs in association with the tourmaline and carbonate. The gold is very pale in colour. The country rock in the vicinity of the vein is highly carbonated and is mineralized to a considerable distance with coarse cubes of pyrite. Small quartz veinlets cut the country rock and adjacent to them have selvages of almost pure carbonate. Assay values of vein or wall-rock have not been reported. The vein has been trenched to a depth of 6 or 8 feet. South of the main vein a trench has been dug southward for about 500 feet. At 250 and 400 feet south of the main vein are two quartz veins striking with the shearing and dipping 45 degrees south, with widths of 3 to 6 inches respectively. Nearly 600 feet south of the main vein two, apparently intersecting veins occur. These have opposite dips and may be the limbs of a saddle vein similar to the main vein. The width of the veins is between 16 and 24 inches. Thirty feet farther south is another vein exposed for 60 feet. It is 14 inches thick at the western end, increasing to 3 feet in the central part, and pinching out toward the east. It strikes east 30 degrees south and dips 65 degrees south. Three hundred and fifty feet south of the last-mentioned vein are two veins striking south 20 degrees east and dipping steeply to the south. Each has a maximum width of 8 to 10 inches and the more northerly vein is exposed over a length of 30 feet. The composition of these smaller veins is in general similar to that of the main vein to the north, except that in them

the proportion of ferruginous carbonate is higher. Tourmaline forms heavy masses in the vein. The mineralization of the wall-rock is similar to that observed elsewhere and there seems no doubt that the alteration of the rock is due to the action of the vein solutions.

"Though considerable free gold occurs in the veins, no systematic assays have been reported. Mineralization within and near the main vein is heavy and merits investigation as a possible orebody of economic proportions. It is significant that the veins on this property dip across the schistosity as on other properties nearby. The presence of the saddle vein suggests that other similar veins may be encountered at depth. The saddles are due to the influence of the shearing in providing for the vein solutions channels, other than the south-dipping fissures in which the veins usually lie. A series of steep, diamond-drill holes should yield considerable information concerning the nature of the mineralization of the veins at depth and would probably also indicate the presence of other veins which do not outcrop on the surface.

TAVERNIER TOWNSHIP

Peacock Group.—In the south-east corner of Tavernier township is a group of claims generally known as Wm. Peacock's group. The property is best reached by canoe from mileage 12 on the C. N. Ry., east of the flag station of Signai. The canoe trip down the Megiscan river, up the Assup river and up the Peacock creek is without notable obstacles. From a camp on Peacock creek a trail, three-quarters of a mile long, leads to the discovery on claim A-11783 The trail crosses the workings.

The country is very flat, swampy and rock outcrops are low. This makes prospecting a difficult task. The country rocks are generally Keewatin greenstones. Finely laminated tuffs, chlorite schist showing pillow structures, and rusty carbonated schist, cut by diorite intrusions, outcrop on this group of claims. On claims A-11782 and 11783 the carbonated schist shows irregular lenses of white quartz with black tourmaline and fine pyrite crystals disseminated throughout the wall-rock. Trenching shows the rusty carbonate to be about 200 feet wide. The best mineralized band has a width of 20 feet in which crystals of pyrite are fairly heavily

disseminated. It is accompanied by a green mica, possibly fuchsite, quartz and tourmaline. Gold and silver values have been obtained.

LAVERLOCHERE TOWNSHIP

A mild rush to stake mining claims took place last fall on a report of rich gold ore having been found on lots 18 and 19, range IV, of Laverlochère township, twelve miles east of Ville-Marie, in Temiscamingue county. A considerable number of claims have been staked throughout this township and the adjoining sections of Baby and Gaboury.

Lots 18 and 19, range IV, have been under mining license for the past few years. On these as well as on adjoining lots narrow vitreous quartz veins have been uncovered. These are slightly mineralized at times, as well as the dark coloured rock which forms the walls of the veins. Near the line, between 18 and 19, at mid-length of the lots, there is a vein of quartz mineralized with chalcopyrite, galena, sphalerite and pyrite. In 1922 a pit ten feet-square and ten to twelve feet deep had been put down. The mineralized zone is the full width of the pit at the bottom. Since more surface work along the vein has been done. The vein is said to have been traced for 500 feet.

In 1927, *The Bellehumeur Mining Company, Limited* was organized and bought the mining rights on these two lots. The capital of the company is $4,000,000 in one dollar shares. Camps were built last fall and work done on the original discovery.

GASPÉ PENINSULA; ITS GEOLOGY AND MINERAL POSSIBILITIES

By Frederick J. Alcock *

The first mining venture in the history of Canada was undertaken in Gaspé peninsula. In the year 1665 the Intendant Talon stopped at Little Gaspé and visited the occurrence of galena which had long been known by Micmac Indians to be there. He later brought out a company of miners from France, headed by a Dutch engineer and sent them to develop what he hoped would be silver mines. The expedition proved a failure as have other attempts to mine these small deposits on the coast. The fact that mineral veins were known to occur, however, suggested the possibility that somewhere in the peninsula larger deposits might be found which would be of commercial importance. It was not until 1910 that promising indications of lead were found in the interior on the headwaters of the Cascapedia river. This region has since attracted a great deal of attention. Many claims have been taken up and a large amount of exploration and development work carried out. The geology of the region has been studied by both the Provincial and the Dominion Department of Mines and surveys of the most promising field have been made. Much still remains to be done, however, before our knowledge of the whole of the peninsula can be considered even approximately complete. The present paper is intended to summarize what is known of the mineral possibilities of the region.

GEOGRAPHIC SUMMARY

Gaspé Peninsula is that part of the Province of Quebec which lies south of the St. Lawrence river, north of Chaleur Bay and Restigouche river, and east of Matapedia river and Lake Matapedia. It has a length in an east and west direction of about 150 miles and a greatest width of 85 miles. A railway, the Canada

* Geologist, Geological Survey of Canada, Department of Mines, Ottawa. This report is published by kind permission of the Director of the Geological Survey.

The Cascapedia river at Joe Martin's Camp *Photo. Geol. Surv. Can.*

Mount Nicolalbert, Cap-Chat river, Gaspé. *Photo. Geol. Surv. Can.*

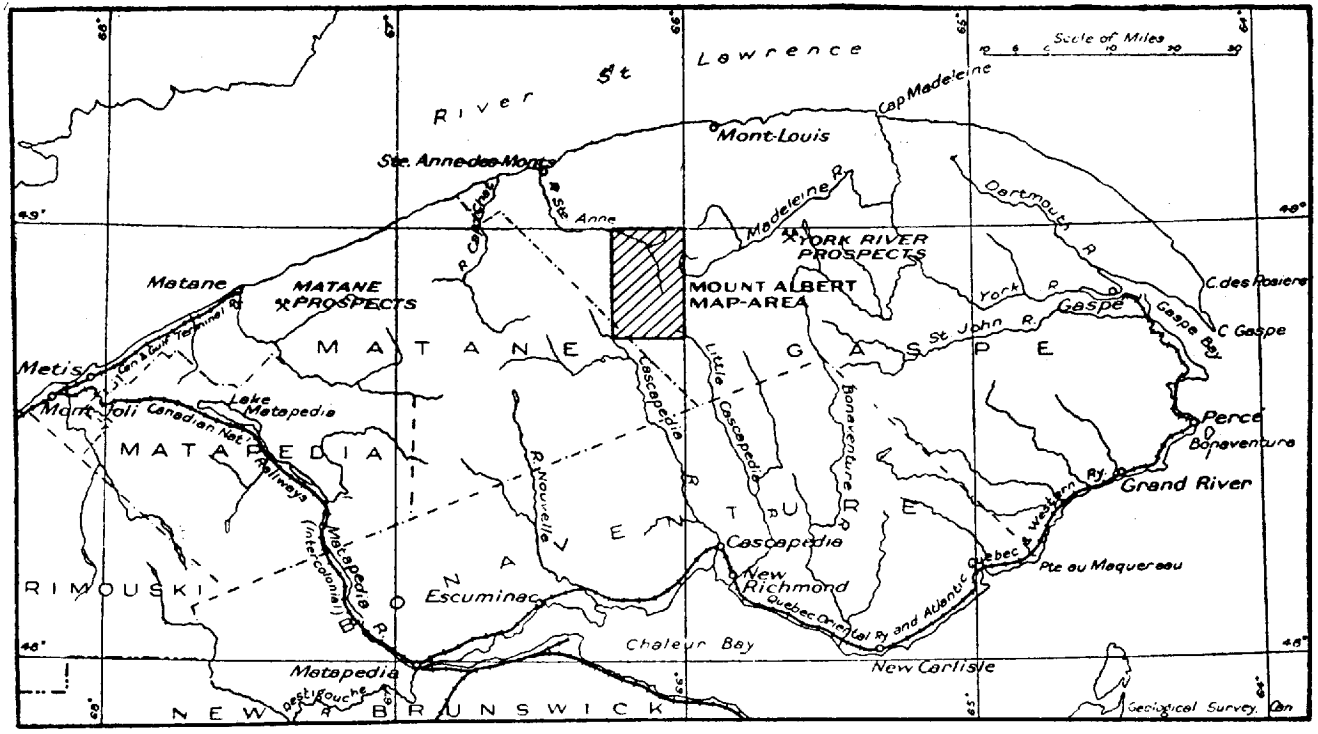
and Gulf Terminal, extends along the north shore of the peninsula as far as Matane while on the Chaleur Bay side, the Quebec Oriental runs from Matapedia on the Canadian National to New Carlisle and the Atlantic, Quebec and Western from New Carlisle to Gaspé Basin. The Provincial Government is extending the motor road on the St. Lawrence side to Gaspé Basin so that in a short time motorists will be able to make a complete tour around the peninsula. The beautiful coastal scenery and the touches of local colour will make this a most attractive journey.

The population of Gaspé is confined to a mere strip along the coast. Settlements in places go for a few miles up the main valleys but the interior is uninhabited. The industries are agriculture, fishing and lumbering. Fly-fishing, hunting, and the attractions of the coastal scenery bring in a considerable number of visitors. Metis on the north shore and Percé and Gaspé Basin at the eastern end of the peninsula are noted summer resorts.

TOPOGRAPHY

The interior of Gaspé is a plateau varying in height up to 4,200 feet. Standing anywhere on a summit where a distant view can be obtained an even skyline meets the eye in every direction, with only an occasional elevation rising slightly above the general level. The highest part of the peninsula is a belt of country known as the Shickshock mountains. This lies north of the medial line of the peninsula and runs in a northeast direction parallel to the coast. The highest elevations are on Tabletop mountain which consists of a mass of granite extending in a north and south direction for a distance of about fifteen miles. To the east of it the country is about 1,000 feet lower. Both north and south of the Shickshocks is a lower plateau country, characterized by broad flat interfluvial areas separated by deep, steep-sided valleys. On the flats divided are occasional ponds and swamps.

The streams of Gaspé are swift and in places their headwaters are torrential. They are entrenched below the plateau surface in valleys from 500 to 2,000 feet deep. The valley bottoms are narrow with flood-plains well developed only in their lower reaches. The valley slopes are steep. Hard rocks such as volcanics give in places almost vertical cliffs; in other places talus slopes lie at



Outline of Gaspé peninsula, The zinc-lead deposits are in the south-west corner of the Mount Albert map-area.

the angle of repose of the loose material. The region is forested so that it is only on the high bare summits that distant views can be obtained. The coastal portions of Gaspé present a considerable variation of form and scenery. The St. Lawrence side is a smooth coast with no natural harbours. East of Ste. Anne des Monts the high plateau country comes down to the coast forming cliffs and making road construction difficult. The Chaleur Bay side shows a much greater variety of scenery with bays, cliffs, sand beaches, bars, points, rolling farming country and hills in pleasing combinations.

GENERAL GEOLOGY

The rocks of Gaspé consist of sediments, volcanics and intrusives of Palaeozoic age. The sedimentary succession ranges from Cambrian to Carboniferous.

The oldest rocks consist of a series of shales, slates, sandstones, limestones and limestone-conglomerates forming a broad band along the northern part of the peninsula. These are correlated with the Sillery and Levis formations at Quebec city. Of these, the latter is the younger and contains fossils of Lower Ordovician age. The Sillery contains layers of limestone-conglomerates in some of the pebbles of which are fossils almost exclusively Lower Cambrian in age. The series itself is probably late Cambrian. Associated with the sediments near Matane are some basic volcanics.

South of this band of sediments is a broad zone 4 to 10 miles in width which corresponds closely with the belt of high country known as the Shickshocks. This belt consists largely of altered volcanic rocks younger than the shales, etc. They include altered greenstone rocks, chlorite schist, and banded tuffaceous varieties. A very common secondary mineral in these rocks is epidote. Associated with them are altered sediments, consisting of quartzite, mica-schists and garnetiferous gneisses. These rocks were deformed by movements in Ordovician times, probably post-Canadic and pre-Trenton and intruded by masses of peridotite.

The largest mass of peridotite is that forming Mount Albert. It covers an area about 6 miles long and about 4 miles wide at its widest point. Along the border of the mass is a zone of amphibo-

lite, in places carrying red garnets. The amphibolite is considered to be genetically related to the peridotite and is probably an early differentiated phase.

The southern three-quarters of Gaspé is underlain largely by rocks of Silurian and Devonian age. The oldest of these is a series called by Logan the Gaspé limestones. The lower beds of these are of Silurian age. Silurian fossils have been collected in the interior of Gaspé and at several places along the Chaleur Bay coast Silurian sections are known to occur. The greater part of the Gaspé limestones, however, are of lower Devonian age. The best section rocks is exposed at Cape Gaspé at the eastern extremity of the peninsula.

The early Devonian was a period of volcanic activity as well as one of sedimentation. With the upper beds of limestone are associated a certain amount of tuffaceous material and overlying them is a thick series of volcanic flows which in places cover considerable areas.

Overlying the Gaspé limestones and the volcanics is a thick series of clastic sediments known as the Gaspé sandstones. This series covers wide areas in the interior of Gaspé and has been estimated to have a thickness of at least 5000 feet. It has a grey to buff colour and in places contain conglomeratic and shaly beds. Towards its base it contains horizons in which marine fossils of Middle Devonian age are numerous. The upper portions locally carry plant remains and are most probably of continental origin, deposited as a large delta, the material of which was derived from an ancient land mass to the east.

Sediments of Upper Devonian age outcrop along Chaleur Bay. They consist of sandstones, shales and conglomerates. One horizon is famous for the fossil fish which have been collected from it.

In late Devonian times, mountain building movements took place. The rocks were thrown into folds and were intruded by deep-seated igneous rocks. These intrusives are exposed in the middle of the peninsula particularly on Tabletop mountains where erosion has partially uncovered them.

The youngest bedrock series in the peninsula is the Bonaventure conglomerate which outcrops along the shore of Chaleur Bay. It is a coarse conglomerate of deep red colour forming a very conspicuous feature of the coast. It lies for the most part hori-

zontally but in a few places it has been broken and tilted by faulting. Its age has generally been considered to be Carboniferous.

From the Palaeozoic on there are no bedrock formations represented from which we may deduce the geolocial history of the peninsula, so that it is to be inferred that for most of the time at least the region was above the sea undergoing erosion. Some idea of what took place during this long period can be obtained from physiographic data.

The flat-topped character of the interior of Gaspé including even the belt known as the Shickshock mountains is evidence that the plateau summit is an old erosion surface produced by peneplanation. Folded rocks of varying degrees of hardness are bevelled off by this plane. Just how many cycles of erosion the region underwent, is impossible to say. The existence of a higher plateau on the harder rocks of the Shickshocks and a lower plateau developed on softer shales and limestones, etc. to the north and to the south suggests there were at least two. After the first reduction to base level uplift took place and a second peneplain was developed on the softer rocks. Still later, probably in late Tertiary times, uplift once again took place, inaugurating the present cycle of erosion. The Shickshock mountains date from this period of uplift; they are really mountains of denudation formed by the dissection of an uplifted surface. That the region in the Pliocene stood even higher than it does at present is shown by the fact that the valley of the St. Lawrence extends below sea-level. Depression took place in the Glacial period. The peninsula was apparently however, not overridden by the Labrador ice-sheet. The higher summits do not show signs of glaciation, and there is an absence of erratics composed of Precambrian gneiss from the north shore of the St. Lawrence except for a zone a few miles wide facing the St. Lawrence. Local glaciers were present, however, in the high country of the interior and spread out in all directions. Since the disappearance of the Pleistocene glaciers, there has again been uplift as is shown by the presence of terraces along the coast and lower valleys. These show that since glacial times there has been an uplift of at least 434 feet.

STRUCTURE

Gaspé peninsula is a region of Appalachian structure, the rocks being thrown into folds and broken by both normal and thrust faults. The structural trend is broadly east and west in a broad curve which roughly parallels the north shore of the peninsula.

There were at least two periods of folding, one in the Ordovician and one in the late Devonian, in addition to which there were vertical movements probably accompanied by faulting. During the Ordovician disturbance the pre-Trenton rocks were locally metamorphosed and in places intrusions of peridotite took place.

The main structural features of the peninsula today are, however, a result of the period of folding which took place in the late Devonian. The axes of the folds run in a general easterly direction forming a broad curve roughly parallel to the St. Lawrence coast-line. The thrust which produced the folding was apparently from the south against the old Precambrian land mass to the north. The folding was accompanied by faulting on a large scale.

The Devonian period of folding was accompanied by the intrusion of a granite batholith, a very important event from an economic point of view since the chief mineral deposits of the region owe their origin to it. As has already been mentioned erosion has proceeded deep enough to expose only the upper part of the intrusion. The largest area of granite exposed is on Tabletop mountain where it outcrops in a north and south direction for a distance of 15 miles across the strike of the folded sediments and volcanics. From the southern part of Tabletop a zone of granite extends westerly parallel to the structural lines. Hogback mountain west of Ste. Anne River and Barren and Barnshaped mountains are the more important exposures of this east and west trending belt. Twenty miles to the east of Tabletop porphyry intrusions at the headwaters of York river are evidence that the batholith underlies also that part of the peninsula. Apparently only the upper part of the batholith has been unroofed; had the region been planed down to still greater depths there would undoubtedly be exposed down the middle of the peninsula a band of granite parallel to the structural lines. The north and south extension of Tabletop is evidently only a branch intrusion which rose to greater heights than the main mass along a plane of weakness.

ECONOMIC GEOLOGY

The mineral occurrences of Gaspé which have attracted attention as being of possible economic importance are (1) The zinc-lead deposits of Lemieux township. (2) Copper occurrences at the headwaters of York river. (3) Copper occurrences near Matane. (4) Asbestos at Mount Serpentine. (5) Silver-lead-zinc at Cross Point. (6) Petroleum. Other mineral occurrences of minor importance or which have not received enough attention to prove or disprove their value are also known.

ZINC-LEAD DEPOSITS OF LEMIEUX TOWNSHIP

The zinc-lead deposits of Lemieux township, Gaspé county have received a great deal of attention during recent years. The region lies on the headwaters of Brandy brook and the north branch of Berry Mountain brook, two headwater tributaries of Cascapedia river. It is reached by a road 46 miles long ascending the east side of the Cascapedia to Berry mountain, and above this point, the west bank of Berry Mountain brook.

The deposits are in the form of veins and mineralized breccia zones in sediments of Lower Devonian age. These sediments are cut by the granite batholith of late Devonian age to which reference has already been made. Dykes and masses of syenite and porphyry which are believed to be early differentiates of the granite also intrude the sediments. The veins are younger than the syenite and porphyry intrusions. They are believed to have been deposited by solutions given off from the granite mass during the later stages of its cooling. Some of the larger veins lie along contacts of the syenite and intruded sediments.

The gangue material in the veins is quartz and carbonate and the ore minerals are sphalerite and galena. A small amount of pyrite, marcasite and chalcopyrite also occur and locally a little barite. The quartz is of two varieties, white and amethystine. The sulphides are mostly associated with the white. Bands of the amethystine variety showing comb structure are common but only rarely do these contain sulphides. The carbonate consists of dolomite and yellowish ankerite. The sphalerite is of a light honey-yellow colour and is practically free from iron. The galena is usually

associated with sphalerite but in places it forms large solid masses in the veins. Precious values are low so that the deposits will have to be mined for their zinc and lead content alone.

A number of companies hold claims in the region. Messrs. Lyall and Beidelman, president and vice-president of the Federal Zinc and Lead Company have the largest holdings. Besides the claims belonging to that company they control a number of others known as the Lyall and Beidelman. The new Richmond Mining Company owns two blocks which are under lease to the Federal Zinc and Lead Company. The North American Mining Company also own a number of blocks. Besides these groups of crown-granted claims, a number of other holdings which have not yet been patented have been taken up by various companies. These include groups held by Lyall and Beidelman; Pioneer Mining Corporation of Canada, Harvie, Ltd., Mining Corporation of Canada; M. J. O'Brien, Ltd.; Gaspé Mines, Ltd.; Cascapedia Mines, Ltd.; and others.

THE FEDERAL ZINC AND LEAD COMPANY

The Federal Zinc and Lead Company own the crown-granted blocks, C, F, G, H, J, K, M, N. Their main camp is on Block H on what is known as the Federal Hill. Most of the underground development carried out by the company has been done on this block.

The vein on which most work has been done is the No. 1 or Federal. This has a known length of about 600 feet and an average width of 8 feet. In places it is considerably wider and in addition is bordered locally by mineralized breccia. Several other veins intersect it. The strike of the vein is northerly cutting across the bedding planes of the argillaceous sediments. The dip is nearly vertical. The west wall of the vein in the south drift on the 100-foot level follows a post-mineralization fault plane which is marked by a zone of crushed shale varying up to 6 inches in width. In the north drift, 180 feet north of the shaft, the vein is cut off by a fault plane dipping at an angle of 50 degrees to the east. North of this fault the drift follows another vein, known as the Porphyry, for a distance of 200 feet. This shows a width of from 1½ to 6 feet, bordered in places by breccia.

Photo. Geol. Surv. Can.

The Federal hill, from across Berry Mountain brook.

Photo. Geol. Surv. Can.

Village of Mont Louis, on north shore of Gaspé peninsula.

Shaft No. 1 was sunk on the Federal vein to a depth of 253 feet. The amount of horizontal working carried out is as follows:

Drifting	*Feet*
North drift (100-ft. level)	657.3
Drift from No. 1 west crosscut north (100-ft. level)	34.2
South drift (No. 1 level)	360.8
Drift around Federal shaft (100 ft. level)	73.8
	1,126.1
Crosscutting	
No. 1 west crosscut north (100-ft level)	180.4
No. 2 " " " " "	164.0
No. 1 east " " " "	30.9
No. 1 west " south " "	48.0
Adit 100-ft. level	126.8
Adit 250-ft. level	104.0
West crosscut 250-foot level	165.0
East crosscut 250-foot level	61 C
	880.1

The underground workings were sampled by W. H. Weed. His assays show that the lead content of the veins and brecciated zones varies from nothing up to 14 per cent and the zinc up to 15 per cent. "A composite sample representing equal parts of material from twelve cuts across the Federal vein from the extreme south end to the northern most point exposed shows 3.8 per cent lead and 7.9 per cent zinc with 9.46 per cent lime and 43.85 per cent silica. This composite sample is considered as representative since it checked up closely with the calculated average of the individual assays and it may be accepted as an average for the entire vein as exposed underground."

Numerous other veins are exposed on the Federal claims. The McKinley or No. 16 forms a large outcrop on the Federal hill 900 feet south of No. 1 shaft. It shows a width of 60 feet which includes, however, a horse of country rock. Its length has not been determined. It carries sphalerite and galena and is bordered by a brecciated zone.

On Block J two veins have been located, but as yet insufficient work has been done on them to prove their value. One strikes north 28 degrees east magnetic and has been traced for 500 feet. The other, which lies to the east, strikes north 15 degrees east magnetic and shows vein material over widths up to 40 feet. To the south it crosses to Block N and to the northeast to Block T of the North American Mining Company.

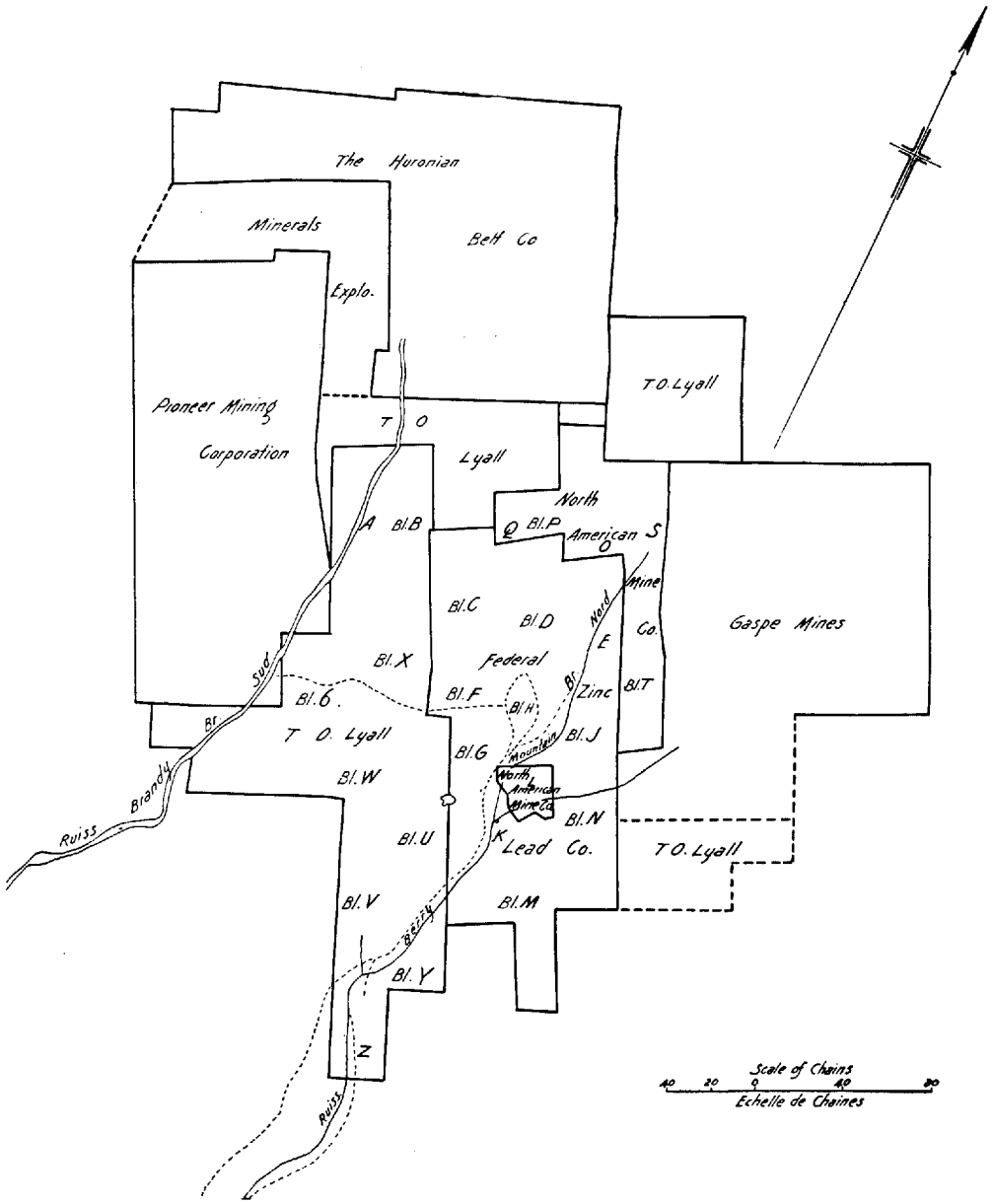
LYALL AND BEIDELMAN

Lyall and Beidelman hold the patented blocks A, B, W and X and a large number of other claims. Discoveries within recent years in the Brandy Brook region have drawn a great deal of attention to the possibilities of these claims.

A strong mineralized zone strikes in a northeast direction across Block 6, the northwest corner of Block W and Blocks A and B. Numerous occurrences of quartz have been uncovered and several strong veins traced.

What is known as the Big Vein strikes in a northeast direction across the extreme northwest corner of Block W, and the eastern part of Block 6. It follows closely the northern border of a syenite intrusion. The vein has been traced for a distance of about 1000 feet. It shows widths up to 30 feet with good sphalerite and galena mineralization. Three diamond-drill holes were put down to cut this vein. One intersected 12 feet of quartz with good zinc and lead values, a second 13 feet of solid vein material and the third 2 quartz veins 6 feet and 7 feet wide respectively separated by 5 feet of argillites. The holes show that the vein dips from 64 to 77 degrees to the southeast.

In Block A several important veins have been traced. One lying south of the trail leading to the Pioneer camp has been traced for over 400 feet. It shows good mineralization with widths up to and over 20 feet. North of this trail in the same block another vein was discovered in 1927, along the border of a syenite dyke. This vein strikes northeast and has been traced by trenches for a distance of 1000 feet. Vein widths of over 12 feet occur in some of the trenches and at the place of discovery a considerably greater width was uncovered. Owing to its position at this point on a steep slope the real thickness is difficult to determine without more work. Large masses of solid galena occur in the vein at this point.



Sketch plan of principal holdings in Lemieux township, Gaspé county.

Numerous other veins have been uncovered in the Brandy Brook region on the holdings of Lyall and Beidelman. More work is needed, however, to prove their lengths, widths and values.

NEW RICHMOND MINING COMPANY

The New Richmond Mining Company owns Blocks D and E. These are under lease to the Federal Zinc and Lead Company.

On Block E a shaft known as No. 3 was sunk to a depth of 69 feet on what is known as the Bois or No. 14 vein. The vein shows a maximum width of 18 feet. It strikes in a north-east direction and lines up with a vein on Block D. Altogether this vein zone has been traced by trenches for a distance of over 2000 feet. Northeast of No. 3 shaft the vein follows for a short distance the border of a syenite dyke.

During the summer of 1927 two new veins on Block E were traced by trenches. They lie about 500 feet north of the shaft No. 3. They strike in a northeast direction, are about 200 feet apart, and show good sphalerite and galena mineralization over widths up to at least 15 feet. Other quartz showings are known on these claims.

NORTH AMERICAN MINING COMPANY

The North American Mining Company owns seven Crown-granted blocks in the Berry Mountain Brook region. Earlier work by the company was carried out chiefly on Block L. A shaft was sunk on a vein to a depth of 30 feet. The usual type of mineralization was encountered. Recently new vein showings have been opened up near the eastern border of Block L.

In the summer of 1927 prospecting carried out on Block T opened up new veins. In one trench two veins, 5 and 10 feet wide, respectively, separated by 30 feet of shales were exposed. It is probable that these are the continuation of two veins which cross the southeast corner of Block J in a northeast direction. Six hundred feet to the northeast of those exposures a vein was located, following the northeast border of a syenite dyke. Good galena mineralization was exposed. Another mineralized zone known as Vein No. 45 was also opened up on Block T. Definite information

about the size and character of this vein, however, was not obtained at the time of the writer's visit.

PIONEER MINING CORPORATION OF CANADA

The Pioneer Mining Corporation of Canada holds two large blocks of claims and their associated company, the Huronian Belt, one block. These lie to the west and north of the Federal and Lyall and Beidelman holdings in the region of North Brandy brook. An active prospecting campaign was carried out by them during 1926 and 1927.

Numerous mineralized showings were located. What was considered the most promising is what is called the Big Vein. This is a zone striking in a northwest direction across claims Nos. 374 and 1686. A series of trenches spaced at an average distance apart of 120 feet traced this zone for a distance of 2300 feet. The trenches are on the flat plateau surface between the valleys of Brandy and North Brandy brooks. The overburden here is very heavy so that the trenches do not expose fresh vein material. The mineralized zone was followed by the red iron-stained character of the overburden, by the presence of loose crumbly quartz, rounded masses of galena, and chambered quartz with chalcopyrite and malachite. Two shafts were put down on the zone to depths of 73 and 39 feet, respectively, but definite information about the actual widths and values of the vein zone were not obtained.

Aside from this vein zone a large number of mineralized showings were found on the Pioneer property. No strong veins were, however, proved up. An exploratory tunnel was driven into the side of the hill above the main camp in North Brandy valley for a distance of 530 feet. This intersected several small veins and a mineralized shatter zone, but did not open up any strong ore-body. The tunnel would have to be continued for a further distance of about one thousand feet in order to work the Big Vein which it would then tap at an elevation of 400 feet below the plateau where the trenching was done.

GASPE MINES, LTD.

Prospecting was carried out on the Gaspé group during the summer of 1927. Most of the work was concentrated on claim

No. 647. A number of veins were uncovered and traced. At the time of the writer's visit two had been followed over distances of 600 and 700 feet respectively. These show veins and mineralized breccia with widths up to 25 feet. The mineralization is the usual yellow sphalerite with galena in a matrix of quartz and carbonate.

OTHER GROUPS

Prospecting by the Phelps-Dodge, Mining Corporation of Canada; Harvie, Ltd.; M. J. O'Brien, Ltd.; Minerals Exploration and other companies on their respective holdings in 1927 did not lead to the discovery of anything of promise.

SUMMARY

Though numerous veins have been located in the region much remains to be done to prove whether the deposits are of sufficient size and value to enable them to be mined profitably. Since the precious metal values are so low the veins will have to be mined for their lead and zinc content alone. This means that large tonnages must be in sight before mining operations are justified. Whether some of the larger veins will furnish the necessary tonnage remains to be proved. Several are sufficiently large to warrant development work. The strong mineralized zone on the holdings of Lyall and Beidelman in the Brandy region is particularly promising.

YORK RIVER COPPER PROSPECTS

In the year 1909 a copper-bearing float was found on York River by A. E. Miller of Gaspé and a few years later Rupert Miller found other pieces near the outlet of York lake some five miles farther upstream. In the summer of 1921 a prospecting party consisting of Messrs. A. E. Miller, F. Miller and Angus Miller found sulphides in places on what is now called Copper Mountain. In August, 1922, Mr. T. C. Denis, Superintendent of Mines for the Province of Quebec, visited the claims and in the following year the writer spent five days in the district.

The region is rather difficult of access owing to the absence of roads in the interior of Gaspé. It may be reached from Mont

Photo. Geol. Surv. Can.

Mount Lyall from the Federal Hill

Photo Geol. Surv Can.

The Federal Mine Camp

Louis on the north shore of Gaspé. A waggon road can be followed for a distance of 6½ miles up the Mont Louis valley and from there a pack-trail about 13 miles long crossing the Madeleine river leads to Copper Mountain. Another route is by ascending the York river to Lac des Monts from which a pack-trail 7 miles in length leads to the Miller camp. Canoes, however, can be used on the upper part of the York only during the period of high water in the spring.

The rocks of the region consist of altered limestones, argillites, tuffaceous volcanics and intrusive porphyry. The limestones on Copper Mountain have been altered to a considerable extent to secondary silicates, consisting of massive garnet rock, and wollastonite and diopside. The intrusive porphyry is grey to pink in colour, and consists of a dense matrix in which occur rounded phenocrysts of quartz, small feldspar, and minute black mica crystals.

The mineralization consists of chalcopyrite and some pyrite in porphyry and the intruded rocks. The chalcopyrite occurs both in disseminations and masses through the rocks and as small veinlets. Where present in seams it is commonly associated with quartz. In one place some molybdenite was found with chalcopyrite and pyrite in a seam in quartz porphyry.

The deposits are believed to have been of contact origin due to the intrusion of the igneous mass of which the porphyry intrusions are the upper differentiated portions. Though no large body of ore was exposed at the time of the writer's visit the presence of copper mineralization suggests that this region is worth detailed prospecting.

COPPER OCCURRENCES NEAR MATANE

Native copper occurs in small quantities in amygdaloidal volcanic rock on the Dubé claim on Gagnon Brook, lots 2 and 3, range V, St. Denis township, Matane county, about eight miles east of the town of Matane. Two shafts were sunk to depths of 30 and 50 feet respectively, but only a small amount of copper was located. In the Matane river district large boulders of dark rock carrying numerous particles of native copper, in some cases pieces of 1 pound to 1½ pounds, have been found. It is possible that somewhere in

the region there may yet be discovered larger and richer occurrences than those known on Gagnon Brook.

On Gagnon Brook mining operations were carried out also on the Saucier claim. The rocks here are limestone, shale and a black basic volcanic. The mineralization consists of calcite veins carrying chalcopyrite and bornite. Three shafts were sunk and from one drifts and crosscuts were run. Diamond drilling operations were also carried out in an endeavour to trace the mineralized zone. No quantities of ore sufficient to justify mining operations, however, were discovered.

ASBESTOS

Serpentine occurs in Gaspé Peninsula at Mount Albert near the headwaters of Ste. Anne river and at Mount Serpentine near the Dartmouth river. It might be expected that asbestos and chromite should be associated with the serpentine in these areas. Disseminated chromite occurs locally in the rock at Mount Albert, but nowhere has it been found to be in sufficient quantities to be of commercial interest. Asbestos occur in places at Mount Serpentine and a small amount of development work in the form of pits has been done to investigate it. In one pit veins with fibre up to seven-eighths of an inch in length were uncovered. The amount of rock with this grade is, however, small and since the area of the serpentine belt here is only two miles long and less than half a mile wide there seems little likelihood of workable deposits being discovered.

SILVER-LEAD-ZINC AT CROSS POINT

During the past year a group of claims was taken up by Messrs. Lyall and Beidelman near Cross Point on Chaleur Bay. The rocks of the region are volcanics, in places porphyritic, and Gaspé sandstone. The mineralization is along a series of cross fractures in the volcanic and had originated partly at least by replacement. In places specks of galena occur in the solid rock near the fractures and at one place a matrix of galena was found surrounding phenocrysts of feldspar which had remained unreplaced. The galena is silver-bearing and with it is associated sphalerite. At the time

of the writer's visit only a small amount of work had been done in exposing the occurrence, but it appeared to be sufficiently promising to warrant development.

PETROLEUM

Drilling for oil on York river at the east end of Gaspé peninsula was carried on over a period of 40 years. The results of these operations were described by R. W. Ells in the Annual Report of the Geological Survey for the year 1902. It is frequently asked whether, in spite of Ell's adverse report, there may not be a possibility of developing a petroleum field in Gaspé.

There are undoubtedly oil-bearing strata in the peninsula. Oil seepages occur in the Gaspé Basin region and at other localities as far west as the Lake Matapedia region. Of the 52 wells drilled in the York River district a large number produced oil. One known as No. 27 produced several hundred barrels. The oil obtained from the wells was of two varieties, a light amber oil and a dark green heavier type.

Even where oil is known to occur, however, certain conditions must be fulfilled in order to make an oil field. There must be favourable structure to allow the oil to accumulate in pools; there must be strata of porous rock to serve as a reservoir; and there must be an impervious layer or rock over the reservoir to serve as a capping to retain the oil.

What is usually considered to be the most favourable structure is the broad dome or anticline with gentle dips. In saturated rocks the gas and oil being lighter than water rise and accumulate in the upper part of the traps.

The rocks of Gaspé are thrown into anticlines and synclines, but two features in connection with their structure have usually been considered unfavourable for the accumulation of large pools of oil. The first is the comparatively steep dips of the folded rocks. In places the dips are as high as 65 and 70 degrees. In the deep holes sunk at or near the axis of several of the anticlines no oil or only small amounts were encountered while some which were put down near the centre of the synclines were recorded as more productive. The second feature is the presence of numerous faults. A considerable number of faults were worked out and Ells was of

the opinion that there are many more in the region than have been definitely proved. It was observed that many of the oil springs of the district occur along lines of fracture and it is possible that these faults may have allowed the escape of most of the oil.

Whether or not more favourable structure may not be found in the interior of Gaspé is a question to which a definite answer cannot be given at present. Very little geological work has been done in the interior of the peninsula. It is known, however, that in certain areas the dips of the Gaspé sandstones are low and it is possible that somewhere a structure favourable for the accumulation of oil may be present. Even the existence of faults is not necessarily an unfavourable condition. In certain oil fields, faults, through the sealing of porous beds, have produced the traps in which the oil accumulated. Numerous examples could be cited.

With regard to a reservoir, the Gaspé sandstones might be expected to serve for this purpose. They are underlain by a thick series of marine strata which might be an abundant source of oil.

The question of a capping rock is one about which less definite information can be given. The Gaspé sandstone is a thick series deposited largely under continental conditions. It contains numerous shale beds which if widespread might be counted on to serve as a capping rock. There is no evidence, however, that shale horizons are of sufficient lateral extent to be useful for this purpose. The careful mapping of the whole peninsula might suggest possible territory where recommendations for drilling might be made but at present sufficient information for this is not available.

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THE CHIBOUGAMAU DISTRICT, QUEBEC

By J. B. Mawdsley *

The Chibougamau district is again attracting interest and parties have proceeded to the area during the past winter and spring and indications point to prospecting activity within the region during the summer of 1928.

The term Chibougamau district is applied loosely to an ill-defined area of about 1,000 square miles lying mostly to the north and west of Chibougamau lake which lies in the province of Quebec approximately half-way along a line joining lake St. John and James bay, 150 miles north of the Canadian National Railway and 40 miles south of Mistassini lake.

HISTORY

Chibougamau lake was discovered by white men early in the seventeenth century, its early discovery being due to its position on the direct route between lake St. John and James bay. The transient visits made to this part of the country in the seventeenth and eighteenth century by French fur traders, missionaries and explorers made available a certain amount of geographic information. The first geological work in the area was done by Mr. James Richardson of the Geological Survey in 1870. Geological work was done later by Mr. Walter McOuat, Dr. A. P. Low, Mr. J. Obalski and Professor E. Dulieux. Geographic exploration and surveys of parts of the region have been made by many surveyors, notably by Henry O'Sullivan.

It was not till 1903 that important mineral discoveries were made. From then until 1910 considerable interest was aroused, at intervals, by other mineral discoveries in the area, and by various official and private reports on the economic possibilities of the district. Interest became so marked that considerable pressure was brought to bear on the Quebec government to build a railroad

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into the region to exploit its mineral wealth. On the recommendation of the then newly appointed Superintendent of Mines for the province, Mr. Theo. C. Denis, the Chibougamau Mining Commission was appointed. This Commission consisted of Drs. Alfred E. Barlow and E. R. Faribault of the Geological Survey and J. C. Gwillim, Professor of Mining Engineering of Queens University. Dr. Barlow was chairman of the Commission. With the aid of a large party the Commission, in 1910, made a reconnaissance map of 1,000 square miles of territory, investigated thoroughly the then known deposits, and, in 1911, published a complete report. Although expressing its confidence in the possibility that the area might eventually yield to the prospector and mining engineer economically valuable deposits of the base and precious metals, the Commission put itself on record as not considering it in the public interest that a railroad be, at that time, built into this region. It also stated that the known deposits of asbestos in this area were not of commercial value. This authoritative report killed public interest in this area for many years. In recent years the area has become more accessible and as a result of discoveries in the northwestern part of Quebec, prospectors have again entered the region. Other finds have been made and recently general interest has been aroused in the mineral possibilities of the region by the rumours that a railroad into it is now planned.

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LOCATION AND MEANS OF ACCESS

In the days before the building of the transcontinental railway, the Chibougamau area was entered with difficulty, but since that time it has become more accessible. The old route was from St. Félicien on lake St. John, by the Ashuapmouchouan river route. This is a difficult and arduous route, skilled canoemen requiring two weeks to make the 180 miles. At present there is a much easier summer route from Oskelaneo River station on the Canadian National Railways which is nearly 50 miles shorter, and may be covered in just half the time. The Quebec government last summer improved this route considerably. This route is well marked and well travelled and is best negotiated by the 18-foot freighter type of canoe with small outboard motor. There are twenty-five portages to be made from the Canadian National Railway to Chibougamau lake. With a few exceptions the portages are dry and easily travelled, and are well under a mile in length with the exception of one, 1 1-4 miles in length. The approximate cost of transportation of supplies over this route is between 20 and 25 cents per pound.

A winter trail is now available for dog or light sleigh traffic from St. Félicien, on lake St. John, to lake Chibougamau. Cost of winter transportation over this route is about 15 cents per pound. As the area is dotted with lakes, aeroplane travel within the region is feasible.

TOPOGRAPHY

Topographically the area may be divided into three sections, a central hilly or mountainous section and two more or less flat and low sections lying to the north and south of this area. The hilly section is 5 to 6 miles wide, and is known to extend in an east and west direction for at least 15 miles. This section skirts the north shores of Chibougamau lake and lakes Dorés, David and Simon which are located in the belt of country immediately to the west of lake Chibougamau. Peaks in this mountainous section rise to heights of 300 to 700 feet above lake Chibougamau. They are usually rounded in outline but steep cliff faces are not uncommon. The trend of these hills is on the whole irregular, and the lakes and streams draining this area have no very definite trend.

The low area to the south of this mountainous section contains many lakes, which make up from one-third to one-half of the surface. These bodies of water trend east-north-east, and they usually contain many islands and many points whose trend is in this same general direction. The largest of these bodies of water is lake Chibougamau which has a superficial area of 90 square miles, and is more or less equidimensional, and dotted with a number of small islands, and its shores cut up by many long points. Chibougamau lake drains westward into lake Dorés, a lake having approximately the same length of 12 miles but an average width of barely 2 miles, and draining in turn by a circuitous route into lake David, lake Simon and lake Asinichibastat. Lake Chibougamau has a height above sea-level of approximately 1230 feet and Asinichibastat is 43 feet lower, or at an elevation of 1187 feet above sea-level. These waters flow into Chibougamau river and finally reach Hudson bay by way of the Nottaway river. The country surrounding these lakes and to the south of them is comparatively low and drift covered with few rock outcrops.

To the north of the mountainous belt is another similar belt of low country not visited by the writer. Although low, it has a much smaller percentage of water than the southern low belt. The largest lakes within it are Rush and Wakonichi lakes. The former is a lake some 8 miles long and 2 miles wide, draining westward into Chibougamau river; Wakonichi lake is 20 miles long and averages 2 miles in width, and drains northward into lake Mistassini and the watershed of Rupert river. The trend of these lakes is also north-north-east. Although the area is generally low some high hills are found along the shores of Wakonichi lake.

GEOLOGY

The general geology of the Chibougamau district is shown on the Nottaway sheet (Can. Geol. Survey, Map No. 190A). The writer carried out during part of the field season of 1927 detailed work in an area lying to the west of Chibougamau lake. This area comprising 70 square miles, has as its north boundary the Mackenzie-Obalski township line and includes the north parts of Dorés, David and Simon lakes. This small area lies within the previously mentioned southern lowland belt, immediately to the

south of the central hilly region. The recent mineral discoveries and stakings lie within this section.

The study of this area has increased somewhat the knowledge of the general geology of the whole region and its relation to the mineral occurrences and economic possibilities of this district. A map and detailed report on this work will be published in the forthcoming Summary Report of the Geological Survey.

The bedrock geology of the Chibougamau district consists of Precambrian rocks whose distribution and relationships are at present not fully known. These rocks are covered especially in the lowland areas by moraine of glacial origin of Pleistocene age.

The detailed mapping carried out during the summer of 1927 altered only slightly the contact between the volcanics and intrusive belt as shown on the Nottaway sheet. These volcanics range from trachyte to andesite, are usually chloritized and altered, and are typical greenstones, resembling the rocks considered of Keewatin age in western Quebec and Ontario. Within similar volcanics in other parts of the Chibougamau area altered peridotites occur, in some of which commercially unimportant amounts of asbestos have been found.

In the north part of the intrusive belt lying south of these volcanics, shown on the Nottaway sheet as extending through lake Dorés to lake Asinichibastat and having a width of 6 to 8 miles, the latest work has resulted in the differentiation of at least four types of intrusives including remnants of older volcanics of the same age as the volcanics to the north. Except for a fairly fresh gabbro the other three types grade almost insensibly from one to another. Moreover, all three rocks show certain petrographic peculiarities which lead the writer strongly to suspect that they originated from a common magma and were closely related in time of origin, indicating a magma capable of rather rapid and extreme differentiation.

For want of a better name these three rock types have been called provisionally by the writer in order of age: soda-granite and soda-syenite, oligoclase anorthosite and ferro-magnesian-poor soda granite. No orthoclase was recognized in these rocks which makes them a peculiar and interesting series.

All three types have the common characteristic that no feldspar other than an acid soda-lime feldspar is present, and that this

feldspar is very usually in all three types, an oligoclase close to albite in composition. When quartz is present in any of these types it is often seen to be in hand specimen opalescent, resembling in colour and lustre the precious opal; in thin section the quartz is seen to be filled with dust-like inclusions and cavities. Practically all three of these rocks have suffered alteration, usually to zoisite, epidote, chlorite, and talcose material.

What is believed to be in the main the oldest are the dark soda-granites and the soda-syenites. In the field they were called diorite and quartz diorite which they closely resemble in appearance but study of thin sections shows them to contain oligoclase felspar close to albite-oligoclase in composition, which makes the rocks closer to the soda syenites and granites than to the diorites. Green pleochroic hornblende is commonly present in the rock, and quartz is present but usually in minor amounts. Bodies of this rock were found between Caché and David lakes and in the southwest part of lake Simon.

The term anorthosite is for the present still retained for the second intrusive although it is essentially composed of the acid plagioclase felspar oligoclase. The Commission recognized the composition of the rock and were apparently, like the writer, at a loss what to call it other than anorthosite. The term anorthosite has been applied to rocks made up almost exclusively of plagioclase usually of a basic variety such as labradorite. These anorthosite rocks therefore differ from a gabbro only in that they contain no dark mineral constituents. In composition the Chibougamau anorthosite mapped by the writer is too acid to be termed a gabbro, and is really a ferro-magnesian-poor soda-syenite. Some phases of the anorthosite carry appreciable amounts of quartz, and it, therefore, even approaches a ferro-magnesian-poor soda quartz syenite. The rock minerals shows very generally crushing effects and the feldspar crystals which are up to 2 and 3 cm. long, are crushed and shattered. Along these fracture planes green chloritic material is commonly present. In thin section the feldspar which is intermediate oligoclase in composition is a little more basic than in the other two rock types. The felspar is highly altered to a mixture of chlorite, zoisite, and some white mica. Epidote and quartz are sometimes present.

In the areas mapped by the writer a body of this rock was found on the north shore of lake Dorés as shown on the Nottaway

sheet. Another mass was found about lake David but the rest of the vicinity of Simon and David lakes shown on the Nottaway sheet as anorthosite are underlain by the other two acid intrusives.

The third intrusive, the ferro-magnesian-poor soda-granite, is light in colour and usually contains from 50 to 60 per cent of quartz which is often opalescent. The dark minerals are present in much smaller quantity but similar to those found in the first intrusive, the dark soda-granites and syenites.

This rock type was found to occupy a large part of the intrusive belt mapped. Between lake David and Asinichibastat, a body with a straight northern boundary is in contact with the volcanics to the north.

Just northwest of Caché lake and west of lake Dorés occurs the fourth intrusive, a small mass of gabbro. A similar mass is found on the southeast shore of lake Simon and still another mass just west of Mackenzie bay a mile east of Juggle mountain. Undoubtedly there must be other masses of similar rocks in the district. The last-mentioned mass is a very fresh augite-gabbro, while the other two masses are more altered, possibly by later invading solutions. The unaltered type resembles and may be of the same age as the younger gabbro dykes found in the Rouyn area of Quebec. The more altered masses may be an older gabbro or even a basic phase of the dark soda-granite and soda-syenite. The masses mapped so far, did not give evidence on which to decide this important point.

In Mackenzie bay are found steeply dipping remnants of conglomerate and associated fine-grained sediments which lithologically resemble the flat-lying sediments mapped by Low and the Commission geologists further to the north on the shores of Wakonichi lake. These steeply dipping sediments rest unconformably on the older lavas and along the east shore of Contact bay, which is the southwest arm of Mackenzie bay, are intruded by a long 4-foot, flat-lying quartz vein of white glassy quartz carrying a small amount of tourmaline. This vein must be attributed to igneous action which might very possibly be related to the same age of intrusion as the intrusives to the south.

The sediments on Wakonichi lake are described by the Commission as also intruded by quartz veins. These sediments rest unconformably on an eroded granite surface. The veins suggest

a granite younger than the sediments. This younger acid intrusive has so far not been recognized.

STRUCTURE

Work in the region has not been detailed enough to determine all the age relations or structures of the various rock types. Nevertheless a few significant facts regarding the regional structure were noted which are worth considering. North of the intrusive belt extending through Dorés and Asinichibastat lakes the belt of volcanics strikes east and west, dips vertically and faces north. The synclinal axis of these folded volcanics must, therefore, lie in the high mountainous belt to the north. Very possibly the steep dipping conglomerates and fine sediments on Mackenzie bay lie infolded in this syncline. The 6 to 8-mile wide intrusive belt to the south of these volcanics and sediments was presumably intruded along an east and west anticlinal axis paralleling the syncline previously indicated.

As, has previously been pointed out, remnants of volcanics have been found at points across the northern half of this intrusive belt. Presumably similar remnants and intrusives of similar composition will be found across the southern part of this belt. The greenstone areas can be considered as roof pendants, remnants of the invaded overlying rocks which erosion has since swept away. The three types of intrusives in this belt can be considered as the successive products of crystallization at the top of the intruded magmatic mass. As previously stated this indicated differentiation is rather of a remarkable and significant nature. Lack of detailed information makes it impossible to speculate in any useful way regarding the structure of the northern part of the Chibougamau area. Admittedly the above-mentioned structure is largely unproven but the proof or disproof of this hypothetical structure will help solve the major problems of the area and may result in valuable knowledge useful in directing prospecting effort in the region.

Shearing is common in the area mapped by the writer. An east and west sheared zone some hundreds of feet wide occurs on the greenstone-anorthosite contact north of Cedar bay on the north shore of lake Dorés. A shear zone in the greenstone, locally 1,000

feet wide, extends from lake Asinichibastat to a point northwest of Caché lake, a distance of 8 miles. This shear lies just to the north of the light-coloured granite which underlies this part of the intrusive belt, and parallel to its east and west contact. Shear zones are usually carbonated, and in some pyrite, chalcopyrite and sphalerite mineralization was observed.

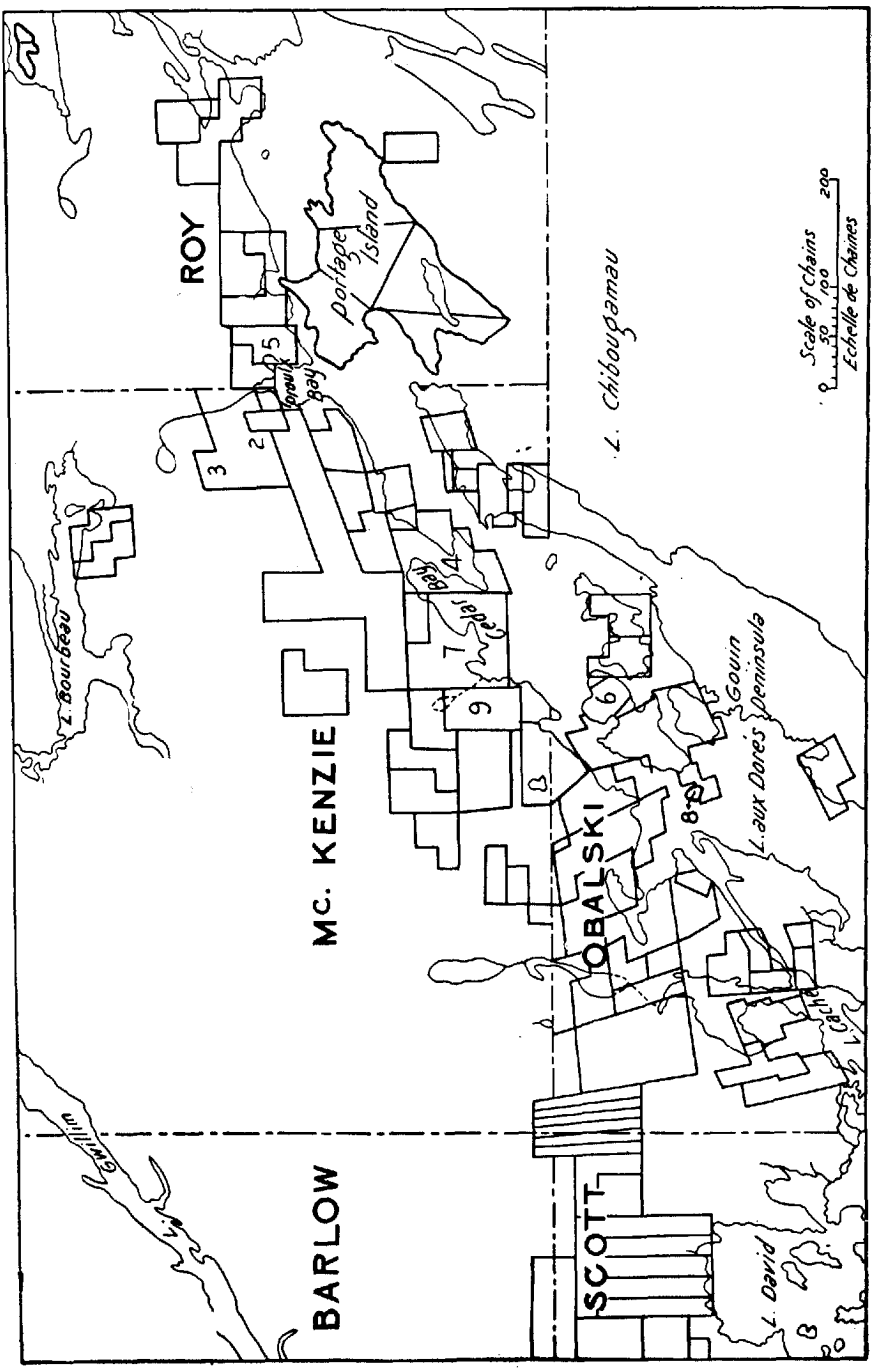
ECONOMIC GEOLOGY

Most of the mineral occurrences discovered since the work of the Commission in the area in 1910, were visited. Time did not permit examination of the many deposits so thoroughly investigated by the Commision. In most cases the workings are now caved in and the growth of vegetation makes it difficult to examine the development. An exception was made in the case of the deposit of asbestos on Asbestos island, Mackenzie bay, Chibougamau lake which was examined in some detail.

Asbestos Island.—The writer's examination of the numerous pits and strippings on the island convinced him that the Commission geologists and mining engineers were correct in stating that on Asbestos island the deposit of asbestos is not commercially valuable. The serpentinized peridotite forms an east-west belt some hundreds of feet wide. It is in contact on the north with an altered pyroxenite and on the south the contact is hidden under the waters of Mackenzie bay. The extension of the peridotite is present on the adjacent mainland. This basic rock is found with the volcanic rocks of the area. The structural and age relations of the peridotite and volcanics are unknown. Useless brittle picrolite, forms the widest veins and a large percentage of the vein material. As regards the real asbestos fibre the following extract from the Commission's report is probably a fair statement of the quality and quantity available.

"At no exposure in this district, which we examined, is there an appreciable quantity of No. 1 fibre. The maximum good fibre is 2-3 inch long; this is comparatively rare, and the whole product as mill fibre seems unlikely to run as high as five per cent of the rock mass when mined in large quantites." *

* Report Chibougamau Mining Commission, 1911, p. 182.



Sketch-map showing the location of some of the mining properties described in the report: — 1.—Asbestos Island (Chibougamau Dev. Co., Ltd., J. C. Lamothe, Pres.); 2.—Claim Q-1402, T. A. Steele; 3.—Claim Q-1398, T. A. Steele; 4.—A. Dumond: The Consolidated Mining & Smelting Co. of Canada, Ltd.; 5.—T. Fortune; 6.—Merrill Island—Block "C", (The Blake Dev. Co., Ltd.); 7.—McKenzie Property (Chibougamau-McKenzie Mines, Ltd.); 8.—Noll Island; 9.—Obalski Mining Syndicate.

Other small masses of these serpentinized rocks are known in the district. The small size of these masses is very probably an important factor in limiting the amount of asbestos in them to non-commercial extent.

Sulphide mineralization.—The potentially important deposits of the district are at present the sulphide deposits carrying values in one or some of the following metals, copper, zinc, gold and silver. Considering the small area studied by the writer the number of sulphide mineralized showings present was notably large. Most of these showings are merely evidence of mineralization and do not of themselves promise an ore-body, but they nevertheless bear witness to the widespread occurrence and considerable quantity of this mineralization If the necessary controlling factors for the localization of this abundant mineralization existed at the time of its deposition, deposits of importance would have resulted. Careful prospecting and development will show whether commercial concentrations of the valuable sulphides are to be found in the district.

The writer visited only the recent mineral discoveries in the district which are confined to lake Dorés and the territory immediately to the west of it. On lake Dorés there are at least two properties upon which development work has shown interesting mineralization. One is the Mackenzie property and the other the claims on Merrill island held by the Blake Development Company, Limited. There are also others worthy of mention.

Steel and Fortune Claims.—A mile north of Proulx bay on the north shore of Dorés lake is a group of claims staked in 1926 by Messrs. T. A. Steele and T. Fortune. These claims lie three miles to the northeast of Cedar bay where the Mackenzie showing is located. These claims are underlain by drift-covered intermediate to basic volcanics. On claim No. Q1393 near the northeast corner of the group, pits and strippings at various points disclose what may be a continuous mineralized zone or a series of almost parallel veins extending north. This zone has been traced for a length of 500 feet. The southernmost pit discloses a zone eight feet wide composed of a series of ramifying glassy quartz veinlets which cut across the basic volcanics and include fragments of them. Quartz forms 50 per cent of this zone, calcite and some pyrrhotite and chalcopyrite are present. The pits to the north disclose similar

mineralization with a width of 18 inches to 2½ feet. Some of the quartz is sugary and some cherty, and besides the previously mentioned sulphides, sphalerite is also found in small quantities. Three narrow quartz veinlets with similar mineralization having a more or less east-west strike, are seen at three localities, one 500 feet north of the known zone, one to the west of the zone's known north end, and another to the west and near the southernmost pit on the mineralized zone.

On the southeastern claim of the group, claim Q-1402, 2,000 feet south of the southernmost pit on the mineralized zone described, a north and south trench 25 feet long cuts across a gossan-covered outcrop. Pyrite mineralization occurs throughout this rock. The trench cuts through a vertically dipping 5-foot bed of volcanic fragmental which strikes a little north of west. The matrix of this fragmental has been replaced by fine-grained pyrite which forms 30 to 70 per cent of the rock mass. A little calcite and what appears to be fine silicified stringers traverse the mineralized outcrop.

The mineralization of this group of claims is not heavy but is extensive. If encouraging assays are given by the known mineralization, search for shear zones and other mineralized zones is advisable.

Mackenzie showing, Cedar Bay, Lake Dorés.—A group of claims is held by the Chibougamau Mckenzie Mining Corporation on the north shore of Dorés lake. On one of these claims on the point at the southwest end of Cedar bay considerable stripping has exposed almost completely the bedrock, for an area of about 200 by 200 feet. This area of bedrock lies in the oligoclase anorthosite nearly a mile south of the anorthosite volcanic contact. The north side of the bedrock area is believed to be an altered porphyritic rhyolite, probably an inclusion in the anorthosite. This rock is exposed for 15 feet in width. South of it and in contact with it is a band of dark rock, 40 feet wide, sheared at the same angle as the contact, south 65 degrees east. The rock is sheared vertically and is intruded by a great number of narrow veins of dark quartz, having the same strike and dip. This sheared basalt-like rock is altered anorthosite whose feldspars are altered to a mass of chlorite and talc or white mica. This alteration is due to the solution from

which were deposited the vein quartz and disseminated sulphides. A rock-trench across the shearing discloses a 7- and a 3-foot zone in which the quartz veins form 40 to 60 per cent of the rock mass. Close to these quartz veins are grains or masses of pyrite and chalcopyrite forming not more than 10 per cent of the total volume of the rock. Assays of these zones are said to give encouraging values in copper, gold and silver.

South of this altered, sheared and mineralized anorthosite is an oligoclase anorthosite, recognizable as such though shattered and altered. Fifty feet from the north contact of this mass is the 19-foot prospect shaft sunk on a mineralized zone striking north 80 degrees east with vertical dip and a length of some 70 feet. The width of the zone varies up to 6 feet. Although some shearing continues from the two extremities of the zone the mineralization does not persist into the adjacent rock mass. The mineralization is roughly banded. Dark quartz containing up to 50 per cent of chalcopyrite occurs in the shaft near the surface over a width of 2 feet and there is a width of 3 feet of disseminated pyrite and chalcopyrite in a black chloritized schist. When visited, the shaft was filled with water to within 8 feet of the surface. From information from a reliable source it is understood that the mineralization widens slightly and has a width of 6½ feet at the bottom of the 19-foot prospect shaft. No actual assay values are available but it is known that encouraging assays in gold and copper, and values in silver were obtained from the shaft.

The amount of mineralization already exposed is encouraging and warrants careful prospecting along the present known zones and on their edges in search of other zones.

Cedar Bay.—To the northeast of the Mackenzie showing halfway up the east side of Cedar bay, engulfed in the anorthosite, is a greenstone fragment one-half mile south of the contact of the anorthosite with the northern area of volcanics. In 1926, Mr. Austin Dumond exposed an area of greenstone in a north and south trench 120 feet long. Cutting a fine-grained diabase greenstone striking 35 degrees south of east with a dip of 75 degrees to the southwest is a sheared and mineralized zone 6 feet wide. The metallic minerals are distributed in rough bands and form about 20 per cent of the rock mass. The metallic minerals are magnetite, pyrite and chalcopyrite, associated quartz and some carbonate.

On the strike of this showing on the west shore of Cedar bay similar shearing and mineralization occurs. During 1927 *The Consolidated Mining and Smelting Company of Canada, Limited* did some systematic exploration west of the shore but the results obtained are not known to the writer.

One thousand feet north of the end of Cedar bay, just north of the greenstone-anorthosite contact, in the greenstone, are outcrops of sheared and carbonated rock containing a few narrow quartz veins. The shearing strikes at 20 degrees south of east and its extent is hidden by drift. It, nevertheless, must be some hundreds of feet long and at least 300 feet wide.

Blake showing, Merrill Island.—Two miles southwest of the Mackenzie showing on Cedar bay, on the northwest shore of Merrill island, lake Dorés, is a mineralized occurrence upon which trenching has been done. This showing is on the northwest part of Block C, mining concession 136, held by the Blake Development Company, Limited.

The country rock here is the crushed oligoclase anorthosite which underlies the north part of Dorés lake. Trenching exposes a shear zone in this anorthosite with a strike of south 40 degrees east and vertical dip. Rock trenches have been blasted across it at intervals from the shore for a distance of 250 feet southeast. This shearing is mineralized with quartz, pyrrhotite, chalcopyrite and some fine and coarse pyrite. In the 25-foot trench on the shore, the 12 feet in the southwest part of the trench is heavily mineralized with the sulphides which form 30 to 50 per cent of the rock mass. The next 6 feet to the northeast is similarly mineralized but not so heavily. The rest of the trench to the northeast shows only disseminated sulphides in the sheared and altered anorthosite.

In the rock trenches, found for 250 feet to the southeast, there is a progressive decrease in the shearing and mineralization of the anorthosite rock away from the lake. In the trench, 250 feet from the lake, mineralization is scarce and the country rock merely shows a blocky shattering.

A report by J. G. Ross of Milton Hersey Company, Limited, of Montreal, notes values in one case over a width of 31½ feet as being 4.3 per cent copper and $14.03 in gold and greater values over shorter lengths were obtained in other trenches. The mineralization improves progressively towards the lake. Future work

should be directed to ascertain the value and persistence of this mineralization under the water of the lake. Indications point to improvement of mineralization in this direction and may result in the discovery of a commercial ore-body.

It may be worth noting here that Merrill island is half a mile distant from the north shore of the lake. On the north shore on the strike of the shearing found on the island are two small prospect pits which show narrow shears and similar mineralization.

Other mineralized showings visited.—The previously described mineralized showings give a concrete idea of the type of mineralization met with on lake Dorés and on the lakes to the immediate west of it. Besides these showings just described, similar mineralization was found at numerous points in the small area studied. In the anorthosite and adjacent greenstones along the north shore of lake Dorés, numerous pits disclose shearing and small amounts of mineralization.

On Knoll island at the southwest end of Merrill island there is an irregular body of quartz some 50 feet long and 12 feet wide containing tourmaline and small amounts of pyrite and tourmaline. This quartz body is found intruding a sheared chloritized rock believed to be a granite. On adjacent islands to the south the anorthosite found north of Knoll island gives place to granite. Different parties assaying this unpromising showing have obtained high gold and silver values.

Four miles south-southwest of Knoll island on the north shore of an island in range V, Obalski township, close to the west shore of Dorés lake, large pieces of mineralized quartz float are found. Two boulders 40 feet apart are 8 and 10 feet respectively in diameter and six pieces at least a foot across are found in the immediate vicinity. The blocks are glassy white quartz with large patches of chlorite and chalcopyrite scattered through them. A little pyrite is also present. The number of the pieces found in the one locality leads the writer to consider that the vein from which the southwesterly moving ice plucked these masses will probably be found well within a distance of half a mile northeast of the boulders. Although the mineralization in the boulders themselves is not particularly rich it is interesting that such mineralization is found half-way across the 8-mile wide belt of intrusives.

Two mineralized showings in sheared greenstones and diorite-

looking granites are found, one on the end of the long point in David lake, and one on the southeast shore of Simon lake. Both these showings are small. The most significant feature noted by the writer in the vicinity of these two lakes is the 8-mile shear zone extending in an east and west direction from lake Asinichibastat to a point 1½ miles northwest of the north end of Caché lake. It has a width in places of 1,000 feet. This shear zone is a mile to three-quarters of a mile south of the Mackenzie-Obalski township line and about a mile north of Simon and David lakes. The shear zone lies in the greenstones just north of the east-west granite-greenstone contact. The shear is usually carbonated and chalcopyrite, pyrite and quartz mineralization is at times encountered. In this shear zone a mile north of the northeast corner of lake David there is a 1½-inch vein containing 70 per cent of light-coloured sphalerite, some pyrite, quartz, and a very small amount of chalcopyrite. This shear zone has so far been virtually unprospected. As mineralization has been observed and as shearing which often localizes the deposition of mineralization is also present, this zone should be carefully prospected for economic concentrations of sulphides.

CONCLUSIONS

Metallographic study of specimens from the deposits visited shows that the mineralization comprises quartz, pyrite, magnetite, pyrrhotite, chalcopyrite, and sphalerite. Although in no instance have all these minerals been found together the evidence so far obtained points to a common origin and approximately contemporaneous crystallization. As no later acid intrusive is known than the quartz-rich ferro-magnesian-poor soda-granite, and as the older intrusives and still older volcanics all contain the sulphide mineralization, it is at present believed that the soda-granite is the source of the quartz sulphide mineralization.

All rocks older than this intrusive must, therefore, be considered as possible hosts for this mineralization. These older rocks are the volcanics, the dark soda-granites and soda-syenites and the oligoclase anorthosite. In nearly all cases the mineralized showings are found in shear zones in these rocks. Those areas underlain by sheared rocks especially where they show some evidence of sulphide or quartz mineralization, should be prospected.

The mineral occurrences visited, and in fact most of the prospects of the district, are located along the greenstone intrusive contact to the north and west of Dorés lake, or in the anorthosite immediately south of it, and to the north of David and Simon lakes. The contact of volcanics and intrusives 6 to 8 miles south of this north contact although largely drift covered should be worth prospecting. The older intrusives and included greenstone fragments within the intrusive belt should not be overlooked.

No information has been obtained of the greenstone area to the north and northwest of Chibougamau and Dorés lakes. This area, roughly 20 miles long and 10 miles wide, must, nevertheless, have many geological features similar to those of the geologically mapped area immediately to the south of it, and in which the mineralized showings above mentioned are found. It would be surprising if in this section no acid intrusives and related mineralization existed. There is no reason why this territory should not be as well worth prospecting as its southern fringe, about lakes Dorés and David.

Transportation to Chibougamau is at present expensive, but its cost is not prohibitive. Although discoveries thus far do not justify large expenditures for improved transportation, it is to be expected that intelligent prospecting and exploration in the next few years will disclose economically important bodies of sulphides.

EAGLE RIVER AREA, ABITIBI TERRITORY, QUEBEC

By J. B. Mawdsley *

LOCATION AND AREA

During the field season of 1927 geological exploration and mapping was carried on in the Eagle River area which lies chiefly between latitudes 49°00′ and 49°30′, and longitudes 74°30′ and 75°30′. A small northern extension lies along the series of lakes drained by the Opawika river. The area has an east-west length of 45 miles, a width of 35 miles and a superficial area of approximately 1,600 square miles. The southern boundary of the region lies 60 miles north of the Canadian National railway, and its west boundary 180 miles east of the Ontario-Quebec boundary. The northeast corner of the area lies 20 miles southwest of lake Chibougamau. At least a third of this area is covered with water and large parts of the rest of it by forests of good pulp wood.

PREVIOUS WORK

A track survey of the Opawika river was made for the Quebec government in 1898 by Henry O'Sullivan. H. C. Cooke (1) made a geological reconnaissance of this river in 1916.

ACKNOWLEDGEMENTS

The writer was ably assisted in the field work by Messrs. J. A. Retty and R. M. Williams.

The mapping in 1927 was confined to the water courses, except in the vicinity of Little Nemenjish and Kaopatina lakes, where bush traverses were made. Examination of the rocks along the shores of the very numerous lakes and rivers in the area sufficed

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(1) Cooke, H. C.: Some Stratigraphic and Structural Features of the Pre-Cambrian of Northern Quebec: Jour. of Geol., vol. XXVI, p. 180-188, 1919.

to give a good idea of the general geology. Further topographic mapping by the Quebec government is now in progress in this area, and the geological map based on the 1927 field work will not be published until this information is available. As it is difficult to discuss the geology in detail without an accompanying geological map, in this report only a general discussion of the geology of the Eagle River area is attempted.

MEANS OF ACCESS

The Eagle River region may be entered by three main canoe routes, two of which completely traverse the area. The parts of these routes immediately to the south are shown on the three-mile to the inch Saint-Maurice sheet issued by the Quebec Department of Lands and Forests. It may be entered from the west by a well travelled and fairly easy route, beginning at the Canadian National railway about 4 miles west of Monet station and following the Susie river and Cedar lake to Megiscane river which is followed down stream to the mouth of St. Cyr river. This latter river, which has no rapids, is ascended for 30 miles to lake Bailly in Bailly township, nearly 80 miles by water from the railroad and is close to the south boundary of the Eagle River area. From lake Bailly a portage leads to the headwaters of the Eagle river. This northern-flowing river traverses the western part of the region and empties into the northeast part of Father lake.

The central and the eastern routes both begin at the Oskelaneo River station on the Canadian National railway and are followed north for 40 miles to lake Obiduan. The central route which is the more difficult is north for 30 miles up a stream to Lac Baptiste which is on the south boundary of the Eagle River area, 15 miles from its southeastern corner. From this lake the route is north to Kaopatina lake. The eastern route is along the usual canoe route to lake Chibougamau. From lake Obiduan the route swings northeasterly through a series of lakes to Verreau and Clearwater lakes whence the well travelled route is followed north to Lynxeye and Gabriel lakes. These lakes form the headwaters of the Opawika river and Gabriel lake is on the east boundary of the area 12 miles from its northeast corner.

Canoes larger than 18-foot freighters are troublesome on these

routes as there are many portages. Small outboard motors are useful and economically justified. With motors and average loads, any of the three routes can be covered in four to six days. The area is dotted with lakes and may be easily explored by aeroplane.

GENERAL GEOLOGY

The bedrock of the area consists of Precambrian volcanics, sediments and intrusives. These rocks are very largely covered by glacial deposits of Pleistocene age, and large shallow lakes and muskegs.

PRECAMBRIAN

The oldest Precambrian rocks in the area are volcanics, the predominant of which are andesites which in many places show pillow and other volcanic structures. Rhyolites, basalts, and volcanic fragmentals are present in minor amounts. A thick series of sediments and interbedded volcanics, evidently younger than the first-mentioned volcanics, lies in contact with them and forms an important proportion of the rocks mapped. This series consists in part of beds of conglomerate, arkose and slate. When metamorphism has occurred due to the later granite, the sediments and interbedded volcanics have been converted into hornblende and biotite schists. This series has been designated, by Cooke, the "Nemenjish series." Intruding all the above-mentioned rocks are large bodies of granite and related syenites. Amphibolites and biotite and hornblende schists are found within the granite and are considered to be assimilation products or metamorphosed remnants of the intruded volcanic and sedimentary rocks. Cutting all these rocks are a few dykes of perfectly fresh gabbro resembling closely the newer gabbro found in the Rouyn district of Quebec.

The Nottaway map-sheet (No. 190A, G. S. C.) gives a general idea of the geology and drainage in the northern part of the Eagle River area. The Opawika river and its tributaries drain most of this region, which is north of the height of land on the Hudson Bay water shed. That part of the Opawika drainage system within the Nottaway map-area forms a broad arc, whose centre is the north part of Lac du Bras Coupé which lies a few miles north of the centre of the Eagle River quadrangle. The eastern limb of

this arc trends southeastward through Windy and Kaopatina lakes along the upper part of the Opawika to Gabriel and Lynxeye lakes which are at the headwaters of Opawika river. The western limb of the arc passes out of the mapped quadrangle at Gabriel lake, 12 miles from its northern margin. The western limb of this arc passes southwestward through the west part of Lac du Bras Coupé and Father lake. The south end of this last lake is on the west boundary of the mapped quadrangle and 20 miles south of its north boundary. Recent surveys show that the position of Father lake should be some miles southeast of its position as shown on the Nottaway sheet. Opawika river flows westward out of the area near its north boundary from the centre of the west limb of this arc.

On Lac du Bras Coupé, at the apex of this arc, the rocks are granite; to the south of this granite is a belt of volcanics. This belt of volcanics has a width of about 5 miles and extends, apparently continuously, in an east-west direction from the northwest part of Father lake, eastward through Windy lake. The volcanics face south.

South of this band of volcanics is a belt of sediments composed of beds of conglomerate arkose and slate and interbedded volcanics, called, by Cooke, the Nemenjish series. They apparently lie in a synclinal trough striking a little south of east and are overturned to the south. The width of this belt is from 2½ to 5 miles. The thickness of the sediments and volcanics is but a fraction of their exposed width. These rocks outcrop on the south shore and to the south of Kaopotina lake and extend eastward of this lake. To the southeast in the vicinity of Nemenjish lake the hornblende and biotite schists are believed to be the metamorphosed equivalents of these sediments. This belt is intruded by a granite mass which extends southward beyond the south boundary of Eagle River map-area. The granite contains small masses of amphibolites and schists which are the assimilated and altered fragments of the intruded volcanics and sediments.

On the northwest shore of Kaopotina lake, and cutting the granite southeast of it, are dykes of perfectly fresh augite gabbro which as previously stated closely resembles the newer gabbro of the Rouyn district of Quebec.

PLEISTOCENE

Glacial deposits of Pleistocene age in places almost completely cover the Precambrian rocks and greatly influence the drainage pattern of the region resulting in marked differences in the drainage pattern between adjacent areas, as is well shown in the eastern part of the area mapped. The lakes in the hilly granite country to the west of Gabriel and Lynxeye lakes are irregular in shape and trend. They are surrounded by country that contains ridges and areas of boulder, gravel and sand moraines. These ridges have northern facing, steep slopes with a fairly regular outline. In the moraine area south of these scarps a few steep-sided kettle lakes are found. To the west and northwest of this area is another area which is lower and includes Kaopotina lake and is not more than 30 feet above it. The points and bays of the lakes in this locality have a definite pattern which trends south-south-west, corresponding to the glacial striae on the rocks found in this part of the area. The shores of these lakes are composed mostly of rounded boulders and shingle derived from wave-washed morainal deposits. The country about them is low and a rise in the level of these bodies of water would cover most of their points and greatly enlarge the area of the lakes.

The difference in the glacial deposits of the two areas is believed by the writer to be due to the erosional action of the final stages of the Pleistocene ice-sheet and its morainal deposits. At the end of the glacial period the ice-sheet must have been quite thin and could not override even moderately hilly country. In the high areas it was finally brought to rest and melted among the hills leaving terminal morainal deposits as irregular ridges and north-facing scarps of moraine, the kettle lakes being due to the subsequent melting of ice blocks buried in this moraine material. The irregular shape of the lakes of these areas also indicates the lack of movement of the ice when the final morainal load was deposited on the irregular surface. In the lower, level country the south-southwesterly-flowing ice-sheet met less resistance to its advance and was apparently able to flow when quite thin and on the verge of disappearing. This thin sheet had little power to transport material but had the ability of aligning in the direction of its flow, the morainal material previously deposited. To some such action can be attributed the south-southwesterly

trend of the bays and many of the moraine covered points of the lakes in the areas of relatively low elevation.

Some of the long sinuous points of moraine in the lakes and the crooked ridges in other localities are very probably eskers. These ridges of gravel, sand and small boulders trend generally south-south-west and are narrow, steep-sided and sinuous. They often have a height of 20 or 30 feet above the surrounding moraine-covered country and their tops which show no evidence of modification by recent erosion are undulating. They were probably formed as deposits of subglacial rivers flowing in tunnels under the melting ice. On the floors of these under-ice rivers part of the sedimentary loads were deposited forming narrow, sinuous esker ridges of more or less sorted morainal material.

ECONOMIC GEOLOGY

Little prospecting has been done in the Eagle River area and has been confined almost wholly to the Opawika river and a few of its tributaries. No claims are being held in the region and no assessment work had so far been done or interesting mineral deposits found.

The northern granite areas, and the southern mass which underlies two-thirds of the area, give no evidence that they contain commercial concentration of feldspar or other minerals sometimes associated with granites.

Part of the greenstone area on the north, especially in the vicinity of Windy lake, is well exposed and a few small, glassy, unmineralized quartz veins were noticed, and also a couple of unmineralized shear zones. South of this area especially in the vicinity of Kaopotina lake the outcrops are few. In this locality similar unpromising quartz veins and shear zones were seen. To the south of this lake the scattered outcrops of greenstone and sediment give place to outcrops of the large continuous southern mass of granite.

The extensive drift and moss cover will greatly hamper prospecting. Although the continous area of greenstone and sediments is of moderate size and may possibly contain economically valuable deposits of the metallic minerals, it is not at present considered as favourable prospecting territory as some of the adjacent areas of Precambrian volcanics and sediments.

EMPLOYMENT, WAGES AND ACCIDENTS IN MINES AND QUARRIES DURING THE YEAR 1927

(A. O. Dufresne)

This report deals especially with statistics on the number of men employed in the mines, quarries and annexed plants; wages paid to these men; and accidents, fatal and non-fatal, which have occurred during the year. The seasonal character of some of the work and the unavoidable part-time employment require the bringing of total figures, as compiled, to a common denominator so as to have a uniform basis of comparison from year to year. For this purpose the Quebec Bureau of Mines has adopted, for the past fifteen years, the practice of reducing the total number of workmen, mostly on part-time employment, to a basis of a full year of 300 working days. The reduction of the total number of men having found employment in the industries during the most active period of the year to the number of theoretical men having worked the full year of 300 days is an elementary operation; one has only to add the number of days work performed by the men at each mine and quarry and to divide the total by 300. For the year 1927 the quotient is 9,490.

Table I shows how employment in the mineral industry of Quebec has behaved in the past years. It shows a steady increase due, mostly, to the development of new metal mines in Western Quebec. This table gives the total number of men employed and the corresponding number of men reduced to a full year basis.

TABLE I

Workmen employed in mines and quarries in the Province of Quebec.

	1927	1926	1925	1924
Number of men employed.....	15,951	14,022	9,304	8,270
Number of men on a 300-day basis...	9,490	8,728	7,021	6,474

Table II shows labour employment in the mining and quarrying of the various mineral substances produced in the Province. It shows that sand digging and dredging had the largest number of men on the pay-roll of any substance at the time of maximum activity. This is due to the very short season during which the sand-pits and sand-banks are worked. Asbestos is next with a total of 3,170 workmen. These underground and open-cast works are operated steadily throughout the year with but a slight decrease of the number of men employed in the winter months. The search for gold, copper, zinc and lead ores in Western Quebec and Gaspé is responsible for the considerable increase in the figures given for the metallic substances. Nearly twice as many men were engaged in this work in 1927 as the year before. It is this increase in the activities of the development of metal mines which is responsible for the total of the miners exceeding, this year, that of the quarrymen.

A number of men were employed in the development of non-producing properties, especially in Western Quebec. Figures for this are given in Table III. This includes the men employed in the construction of the Horne smelter at Noranda.

Wages paid to the miners and quarrymen in 1927 amounted to $11,418,013, as given in the general table of the mineral production on page 8 of this volume. This is an increase of 16 per cent over the $9,826,900 paid the year before. Of the amount paid in 1927, the miners received $6,498,259 and the quarrymen $4,919,754, which figures compare respectively with $4,923,205 and $4,903,895 for 1926.

The average wage earned by a 300-day workman during 1927 was $1,203; it was $1,126 for the preceding year.

TABLE II

Persons employed in the Mines, Quarries and annexed Plants in the Province of Quebec, during 1927.

	Number of men employed	Number of men calculated on 300-days basis	
	1927	1927	1926
Asbestos	3,170	2,588	2,626
Copper and Pyrite	1,564	1,178	667
Feldspar, Kaolin	135	93	70
Gold and Silver	644	495	256
Graphite	24	11	16
Magnesite	107	67	54
Mica, Phosphate	120	83	94
Mineral Paints, Ochre	45	38	27
Mineral Water	4	1	1
Molybdenite	25	10	4
Quartz and Silica rock and Garnet	73	42	34
Talc	38	31	18
Titaniferous iron ore, Zinc and Lead	258	209	175
Brick, Pottery	1,106	808	730
Cement	862	897	854
Granite	646	409	398
Lime	237	222	233
Limestone	1,790	1,157	1,182
Marble, Slate, Sandstone	336	215	163
Sand	4,767	936	1,126
	15,951	9,490	8,728

TABLE III

	Number of workmen	Wages	Number of days work	Number of 300-day workers
Producing mines	4,115	$4,165,014	960,354	3,201
Non-produc'g mines *	2,092	2,333,245	491,651	1,639
Total	6,207	$6,498,259	1,452,005	4,840

* Construction of smelter included.

During the year, mine and quarry operators have sent to the Bureau of Mines, notices of 416 accidents entailing loss of time to workmen. This is a considerable increase over previous years. But up to 1927 the operators only reported accidents entailing a loss of time of ten days or more. With the Mining Law as amended, operators have now to report all accidents by which a loss of time is suffered by an employee. Article 149 as amended in 1927 now reads as follows:

"If while a mine or a quarry is being operated, an accident "happens by reason of or in the course of the work, the person "operating the same, shall forthwith send a written notice to the "Minister, specifying the nature of the accident, the number of "persons killed or injured and their names if they are known."

The amended article came into force during the year, and a number of accidents were reported which in previous years have been omitted.

The number of fatal accidents recorded is believed to be exact, but it is probable that notices of non-fatal accidents have not been all sent in as required by the Mining Law. Nevertheless, as those received are fairly representative of the most frequent causes, tables have been prepared showing analyses of the accidents as described in the notices received.

The accident average per 1000-full-year workers, as presented on Table IV, was 46.4 in 1927; as compared with 37.3 for the preceding year. The reason for this increase has been given above.

There were 25 violent deaths in 1927 in the mines and quarries; this is an average of 2.63 per 1000 men-year. This index number compares with 2.72, 2.38, 1.83, 2.42 and 2.29 for 1922, 1923, 1924, 1925 and 1926, respectively. In the mines proper the proportion of fatal accidents is 4.3 and in the quarries, .86, as compared with 3.5 and 1.3 for the year 1926.

TABLE IV

Workmen	Number 300-day workers	Accidents		Total	per 1,000 300-day workers
		Fatal	Non-fatal		
Mines.....	4,846	21	358	379	78
Quarries.....	4,644	4	58	62	13
Totals.....	9,490	25	416	441	46.4

TABLE V

Accidents in Mines, Quarries and annexed Plants in the Province of Quebec, during 1927.

	Fatal		Non-fatal		Totals	
	No.	%	No.	%	No.	%
MINES:						
Underground	6	1.4	47	10.7	53	12.0
Open pits	6	1.4	222	50.4	228	51.7
Surface	6	1.3	34	7.7	40	9.1
	18	4.1	303	68.7	321	72.8
QUARRIES:						
In pits	3	0.7	54	12.2	57	12.9
Surface	....	....	1	0.2	1	0.2
	3	0.7	55	12.4	58	13.1
ANNEXED PLANTS:						
Concentrators	4	0.9	34	7.7	38	8.6
Shops	....	....	22	5.0	22	5.0
Power plants	....	....	2	0.5	2	0.5
	4	0.9	58	13.2	62	14.1
Totals	25	5.7	416	94.3	441	100%

The tables which accompany this report have been prepared to help operators, superintendents and foremen in their commendable work of accident prevention. They will find in these, useful information of the most frequent causes of accidents. However, operators are to be reminded that these tables are valuable in so far as they themselves faithfully conform to the law and give notice to the Bureau of Mines of all accidents. These notices must

also contain a complete description of the accident so as to allow proper classification as to cause.

The analyses of accidents as to cause are presented in Tables VI and VII. Haulage, especially in large workings where railways are in use, is the principal cause of fatalities; the sinking of a number of mine shafts in the development of new properties was not done without a few fatal accidents occurring; next comes the handling of explosives, which includes the use of too short fuses, ignorance of proper precautions in testing caps, and disregard of warnings when seeking precarious shelters. Other fatal accidents in mines are attributed to scaling operations, falls of rock underground, steam shovel and boom-derrick operations. In quarries, fatalities were caused by electrocution and falls of rock. In annexed plants, fatal accidents occurred in concentrators only, they are mostly charged to power belts.

The analysis of non-fatal accidents, as given in Table VII, shows about the same degree of frequency for various causes as in 1926. Insufficient details in the report make it difficult at times to place an accident under a proper classification. This is probably the reason for an increase in the percentage of accidents ascribed to cable -derricks. These may include also this year a few accidents which last year had been placed under falls of ground.

TABLE VI

Analysis of fatal accidents in Mines, Quarries and annexed Plants in the Province of Quebec, for 1927.

Causes of accidents	Underground	Open pits	Surface	Total	
				No.	%
MINES:					
Haulage	....	1	4	5	27.8
Explosives	1	1	2	4	22.2
Shaft	3	....	....	3	16.7
Scaling	1	2	....	3	16.7
Falls of rock	1	....	....	1	5.6
Steam shovel	....	1	....	1	5.5
Boom-derrick	....	1	....	1	5.5
	6	6	6	18	100%
QUARRIES:					
Electricity	....	2	....	2	66.6
Falls of rock	....	1	....	1	33.3
	....	3	....	3	100%
ANNEXED PLANTS:	Concentrators	Repair shops	Power plants		
Gearing and shafting	3	....	....	3	75.0
Falls of rock	1	....	....	1	25.0
	4	....	....	4	100%

TABLE VII

Analysis of non-fatal accidents in Mines, Quarries and annexed Plants in the Province of Quebec, during 1927.

Causes of Accidents	Under-ground	Open Pits	Surface	Total No.	Total %
MINES:					
Cable-derricks	....	123	....	123	40.6
Falls and slides of ground	18	39	....	57	18.8
Haulage	15	5	21	41	13.5
Drilling	2	16	....	18	6.0
Locomotive cranes	....	18	....	18	6.0
Falls	6	4	3	13	4.3
Miscellaneous	1	2	6	9	3.0
Machinery and tools	1	4	1	6	2.0
Hammering stone and cobbing	....	3	1	4	1.3
Explosives	2	1	....	3	1.0
Steam shovels	....	3	....	3	1.0
Falls of objects	....	2	1	3	1.0
Hoisting and shaft	2	....	....	2	0.6
Carbide	....	....	1	1	0.3
Nails	....	1	....	1	0.3
Boom-derricks	....	1	....	1	0.3
	47	222	34	303	100%
QUARRIES:					
Falls and slides of ground	....	24	....	24	43.6
Haulage	....	7	....	7	12.7
Hammering stones	....	6	....	6	10.9
Miscellaneous	....	4	....	4	7.4
Explosives	....	2	1	3	5.5
Falls	....	3	....	3	5.5
Derricks	....	2	....	2	3.6
Drilling	....	2	....	2	3.6
Handling stones	....	1	....	1	1.8
Tools	....	1	....	1	1.8
Nails	....	1	....	1	1.8
Electricity	....	1	....	1	1.8
	....	54	1	55	100%
ANNEXED PLANTS:	Concen-trators	Repair shops	Power Plants		
Machinery	9	4	....	13	22.4
Miscellaneous	2	6	1	9	15.0
Falls of objects	3	5	....	8	13.9
Gearing and shafting	7	1	....	8	13.9
Falls	4	3	....	7	12.1
Falls of rocks	4	....	....	4	6.9
Tools	1	2	....	3	5.1
Bagging and handling bags	3	....	....	3	5.1
Nails	1	1	....	2	3.4
Electricity	....	....	1	1	1.7
	34	22	2	58	100%

There is a noted increase in accidents assigned to the operation of air-drills. In quarries, a larger percentage in accidents due to falls of ground is observed, as well as a decrease in explosive accidents. In mills, the percentages of the various causes of accidents are about the same as in 1926. The operations of machinery, gears, belts, pulleys and shaft, falls of objects and falls of persons are amongst the most important sources of accidents.

All mines and quarries in the Province are inspected at intervals by engineers from the Quebec Bureau of Mines. Conditions are generally found satisfactory. Operators do not hesitate to comply with the recommendations of the inspectors. Some of the larger companies like Canadian Johns-Manville and Canada Cement Co. have well organized safety departments, the business of which is to promote interest in safety measures at the work.

Mr. Henri Gauthier, who for the past three years inspected the quarries of the Province has prepared the following comments on the precautionary measures taken against accidents at these works.

"Visits of inspection are regularly made to the more important quarries, while the smaller ones, and those where operations are intermittent, because of their large number, are alternately visited.

"From observations, one may say that, as a rule, the regulations for the protection of workmen are observed, more especially in the large commercial quarries where skilled men of the trade are usually employed. Nevertheless, in several instances the inspection disclosed conditions calling for immediate improvement. In most cases, however, after instructions had been given, re-inspection enabled to ascertain that the necessary changes in the dangerous practice pointed out were effected.

"The statistics show that the majority of quarry accidents are caused by falls or slides of rock and by the use of explosives. It is generally in the crushed stone producing quarries where high working faces are developed and large quantities of explosives handled that these accidents are most frequent. Quarrying being done on a large scale, instead of working 20 to 30-foot walls in two or three 10-foot benches, it is a common practice to blast faces up to and over 50 feet deep at one time. The use of well drills to put down holes, usually 5½ inches in diameter, to a depth of even

50 feet is not uncommon, and series of as many as 60 holes are sometimes blasted at one time. The result is a threatening huge talus of broken rock at the foot of which workmen have to do secondary breaking and the loading. Proper scaling of working faces after each blast and periodical clearing of all loose stones or ground from the walls has been strongly recommended. The handling of thousands of pounds of dynamite needed for the blasting of 100,000 tons of rock at one time, as it is sometimes done, is always a dangerous operation, and requires much care on the part of the blasters.

"Amongst the more frequent cases of negligence observed in the course of quarry inspections, the following may be mentioned: Total absence of magazine and boxes of dynamite temporarily stored in office or tool shed. The reason given for such imprudence being that only the necessary explosives are bought just before each blast.

"Detonators and blasting caps stored with dynamite are quite common examples of violation of the law.

"The presence of tools in magazine, the absence of lock on the doors of the building, and state of uncleanliness are also frequently observed.

"Other examples of unsafe practice often noticed are the opening of boxes of dynamite inside the magazine and smoking while carrying dynamite cases.

"In the building stone quarries, the more frequent acts of imprudence seen are, men travelling on a block of stone being moved by a derrick and, clinging to the cable, are thus transported with the stone from one point to another in the quarry.

"It is gratifying to note here that one of the *Portland Cement Association Safety Trophies* for perfect records of no-lost-time accidents during the entire year of 1927 went to plant No. 3 of the Canada Cement Company, at Hull. Last year plant No. 1 at Montreal can had the same honour. This is the fourth successive year that a cement plant in Canada has had a perfect record."

DESCRIPTION OF FATAL ACCIDENTS

January 18th.—John Gagnon, age 43, foreman of the Bell Asbestos Mines suffered fatal injuries when his head was crushed between an engine and a crane.

On the night of the accident, the eccentric of the engine of one of the cranes broke. This crane was used to load the cars. The broken piece prevented the crane from moving, and while awaiting repairs, it was necessary to remove it from that place. Again, on account of the broken piece, the crane could not rotate, therefore a pole five or six feet in length, was placed between the crane and the locomotive which was to remove it.

Gagnon himself placed the pole at the centre near the base of the crane. The locomotive slowly approached, and Gagnon held the pole against the locomotive until it was firm. It then stopped and, the block being tight, Gagnon signalled the switchman to advance. Meanwhile he remained bent over holding the pole. Suddenly it slipped causing the victim's head to be crushed between the front of the locomotive and the frame-work of the crane.

Verdict:—Accidental death.

March 12th.—While he was working in the gravel pit, Edouard Lesage, age 62, labourer of the St. Ursule Gravel Pit, suffered a fractured spine resulting in death, when the gravel from the side of the pit became loosened, probably by undercaving, and crushed him.

March 23rd.—Vincent Barber, in company with Ferdinand Bonasso, employed by the Asbestos Corporation, Limited, were engaged in barring down loose rock. While Bonasso was working with the bar, Barber was lighting him. They unexpectedly came upon some very loose rock which bore down upon them. The light went out. Whether the victim was struck then by a rock, or slipped down and was then struck is not certain. However, Bonasso immediately went to the aid and found Barber pinned by the leg beneath a rock weighing 400 or 450 lb. The doctor was called and the victim transported to the hospital at Thetford. Later he was sent to Quebec where he died on April 5th.

Verdict:—Accidental death.

April 20th.—Pietre Kulas, age 31, a miner employed by the Jay Copper Gold Mines Ltd., was the victim of a fatal accident at 3.40 on April twentieth.

Three men of whom Kulas was one, were mucking in the bottom of a shaft, where a depth of about 280 feet had been reached. The bucket had been filled and the signal to hoist given. At a height of some seventy-five feet, the bucket was seen to descend rapidly; Kulas who was in the centre of the shaft, was caught underneath it and received its full weight on his head. Death was instantaneous.

J. H. Timmins, hoistman at the time of the accident, states that he had pulled the lever controlling the clutch to the usual position and had commenced hoisting when he noticed that the cylinders of the hoist were pumping water. He walked back, about nine feet, to shut off the injector on the boiler and when he turned around he saw the drum unwinding. He quickly pulled the brake and clutch tight but not before the bucket had reached the bottom. He states that the clutch had become disengaged, due to the fact that the lever had slipped forward.

The coroner's jury returned a verdict of excusable negligence of the hoistman, and added a recommendation that a hoistman should never leave his hoist while in motion.

April 24th.—While he was walking under an open spout which had become blocked, George Hemsworth, age 49, of the Canadian Johns-Manville Co. Ltd., suffered fatal injuries about the body when he received the load of rock upon him.

The victim was a foreman at the secondary crusher "skip" of plant 4A. While conveying over-sized rock, the chute became blocked. Hemsworth gave the order to open the adjoining chute; he advanced from his position and stood directly under the blocked chute which had been left open. Suddenly the motion of the rock in the next chute caused movement in the blocked chute, and the victim received the discharge on his back.

The chute was immediately closed and Hemsworth was found driven down between the ties of the track, causing severe injuries to his legs. He was transported to the hospital but died 24 hours afterwards as a result of the shock.

May 16th.—At about 2 P.M., William Wilfred James, age 40,

a tractor operator for the Canadian Johns-Manville Co., suffered injuries resulting in death.

While driving his tractor with a dirt scraper chained to the rear axle, the nose of the scraper stuck in the dirt and blocked. James changed gears and apparently put on full power, which caused the front end of the tractor to rear up, and the whole machine turned completely over backwards pinning the victim under it and causing internal injuries.

James died the following day from contusion, abrasion and the fracture of several ribs.

May 23rd.—George Astbury, age 29, was an employee at the Eustis mine, holding the position of switchman on a train of cars. At the time of the accident, the train was proceeding to the concentrator with two carloads of minerals.

These cars are drawn by means of an electric locomotive with trolley. Astbury was on one of these cars when the trolley wire suddenly broke. It is thought that the victim was thrown to the bottom of the car by the impulse of the wire. Another opinion is that he purposely threw himself to the bottom of the car when he noticed the broken trolley. However he was seriously hurt in his fall and immediately transported to the hospital in Sherbrooke. He died there on June 6th.

Verdict:—Accidental death.

June 19th.—Gordiano Bianchi, age 29, a miner employed by the North American Magnesite Producers, Ltd., was instantly killed when he was struck on the head by a stone.

In hoisting a skip of stone from the bottom of the quarry to the surface, a piece of rock fell from the bucket striking the victim on the head and killing him instantly.

June 29th.—A. Lessard, 33 years of age, single, was killed by the explosion of a box of No. 8 caps which he was holding in his lap.

On the previous day some men were working on a surface discovery to the east of the Makamic road and had drilled nine holes there. When the time came to blast these, only one hole went off, the other eight being misfires. No attempt was made to

reblast these until the next morning. It was thought that the caps had not exploded and, while some of the men were pumping out the tamping from the holes, with water, Lessard was testing caps. He sat down with the open box in his lap, and taking a short length of fuse, inserted it in a cap. Holding the cap and fuse in one hand, he lit the fuse and then threw away. Lépine, another miner, was standing close by watching, and he states that as Lessard was testing another cap in this way, the box on his lap exploded. Lessard was terribly mutilated: his legs were nearly severed from his body and the lower part of his body was torn open. He died shortly afterwards.

At the inquest, held at the property on June 30th the evidence showed that the victim had been warned to be careful, and that he was an experienced blaster.

The jury returned a verdict of accidental death, and exonerated the Makamik Mines Inc. from all blame.

June 29th.—As a result of an infection in a cheek wound received in an explosion of caps, G. Lépine, age 28, of the Makamik Mines Inc. died.

The victim was standing four or five feet away from Lessard when the explosion of the caps on Lessard's lap took place, and he received some cuts about the forehead.

July 4th.—Mike Smith, age 45, a foreigner of supposedly Dutch nationality, was injured in blasting, and died at about 3 A.M. on July fourth.

The company was engaged in sinking a shaft, by contract. The shaft, at the time of the accident was about 20 feet deep. There is a landing about 7 feet from the surface.

Seven holes, about five or six feet deep, had been drilled and Smith was engaged in springing these. His method was as follows:—He attached a short fuse (6 to 10 ins.) with cap to half a stick of dynamite and dropped it in the hole. At the time of the accident he had lit three fuses in this way and dropped them in the holes. All three shots went off before he reached the landing. His helper Godfred Lilemon, states that he was standing on the surface, near the collar of the shaft, when the rounds were fired and that he saw Smith lie down on his back when he reached the

landing. He called for assistance. A doctor was summoned and Smith was brought into the hospital at Rouyn, where he died later.

The doctor's evidence showed that the greater part of the right buttock and the right thigh were torn away and that there was a gaping wound, peppered with rock. The left thigh. legs and right forearm were also punctured in a number of places. At the inquest, Lilemon stated that the victim probably had some fuses and caps in his hip pocket.

He was experienced in the handling of powder but was not a real miner, having obtained his experience in railroad work.

Verdict:— Death caused by an explosion; nobody held responsible.

July 5th.—Bart Bannon, an employee of the Montreal Crushed Stone Co. Ltd., was instantly killed when he was sitting on a pedestal upholding insulators and was electrocuted.

July 15th.—An accident happened at about 7.15 A.M. on the tressel which crosses Notre-Dame street at the King mine. Jos. Dion, age 52, foreman of the Asbestos Corporation Limited, was killed while walking on the track, and to avoid one train, he was caught by another behind.

For the purpose of conveying sand, the engine of a train is placed in the rear because it would be impossible to see the signals of the switchman and discharger of cars were it placed in the front.

At the time of the accident, as far as can be gathered, two trains were going in a northern direction, one on each track. Dion, who was chief foreman of the electrical department at the mine, had gone to the tressel to give out an order to his men. It is thought that he saw the train approaching on one track, and crossed to the next one without noticing that another train was on that track at the same time. The victim was knocked down by the train and dragged a considerable distance without either the brakeman or the driver being conscious of it.

Philémon Gagné said that he saw the cars jump, and thought an axle had broken on one of the cars. He immediately gave the signal to stop; however, despite the immediate application of the brakes, the train could not stop instantly, and it was then realized that the train of twelve cars had passed over the victim.

Death was accidental; caused by the congestion of the lungs, following a rupture of the thorax.

July 26th.—Leger Charboneau, 32 years of age, was fatally injured in the machine room of the A. Dupré quarry. At the time he was engaged in taking a belt off a pulley, when he was caught by the belt and crushed between it and the shaft.

August 10th.—Following injuries which he had received while repairing an electric car, James Kidd of the Montreal Crushed Stone Co., Ltd., succumbed on August the tenth.

August 23rd.—Jos. Lemay, age 27, driller employed at the King asbestos mine, died having fractured his spine when a head-rock from the side of the pit and drill fell on him.

The victim was in charge of a drill when the accident took place on the walls of No. 8 pit of the King mine, and was preparing a place to install his drill. An eye-witness states that at this place there was a head-rock weighing about three tons, and that it was supported on the slope by a wedge. Lemay removed this wedge and turning his back to the head kicked it four or five times which consequently loosened it. It rolled down carrying with it the victim and the steel bars of the drill. He descended the slope with the landslide to a distance of fifty or sixty feet, where he was picked up dead amongst the debris.

Verdict:—Death caused by fracture of the spinal column, followed by congestion of the lungs.

August 30th.—A fatal accident occurred at 3.45 P.M. at the Chutes mine of Clericy Mines, Ltd., situated to the south of the Kinojevis river, on Clericy river.

Mat. McKee, age 37, sinker and shaft boss for the above company was killed by falling down the shaft on the property. Four men were drilling with hand-steel at the bottom of the shaft, which is 45 feet in depth.

McKee told them that he was going up to the surface to get some more steel and went up the ladder.

Labonté, who was McKee's partner saw him close the counter-weighted doors, at the collar of the shaft, presumably to place the

steel in the bucket. He then opened the doors and lowered the bucket to the collar of the shaft. He next closed one door, probably to stand on it to tie the steel together.

It is evident that in raising this door, his foot slipped or he overbalanced himself with the result that he fell down the shaft, the door closing with a bang as he fell. The three men at the bottom heard the door close and crouched in corners. None of them were injured. McKee received a fractured skull and other severe fractures and died in a few minutes.

The victim was a Finlander and single. He was an experienced sinker.

At the inquest, in Rouyn, the jury brought in a verdict of accidental death through carelessness of the deceased.

September 3rd.—Nap. Carrier, age 26, employed as oiler by the Asbestos Corp., Ltd. was killed while engaged in taking a belt off a pulley, and being caught by it was thrown violently against some boards nearby.

It was early in the morning; about 7. The crushing and drying machinery had been started. On the third floor of the building, two belts had been installed and were connected to picking tables to separate the granite from the serpentine, which should not pass through the asbestos separating machines. It was noticed, only after the machinery had been set in motion, that one of the belts was broken. Carrier, in charge of the oiling of the machinery, was alone on this floor with a young boy and another labourer by the name of Paquet.

The victim removed the belt with his hand. The conducting shaft continued rotating and kept the belt in motion around the pulley. He told the boy to go up on the foot-bridge which was nearby, to disengage the strap and to attach it to a nail which was there. It seems that Carrier took hold of the belt with his two hands and tried to hold it. The pulley had some glue on it, and the belt stuck fast so that the victim was probably held in the belt and drawn to the shaft, where he rotated with the pulley. While turning he had his head crushed on three planks which he used as a platform while oiling.

Paquet immediately stopped the motor, and the victim fell to the ground dead.

Verdict:—Accidental death due to fractures of the skull.

October 6th.—At 9.30 A.M. on this day a fatal accident took place at the King mine of the Asbestos Corporation Ltd. Adonais Lacroix, age 23, labourer for the above company, died as a result of a fractured skull when he was struck on the head by a rock rebounding from three different levels, while charging his bucket.

On the first and second landings labourers were engaged in charging buckets; while the victim in company with his father were at the foot of the third landing. At 145 feet above the first level, that is 233 feet above the third, two labourers, boring holes, had completed one boring and were preparing another bench in order to set up a drill. After having warned the men on the first landing, they began to clear away the surface of the bench with shovels. In this manner they lossened the stones which fell down the slope. It was one of these stones, weighing ten or fifteen pounds which struck Lacroix on the temple after rebounding from the first to the second landing and then on to the victim.

He was rendered unconscious and brought to the hospital where he died in the evening.

Verdict:—Death caused by the fracture of the skull.

October 19th.—Arthur Robidoux, 27 years of age, jackman employed at the Jeffrey mine by the Canadian Johns-Manville Co., Ltd. died of an infection of the outer tissue, after having had his skull fractured.

The victim, in company with Jules Labonté, was repairing a torch while standing near a jackarm, when the boom of the shovel swung towards them; as it started away the rack bolt in the dipper stick broke and fell towards the men, hitting Robidoux on the head behind the right ear. The victim, against the orders of the hospital, returned to work the next day and worked three shifts when he became ill. He was taken to the hospital and later transported to the Montreal Western Hospital where he died on Nov. 4th.

October 26th.—A fatal accident occured to G. B. Gartshore, aged 56, mine carpenter, working at the station on the first level of the Horne Mine.

Three carpenters, of which the victim was one, were engaged in bolting packing timber on to the wall plates at the first level, for raising the rails the necessary height above the cage chair

stops. Each piece of packing timber is fastened to the plate by means of two 5-8 inch by 14 inch bolts. There is lagging outside the plates, and to reach the end of the bolts to screw on the nuts, it was necessary either to cut away the lagging, or to reach over into the shaft compartment.

It is surmised that Gartshore had attempted to screw a nut on the center bolt by reaching over into the compartment, and that the down-coming cage caught his arm and draged him in between the wall-plate and the cage. The clearance between these is about one and a half inches.

Death was instantaneous. The head was nearly severed from the body. The skull was fractured. The right arm was torn from its socket and the rectal region was torn and the bowels protruding.

At the inquest, the jury returned a verdict of accidental death.

November 5th.—While cleaning dirt out of a dump cart, Wilfrid Brochu, age 35, labourer was fatally injured when he was struck on the head by the cart which suddenly righted itself.

The victim was standing on the ground with his head and shoulders between the car door and floor of the car. As the dirt slid out, and fellow workmen were cleaning it out, the car-body unexpectedly righted and the victim's head was caught by the door and crushed to the floor of the car. He was rushed to the hospital at once, but died within 24 hours of the accident.

Verdict:—Death caused accidentally by fracture of the skull and compound fracture of the jaw.

November 5th.—Gerard Pomerleau, age 19, labourer of the Johnson's Company was the victim of an accident at 7.15. He was in charge of the overseeing of a rubbish conveyor in the mill with Joseph Bédard. On the preceding night the conveyor became blocked, and thinking that the belt was not tight enough to transmit the necessary power, it was changed in the morning. The mill was than set in operation and Roy, the foreman, did not leave the premises until he was sure all was in working order. Bédard and Pomerleau were left to clean the pits and see that the appliances worked properly.

According to the testimony of Bédard, the victim began

picking gravel off the belt with his hand in order to prevent it from entering between the belt and the pulley. Bédard warned him of the danger of having his hand caught.

Meanwhile Roy, who had been gone five minutes, wishing to see how the belt was working, returned and found it stopped. The victim was found with his left arm held between the belt and the pulley. His head was crushed against the frame holding up the shaft.

The belt was immediately cut and the victim released. On examination it was found that suffocation due to compression of the thorax caused the death.

Verdict:—Accidental death.

November 12th.—André Grondin, aged 18, a labourer employed in the slopes at the Tetreault mine of the British Metal Corporation died of injuries received by a rock falling from the roof.

Nobody seemed aware of the accident, for the victim was found on the ground bathing in blood. The deceased was 18 years of age.

December 13th.—Not heeding the warnings concerning the morning blast, Selwyn Barber, age 28, steam shovel operator of the Canadian Johns-Manville Co., Ltd., was killed by flying rock when the blast went off while he was in the pit.

The victim, with three others, went into the pit just before the blasting, and sought shelter at a drill cabin. Barber's three companions entered the cabin while he remained outside nearby. These heard the explosion and the fragments falling on the roof of the cabin. On coming forth from their refuge, they found the victim lying a few feet from the cabin unconscious and bleeding badly.

He was immediately rushed to the hospital were he succumbed a few hours later. The following report was given by the doctor at the inquest: "I have examined the body of the deceased, found a large laceration about 4 or 5 inches long on the left side of the head. The skull on the left side was badly fractured and the bone was dispressed about one half inch. There was an extensive injury in the brain. The above was sufficient to cause the death."

FATAL ACCIDENTS DURING THE YEAR 1927

IN MINES, QUARRIES AND ANNEXED BUILDINGS IN THE PROVINCE OF QUEBEC

No.	Date	Name of Operator	Name of Injured	Age	Occupation	Nature of Wound and Cause of Accident
1	Jan. 18	Keasby & Mattison Co.	John Gagnon	43	Foreman	Injured was between the engine and a crane, holding a pole used to push the crane on a siding. The pole slipped, causing the engine to crush injured's head against the crane.
2	Mar. 12	St. Ursule Gravel-Pit	Edouard Lesage	62	Labourer	Death resulting from fractured pine. Gravel fell from side of pit and crushed him.
3	Mar. 23	Asbestos Corporation, Limited	Vicente Barber	35	Drill helper	Fracture of spine and collar bone. Was helping in bearing down loose rocks. When a 400 to 450 pound stone fell and struck his leg.
4	April 20	Jay Copper Gold Mines, Ltd.	Petre Kulas	31	Miner	Skull crushed and internal injuries. Victim was engaged as a shaft-man and at time of accident was engaged in mucking from the bottom of the shaft. One bell had been given from the bottom to hoist a loaded bucket, which appears to have been hoisted about 50 feet, when the friction clutch slipped and allowed the bucket to drop.
5	April 24	Canadian Johns-Manville Co., Ltd.	Georges Hensworth	49	Foreman	While a chute conveying oversize rock became blocked, victim had to walk under spout, which suddenly became unblocked and discharged on rock down on him.
6	May 16	Canadian Johns-Manville Co., Ltd.	Wm. Wilfred James	40	Tractor man	While driving his tractor with a dirt scraper chained on the rear axle, the nose of the scraper stuck in the dirt and blocked. Victim changed gears and put on full power which caused the front end of the tractor to rear up, and whole machine turned over pinning victim under it.
7	May 23	Eustis Mines	George Astbury	29	Miner	He was employed on electrically driven waggons, when the trolley wire broke and threw him down.
8	June 19	North American Magnesite Producers, Ltd.	Gordiano Bianchi	29	Miner	In hoisting skip of stone from the bottom of the surface a piece of rock fell from the bucket, striking the victim on the head and killing him instantly.
9	June 29	Makamic Mines, Inc.	Arthur Lessard	33	Miner	He was testing caps. With the open box on his lap and taking a short length of fuse in one hand, he lit the fuse and then threw it away. He was testing another cap in this way when the box exploded.
10	June 29	Makamic Mines, Inc.	G. Lépine	28	Miner	He was standing 4 or 5 feet from Lessard when the accident occurred. Infection in a cheek wound was the cause of death.

FATAL ACCIDENTS DURING THE YEAR, 1927.—*Continued.*

No.	Date	Name of Operator	Name of Injured	Age	Occupation	Nature of Wound and Cause of Accident
11	July 4	Ribago Mine	Mike Smith	45	Miner	At the time of the accident, he had lit too short fuses and had dropped them in the holes. All three shots went off before he reached the landing.
12	July 5	Montreal Crushed Stone Co., Lts	Bert Bannon	....	.....	Electrocuted by sitting on pedestal upholding insulators.
13	July 15	Asbestos Corporation, Ltd	Jos. Dion	52	Foreman	Walking on track, he was caught by train from behind.
14	July 14	A. Dupré	Leger Charbonneau	32	Foreman	Was taking off belt from pulley, when he was caught by the belt and crushed between it and the shaft.
15	Aug. 10	Montreal Crushed Stones Co., Ltd	Jas. Kidd	....	.....	Died of injuried while repairing electric car.
16	Aug. 23	Asbestos Corporation, Limited	Jos. Lemay	29	Driller	Spine fractured. A head rock from side of pit and drill fell on him.
17	Aug. 30	Clericy Mines, Limited	Mat. McKee	30	Labourer	Fractured skull and other severe fractures. He was at the collar of the shaft, to place steel in the bucket, when his foot slipped or he overbalanced himself with the result that he fell down the shaft.
18	Sept. 3	Asbestos Corporation, Ltd	Nap. Carrier	26	Oiler	Was taking belt off pulley and was caught by same and thrown against roof of building.
19	Oct. 6	Asbestos Corporation, Ltd	Adonias Lacroix	23	Labourer	Fractured skull. Loose rock rebounded from three different levels and fell on head of victim, when he was charging his bucket.
20	Oct. 19	Canadian Johns-Manville Co., Ltd.	Arthur Robidoux	27	Labourer	Victim was repairing a torch near a steam-shovel. As the boom of shovel started away, a rack bolt in dipper stick broke and fell, hitting the victim on head behind right ear. He returned to work next day worked three shifts and became ill.
21	Oct. 27	Horne Copper Corporation	E. B. Gartshore	56	Timberman	Killed by cage when engaged in bolting timber to wall plate in shaft.
22	Nov. 5	Canadian Johns-Manville Co., Ltd.	Wilfred Brochu	35	Labourer	He was cleaning dirt out of dump-car which had been dumped backwards. As dirt sled out of car, car-body righted unexpectedly, and victim had his head caught by car-door and crushed to floor of car.
23	Nov. 5	Johnson's Company	Gérard Pomerlau	19	Labourer	Victim was found hand caught between belt and pulley. His head was crushed against the frame holding up the shaft.
24	Nov. 15	British Metal Company, Ltd	André Grondine	18	Labourer	Victim was struck by heavy stone, which fell from from pit.
25	Dec. 13	Canadian Johns-Manville Co., Ltd.	Selwyn-Barber	28	Steam-Shovel operator	He went down into the pit after being warned that the regular morning blast had not been shot The blast went off as he was standing beside the cabin and a rock hit him on the back of the head.

LIST OF THE PRINCIPAL OPERATORS AND OWNERS OF MINES AND QUARRIES IN THE PROVINCE OF QUEBEC

ASBESTOS

Name of Operator	Address	Location of Mine
Asbestos Corporation, Limited	Canada Cement Co. Bld'g., Montreal	Thetford, Coleraine and Broughton Tps.
Bell Asbestos Mine Corporation	Thetford Mines, Que.	Thetford Tp.
Canada Asbestos & Chrome Co.	Black Lake	Coleraine Tp.
Canadian Johns-Manville Co., Ltd	Asbestos	Shipton Tp.
La Compagnie d'Amiante Boisvert, Ltée.	St Calixte de Kilkenny	Kilkenny Tp.
Johnson's Company	Thetford Mines	Coleraine and Thetford Tps.
Northern Asbestos Co., Ltd.	Thetford Mines	Thetford Tp.
Quebec Asbestos Corporation	East Broughton	Broughton Tp.
Public Industrials Corporation	c-o S. H. Dolbear, 17 Battery Place, New York City, N. Y.	Tingwick and Wotton Tps.

CHROME

Name of Operator	Address	Location of Mine
Asbestos Corporation, Limited	Canada Cement Co. Bld'g, Montreal	Coleraine Tp.
Quebec Chrome Corporation, Ltd.	Black Lake	Coleraine Tp.
Victory Chrome Mines, Limited	c-o Mr. Aurélien Boyer, 1430 St. Denis St., Montreal	Garthby Tp.

COPPER

Name of Operator	Address	Location of Mine
Abana Mines, Limited	95 St. James St., Montreal	Desmeloizes and Dupuy Tps.
Abbey Mines, Limited	205 St. James St., Montreal	Desmeloizes Tp.
Abondé Mines, Limited	134 King St. East, Toronto, Ont.	Desmeloizes Tp.
Alamac Mines, Limited	Rm. 704, Power Building, Montreal	Desmeloizes Tp.
Aldermac Mines, Limited	c-o Holden & Murdoch, barristers, Rm. 603, 2-8 King St., Toronto, Ont.	Boischatel Tp.
Altura Mines, Limited	c-o Ph. Morel, 360 St. Louis St., Montreal	Desmeloizes Tp.
Amity Copper & Gold Mines, Ltd.	623 Bank of Hamilton Bld'g, Toronto, Ont.	Boischatel Tp.
Amos Copper & Gold Mines, Ltd.	720 Insurance Exchange Bld'g, Montreal	Dalquier Tp.
Amulet Mines, Ltd.	Rm. 716, 120 St. James St., Montreal	Rouyn, Duprat & Dufresnoy Tps.
Andean Copper Mines, Ltd.	Rm. 606, Blackburn Bld'g, Ottawa, Ont.	Boischatel Tp.
Archean Mines Development Co., Ltd.	New Birks Bld'g, Montreal	Joannes, Cléricy & Dufresnoy Tps.
Area Mines, Limited	Rm. 716, 120 St. James St., Montreal	Duprat, Dufresnoy & Rouyn Tps.
Argyle Consolidated Gold Mines, Ltd.	Plaza Bld'g, Ottawa, Ont.	Dasserat Tp.
Arrowhead-Clericy Mines, Ltd.	c-o N. Chauvin, 232 St. James St., Montreal	Clericy Tp.
Astoria Rouyn Mines, Ltd.	74 Sparks St., Ottawam Ont.	Rouyn Tp.
Bagamac Rouyn Mines, Ltd.	c-o Lang & Michener, National Bldg., 347 Bay St., Toronto, 2, Ont.	Rouyn Tp.
Bedford Mines, Limited	c-o C. O. J. MacAlpine, secy-treas., 503 Excelsior Life Bld'g., Toronto, Ont.	Duprat Tp.

COPPER—Continued

Name of Operator	Address	Location of Mine
The Blake Development Co., Ltd	36 King St., London, E. C. 2, Engl'd	McKenzie, Obalski Tps.
Albert Blanchette	Arthabaska	Chester Tp.
Bona Vista Mining Corporation	c-o J. A. Migneron, 445 St. François-Xavier St., Montreal	Destor, Aiguebelle & Rouyn Tps.
Buckingham Mines, Limited	c-o Alfred Savard, 126 St. Peter St., Quebec	Destor, Duprat & Boischatel Tps.
Buffalo Rouyn Gold Mining Synd	Rm. 107, Holbrook Chambers, Sparks St., Ottawa, Ont	Boischatel Tp.
Calumet-Rouyn Mines, Ltd	136 St. James St., Montreal	Rouyn Tp.
Campbell Mines, Ltd	120 St. James St., Montreal	Boischatel Tp.
Canadian American Copper Refining Co., Ltd	c-o W. J. Wheeler, 87 Notre-Dame St., W., Montreal	Bolton Tp.
Canadian Copper Co	Arthabaskaville	Chester Tp.
The Canadian Exploration, Limited	c-o Savard & Savard, 126 St. Peter St., Quebec	Desmeloizes Tp.
Caribou Copper Corporation	202 Blackburn Bld'g, Ottawa, Ont	Bourlamaque Tp.
Champlain Copper Mines, Ltd	c-o H. J. Picard, Investment banker, 14 King St. E., Toronto, Ont	
The Chance Mining Company, Limited	c-o Alex. Gray, 1032 Dorchester St., W., Montreal	Boischatel Tp.
Chibougamou Lake Prospecting Synd	South Porcupine, Ont	McKenzoe Tp.
Clericy Consolidated Mines, Limited	11-12 Carleton Chambers, 74 Sparks St., Ottawa, Ont	Clericy Tp.
The Cogomet Mining Co., Ltd	c-o J. A. Ewing, Sun Life Assurance Co. of Canada, Montreal	Dufay & Dasserat Tps.
La Cie Minière Ville-Marie-Rouyn	c-o Aug. Chenier, Ville-Marie	Rouyn Tp.
Coniagas Mines, Ltd	50 Ontario St., St. Catherines, Ont	Boischatel, Montbray & Duprat Tps.
Consolidated Copper & Sulphur Co	Capelton	Ascot Tp.
Consolidated Mining & Smelting Co. of Canada, Ltd	511 St. Catherine St. W., Montreal	Duprat Tp.
Copperfields Developments, Limited	c-o James W. York, barrister, Carleton Chambers, Ottawa, Ont	
Copper Hill Mines, Ltd	c-o W. R. Dillon, advocate, 301 Metcalfe St., Ottawa, Ont	Dufresnoy Tp.
Cyclone Rapids Mines, Ltd	New Birks Bld'g, Montreal	Cléricy Tp.
The Dalquier Mining Co., Ltd	c-o A. Harvey, Amos	Dalquier Tp.
Demara Mines, Limited	Rm. 116, 190 St. James St., Montreal	Desmeloizes Tp.
Desmeloizes Mines, Ltd	c-o C. G. Each, 544 Darling St., Montreal	Desmeloizes Tp.
Dorval Mining Co., Ltd	Box 7, Buckingham	Barraute, Fournière Tps.
Dufault Lake Mines, Ltd	4350 St. Denis St., Montreal	Dufresnoy Tp.
Dunlop Consolidated Mines, Ltd	c-o Johnston, Grant, Dods & MacDonald, Bank of Hamilton Bldg., Toronto, Ont	Montbray & Duprat Tps.
Duparquet Copper Gold Syndicate	1106 Canadian Pacific Bld'g, Toronto	Duparquet Tp.
Duparquet Mining Co., Ltd	c-o J. McWilliam, Room 514, Hospital St., Montreal	Duparquet Tp.
Duprat Mines, Ltd	c-o L. A. McKinley, 606 Blackburn Bld'g, Ottawa	Duprat Tp.
East Bay Copper Co., Ltd	c-o Budleigh Faraday, Rouyn	
Eplett Metcalfe Mining Co., Ltd	North Temiskaming	Montbray & Duprat Tps.
The Northern Explorators, Ltd	Amos	
Fairwood Mining Syndicate	c-o Wilf. J. Grace, 75 Sparks St., Ottawa, Ont	Boischatel Tp.
Fisher Quebec Prospecting Syn., Ltd	Timmins, Ont	Landrienne Tp.
Fripp Mines Ltd	c-o J. P. Callaghan, 120 St. James St., Montreal	
Frontenac Copper Mines, Ltd	c-o J. J. Harold, 86 Notre-Dame St., Montreal	Clericy & Dufresnoy.
The Garthby Copper Mining Co	Garthby	South Garthby Tp.
Guyenne Mining Co., Ltd	72 St. Peter St., Quebec	Guyenne Tp.
Harricana Quebec Mining Syndicate	c-o A. K. Roberts, barrister, Cobalt, Ont	Malartic Tp.
Harvie Mining Co., Ltd	912 New Birks Bld'g, Montreal	Cléricy Tp.
Harvie Mining Exploration Co., Ltd	New Birks Bld'g	Cléricy Tp.
Hecla Consolidated Mines, Ltd	824 Insurance Exchange Bld'g, Montreal	Rouyn Tp.

COPPER—Continued

Name of Operator	Address	Location of Mine
Horne Copper Corporation	802 Royal Bank Bld'g, 2-8 King St. E., Toronto, 2, Ont.	Rouyn Tp.
Horvic Mining, Limited	c-o H. A. Paquette, M.E., 245 Wilson Ave., Montreal	
Hughes Development Corp'n, Ltd	316 Excelsior Life Bld'g, Toronto, 2, Ont.	Dasserat Tp.
Jay-Copper Gold Mines, Ltd	Rm. 76 Canada Life Bld'g, 189 St. James St., Montreal	Dalquier Tp.
Jubilee Mining Syndicate	c-o Beament & Beament, Canada Life Bld'g, Ottawa, Ont.	Boischatel Tp.
Kamiskotia Rouyn Syndicate, Ltd	c-o D'Arcy D. Bogue, 180 St. James St., Montreal	Hébécourt Tp.
Kegamione Development & M'g Co., Ltd.	c-o J. G. Prickett, Rouyn	Royal-Roussillon & Languedoc Tp.
Kinojevis Mining Co., Ltd.	Temiscamingue	
Labyrinth Lake Mining Syndicate	c-o Luxenberg & Levinter, 72 Queen St. W., Toronto, Ont.	Dasserat Tp.
Lakeside Mines, Ltd	c-o Tilley, Johnston, Thomson & Parmenter, 255 Bay St., Toronto, 2, Ont.	Rouyn Tp.
Lapona Copper Mines, Ltd	c-o J. Fortin, Rouyn	Cléricy Tp.
La Reine Mine, Ltd	c-o Louis Brochu, Amos	Desmeloizes Tp.
La Salle Copper Gold, Limited	462 St. Frs.-Xavier St., Montreal	Boischatel Tp.
Locarno Copper Mines, Ltd	c-o Larmonth & Olmsted, Carleton Chambers, Ottawa, Ont.	Dufresnoy Tp.
Mabell Mines, Ltd	710 New Birks Bld'g, Montreal	Cléricy Tp.
Macot Mines, Limited	c-o Albert MacDonald, Rouyn	Dufresnoy Tp.
McDougall Mines, Ltd	503 Excelsior Life Bld'g, Toronto, Ont.	Duprat & Dufresnoy Tps.
Memphremagog Mining Co	c-o Geo. E. Smith, 324 Langlois Ave., Windsor, Ont.	Potton Tp.
Midland Base Metals Corporation	165 Main St., Hull	Desmeloizes Tp.
Montbray Copper Mines Synd	McKeown Block, North Bay, Ont.	Montbray Tp.
The Montbray Mines, Ltd	c-o J. A. R. McCuaig, 602 Temple Bld'g, Toronto, Ont.	Montbray Tp.
Montbray Rouyn Mines, Limited	36 King St. East, Toronto 2, Ont.	Montbray Tp.
Mount Royal Copper Gold Syndicate	c-o Macdonell & Boland, 2, Toronto St., Toronto, Ont.	Boischatel Tp.
National Base Metals Corp	165 Main St., Hull	Desmeloizes Tp.
New Liskeard Mines, Limited	North Temiskaming	Hébécourt Tp.
Nichols Copper Co	Capelton	Ascot Tp.
Nipissing Mining Co	Cobalt, Ont.	Montbray & Rouyn Tps.
Noranda Mines, Ltd	2 King St. East, Toronto. 2, Ont.	Rouyn Tp.
Norman Mines, Limited	419 Blackburn Bld'g, Ottawa, Ont.	Béarn Tp.
North Country Exploration M'g Co., Ltd.	c-o R. J. Mercur & Co., 309 Coristine Bldg., Montreal	Dalquier Tp.
Northern Mineral Areas, Ltd	1106 C. P. R.y Bldg., Toronto, 2, Ont.	Destor Tp.
North Waite Mining Co., Ltd	c-o K. A.MacPhadyen, Rouyn	Duprat & Dufresnoy Tps.
Obalski Mining Syndicate, Ltd	Rm. 201, 17 St. James St., Montreal.	
O. K. Development Syndicate	c-o Phelan & Richardson, Federal Bld'g, Toronto, Ont.	Boischatel Tp.
The Ollier Mines, Ltd	c-o Dr. F. W. Blakeman, Shefford Apts. Ottawa, Ont.	
Ontabec Copper Corporation, Ltd	c-o J. W. York, barrister, Carleton Chambers, Ottawa, Ont.	
Ontario Quebec Mining Co., Ltd	c-o H. G. Smith, B.A., 2, Toronto St., Toronto, Ont.	Dufresnoy Tp.
Oriole Mines, Limited	501-504 Continental Life Bld'g, Toronto, 2, Ont.	Montbray Tp.
Pontiac Mines & Power Co., Ltd	Rm. 105, 190 St. James St., Montreal.	Dalquier Tp.
Pontiac Rouyn Mines, Ltd	c-o Millar & Hunter, 59 Yonge St., Toronto, Ont.	Rouyn Tp.
Quebec Centre Mines, Ltd	c-o Godfrey, Lawson & Corcoran, 10 Adelaide St. E., Toronto, 2, Ont.	Boischatel Tp.
Quebec City Mining Syndicate	111 Mountain Hill, Quebec	Rouyn Tp.
Quebec Copper Exploration Co	c-o J. G. MacKay, Pres., Crown Trust Co., Montreal	
Quebec Copper Gold Mines, Ltd	167 Main St., Hull	Boischatel Tp.
Quebec Copper Syndicate	c-o E. D. Ranck, The Coleman Lamp & Stove Co. Ltd., Queen St. East at Davies Ave., Toronto, Ont.	Duprat Tp.
Rex Copper Mines, Limited	c-o René Chenevert, Rm. 725, 190 St. James St., Montreal	

COOPER—Continued

Name of Operator	Address	Location of Mine
Rhyolite Rouyn Mines, Ltd.	c-o Chs. Parent, 111 Mountain Hill, Quebec	
Riada Rouyn Mines, Ltd.	21 Richmond St. W., Toronto, Ont.	Dufresnoy Tp.
Ribago Copper Corporation, Ltd.	Haileybury, Ont.	Boischatel Tp.
Robb-Montbray Mines, Ltd.	Rm. 1007 Excelsior Life Bldg., Toronto Ont.	Montbray Tp.
Rouyn-Boischatel Development Co., Ltd.	c-o W. H. Thorburn, Broker, Royal Bank Bldg., Toronto, 2, Ont.	Boischatel & Montbray Tps.
Rouyn City Mining Co., Ltd.	c-o Redmond Quain, advocate, Hull.	Rouyn & Boischatel Tps.
St. Anthony Gold Mines, Ltd.	255 Bay St., Toronto, Ont.	Montbray Tp.
Seymour Copper Mines, Ltd.	Rouyn	
Sphinx Rouyn Copper Mines, Ltd.	405-406, Canada Cement Bldg., Montreal	Dufresnoy Tp.
Startford Copper Mining Synd., Ltd.	c-o Robt. Poisson, Thetford Mines	
Syndicat Marilac	c-o J. F. Daniel, St. Esprit, Montcalm Co.	Joannes Tp.
Syndicat Miljour	Ville-Marie	Dasserat Tp.
Le Syndicat Minier Union de Rouyn, Ltée.	Rouyn	
A. Tarut, trustee for Tiama Expl'n Co. Ltd.	c-o Alderson & MacKay, New Birks Bldg., Montreal	Louvicourt Tp.
Thompson-Hay Mining Syndicate	c-o E. J. Thompson, Amos	Cadillac Tp.
Thormoor Copper Mines Ltd.	c-o A. B. White, 404 Royal Bank Bldg., Toronto, Ont.	Rouyn & Boischatel Tps.
Trethewey-Montbray Mining Syndicate	21 King St. East, Toronto, 2, Ont.	Montbray Tp.
Trudeau Mining Syndicate	Rm. 918, 120 St. James St., Montreal	Barrauté Tp.
Turtle Lake Mining Company	c-o J. A. Parent, 193 Main St., Hull.	Dufay Tp.
United Copper Syndicate, Limited	Rm. 708, 190 St. James St., Montreal	
United Mines of Quebec, Ltd.	Rm. 708, 190 St. James St., Montreal	
United Verde Extension Mining Co.	233 Broadway, New Tork City, N.Y. U. S. A.	Rouyn Tp.
Waite-Ackerman-Montgomery Mines, Ltd.	c-o J. Y. Murdoch, Rm. 603, Royal Bank Bld'g, 2'8 King St., W., Toronto, Ont.	Duprat & Dufresnoy Tps.
Wasamac Mines Ltd.	c-o Frank Callaghan, Rm. 815, 190 St. James St., Montreal.	
Wickham Mining Co., Ltd.	South Durham	Wickham Tp.
Windfall Rouyn Mines, Ltd.	402-404 New Birks Bld'g, Montreal.	Clericy Tp.

FELDSPAR

Name of Operator	Address	Location of Mine
Bon Ami, Limited	Drawer 166, Hochelaga, Montreal.	Aylwin Tp.
Wm. & J. J. Cameron	Buckingham	Buckingham & Derry Tps.
Edmond Couture	Glen Almond	Buckingham Tp.
Robt. J. Donaldson	Glen Almond	Buckingham Tp.
John Laneville	Buckingham	Buckingham Tp.
Emmanuel Lapointe	Notre-Dame de la Salete	Portland W. & Derry Tps.
Laurentian Felspar Co., Ltd.	c-o J. A. Davis, 86, Notre-Dame St., W. Montreal	Portland E. Tp.
O'Brien & Fowler, Ltd.	114 Wellington St., Ottawa, Ont.	Derry Tp.
Alfred Parcher	Glen Almond	Derry Tp.
Gonz. Pelneaud	Glen Almond	Buckingham Tp.
Winning & Elliott	Poupore	Buckingham Tp.

GARNET

Name of Operator	Address	Location of Mine
Labelle Nickel & Garnet Co., Ltd.	c-o J. E. Moranville, 1242 Berri St., Montreal	Joly Tp.
Langlade Garnet Syndicate	c-o Deno Blais, 111 Mountain Hill, Quebec	Baudin Tp.

GOLD

Name of Operator	Address	Location of Mine
Acadia Exploration Co	109 Mountain Hill, Quebec	Destor & Hébécourt Tps.
Aconda Mines, Ltd	c-o Alderson and MacKay, New Birks Bld'g, Montreal	Boischatel Tp.
The Adsit Mining Corporation	c-o The Horne Copper Corp'n, Noranda	Rouyn Tp.
Ahearn Mining Co	c-o Redmond Quain, 59 Main St., Hull	Boischatel & Rouyn Tps.
Allied Mines, Limited	Rm. 708, 190 St. James St., Montreal	Dufresnoy Tp.
Alpha Gold Mine, Ltd	96 St. Joseph St., Quebec	Weir & Cranbourne Tps.
Anglo Canadian Explorers, Ltd	c-o John Kerry 189 St. James St., Montreal	
Anglo-French Exploration Co., Ltd	334-5 Confederation Life Bldg., Toronto, Ont	Cadillac Tp.
Argonaut Consolidated Mines, Ltd	Rm. 307, 145 St. James St., Montreal	Dasserat Tp.
Armstrong Mines, Limited	165 Main St., Hull	Boischatel Tp.
Arntfield Gold Mines, Ltd	921 New Birks Bld'g, Montreal	Boischatel Tp.
Atlas Gold Mines, Ltd	c-o A. & E. F. Singer, 85 Richmond St. W., Toronto, Ont	Cadillac Tp.
Bellehumeur Mining Co., Ltd	153 St. James St., Montreal	Laverlochère Tp.
Bell River Mining Syndicate	88 St. Peter St., Quebec	Louvicourt Tp.
Bell Thompson Mining Syndicate	c-o E. J. Thompson, New Liskeard, Ont	Rouyn Tp.
Boischatel Mines, Limited	Rm. 604, Blackburn Bldg., Ottawa, Ont	Boichatel & Dasserat Tps.
Boischatel-Quebec Mines, Ltd	Suite 1008-9, 120 St. James St., Montreal	Boischatel Tp.
Bourlamaque Gold Mines	c-o R. W. Norrington, suite 3052, 120 Broadway, New York City, N. Y	Bourlamaque Tp.
Bras d'Or Gold Mining Co	c-o H. L. Echenberg, Rm. 414, 205 St. James St., Montreal	
British Metal Corporation (Canada), Ltd. (The)	Rm. 706, 263 St. James St., Montreal	Montauban Tp.
Brownell Exploration Syndicate	c-o G. F. Brownell, 50 Church St., New York City, N. Y	Joannes Tp.
Brownlee Gold Mines, Limited	Rouyn, Que	Rouyn Tp.
Buffalo Rouyn Mines, Ltd	c-o Holden & Murdoch, Royal Bank Bld'g, Toronto, 2, Ont	Boischatel, Duprat and Rouyn Tps.
Buffalo Rouyn Syndicate	c-o W. J. Grace, 75 Sparks St., Ottawa, Ont	Rouyn Tp.
Cambrian Gold Mines, Ltd	145 St. James St., Montreal	Malartic Tp.
Canadian Mines Development Synd	c-o Louis M. Atwell & Co., 190 St. James St., Montreal	Boischatel Tp.
Canadian Rouyn Syndicate	c-o L. B. Masterson, Box 91, Rouyn	Rouyn Tp.
Capital Rouyn Gold Mines, Ltd	Standard Bank Bld'g, Ottawa, Ont	Boischatel & Rouyn Tps.
Cartier-Malartic Gold Mines, Ltd	Rm. 523, 190 St. James St., Montreal	Malartic Tp.
La Chateleine Gold Mines, Ltd	193 Main St., Hull	
Clark-Bourlamaque Gold Mines, Ltd	c-o J. A. Jacobs, 282 St. Catherine St. W., Montreal	Bourlamaque Tp.
The Colonial Metals Expl'n, Ltd	308 Bank of Toronto Bld'g, Montreal	Dubuisson & Clericy Tps.
Confederation Mines, Ltd	190 St. James St., Montreal	Boischatel & Destor Tps.
Consolidated Copper and Sulphur Co	C pelton	Ascot Tp.
Corona Mines, Ltd	c-o A. Savard, 126 St. Peter St., Quebec	Duprat & Dasserat Tps.
Crewoken Mining Co	200 Laurier Ave., Hull	
Crown Reserve Consolidated Mines	18 Toronto St., Toronto, Ont	Dasserat & Boischatel Tps.
Dasserat Rouyn Goldfields, Ltd	c-o Smellie & Lewis, 7-48 Sparks St., Ottawa, Ont	Rouyn Tp.
John Dalton	Timmins, Ont	Dubuisson Tp.
Destor Mines, Limited	17 St. James St., Montreal	Destor Tp.
Don Rouyn Gold Mines, Ltd	14 Hospital St., Montreal	Malartic, Rouyn, Dufresnoy and Destor Tps.
The H. A. Driver Syndicate	c-o R. F. Kelly, 632 Dunlop Ave. Montreal	Rouyn Tp.
Dubec Mining Co., Ltd	Room 322, Birks Bldg., Montreal	Dufresnoy Tp.
The Dubuisson Gold Mining Co., Ltd	Timmins, Ont	Dubuisson Tp.
Dufferin Exploration, Ltd	96 St. Joseph St., Quebec	Cranbourne Tp.
Duprat Exploration Syndicate	c-o Louis M. Atwell & Co., 190 St. James St., Montreal	Duprat Tp.
Duprat Mines, Limited	126 St. Peter St., Quebec	Duprat & Montbray Tps.
Dupuy Mines, Ltd	Rouyn	Desmeloizes Tp.
The Eureka Mines, Ltd	Amos	
Explorer Syndicate	c-o W. M. Goodwin, Ste-Anne de Bellevue	Rouyn Tp.

GOLD—Continued

Name of Operator	Address	Location of Mine
Farrell Rouyn Mines, Ltd.	c-o Holden & Murdoch, Rm. 603, 2-8 King St. E., Toronto 2, Ont.	Rouyn Tp.
Federal Gold & Copper Mines, Ltd.	Federal Bld'g, Toronto, Ont	Montbray Tp.
Federal Investment Co.	Rm. 905, 407 McGill St., Montreal	Dufresnoy Tp.
Fisher Quebec Gold Mines, Ltd.	75 Sun Life Bld'g, Toronto, Ont.	Landrienne Tp.
Fiske Gold Mines, Ltd.	63 Main St., Hull	Rouyn & Boischatel Tps.
J. M. Forbes	Timmins, Ont.	
Fournière Gold Mines, Ltd.	52 Spadina Ave., Toronto, Ont.	Fournière Tp.
Frontier Syndicate	c-o Henry J. Stewart, Rm. 523, 190 St. James St., Montreal	Rouyn Tp.
Garwar Quebec Mining Co., Ltd.	315 Confederation Life Bld'g, Toronto 2, Ont.	Malartic & Desmeloizes Tps.
J. J. Godfrey	29 Broadway, New York	Dubuisson Tp.
Gold Star Ltd.	96 St. Joseph St., Quebec	Dalquier & Trécesson Tps.
Graham-Bousquet Mining Corp'n.	Rm. 815, 190 St. James St., Montreal	Bousquet Tp.
Granada Rouyn Mining Co., Ltd.	Rouyn	Rouyn Tp.
Grover-Daly Mines, Ltd.	Rm. 523, 190 St. James St., Montreal	Dufresnoy Tp.
Guyenne Mining Co., Ltd.	72 St. Peter St., Quebec	Guyenne Tp.
Harburn Mines, Ltd.	616 Canada Cement Bldg., Montreal	
The Harricana Amalgamated Gold Mines, Inc.	c-o C. E. d'Auteuil, 81 St. Peter St., Quebec	Dubuisson Tp.
Charles M. Heron	P. O. Box 287, Cobalt, Ont.	Duprat, Dasserat & Montbray Tps.
Horne Copper Corporation	802 Royal Bank Bld'g, 2-8 King St. E., Toronto, 2, Ont.	Rouyn Tp.
Hub Lake Montbray Mines, Ltd.	c-o Robt. Fennell, 357 Bay St., Toronto Ont.	
The Hull-Rouyn Mining Co., Ltd.	c-o Soublière-Lepage Ltd., Champlain, St., Hull	Joannes Tp.
The Huronian Belt Co., Ltd.	Suite 52, 302 Bay St., Toronto, Ont.	Boischatel Tp.
The Kenojevis Syndicate	c-o Roy Driscoll, Temiscamingue	Rouyn Tp.
Kerr Lake Mining Co.	61 Broadway, New York	Dufresnoy Tp.
Kienawisik Gold Mines, Limited	Amos	Dubuisson Tp.
Knickerbocker Expl'n Co., Ltd.	Rm. 110, 145 St. James St., Montreal	Duprat Tp.
The Knox Wiltsey Syndicate	New Liskeard, Ont.	Rouyn Tp.
Lake Duprat Mines, Limited	Trusts & Guarantee Bld'g, 302 Bay St., Toronto, Ont.	Duprat Tp.
The Lake Fortune M'g Co., Ltd.	227 Lemoyne St., Montreal	Boischatel Tp.
Lake Maron Gold Mines, Ltd.	London, Ont.	Dasserat Tp.
La Rose-Rouyn Mines	36 King St. East, Toronto, Ont.	Rouyn Tp.
The Larose Mines, Ltd.	c-o Geo. Parent, 70 St. Paul St., Quebec	Rouyn Tp.
Lartic Mining Corp'n, Ltd.	c-o Holden & Murdoch, Suite 603, 2-8 King St. E., Toronto, 2, Ont.	Malartic Tp.
Laurentian Gold Mines, Ltd.	c-o H. J. Stewart, Rm. 523, 190 St. James St., Montreal.	Malartic Tp.
Laurier Mines, Ltd.	c-o Laurier Finance Corp'n Ltd., 120 St. James St., Montreal	Dufresnoy Tp.
Laval-Quebec Mines, Ltd.	Ch. 307, 145 St. James St., Montreal	Rouyn, Duprat & Boischatel Tps.
The Lepine Gold Mines	c-o J. A. Préville, 440 Place Jacques-Cartier, Montreal	Destor Tp.
London Canadian Gold Mines, Ltd.	c-o J. P. Dransfield, 6 Tennis Crescent, Toronto, Ont.	Rouyn Tp.
Lukis, Stewart Syndicate	Rm. 88, 232 St. James St., Montreal	Joannes Tp.
Makamic Mines, Inc.	Rm. 303, 205 St. James St., Montreal	Dalquier & Destor Tps.
The Malartic Extension Gold Mines, Ltd.	Amos	Dubuisson Tp.
Malartic Gold Mines, Ltd.	503 Excelsior Life Bld'g, Toronto, Ont.	Fournière Tp.
Malartic Mining Co.	200 Laurier Ave, Hull	Fournière Tp.
Malartic Mining Corp'n.	c-o J. P. Crerar, Victoria Chambers, Ottawa	Malartic Tp.
Malartic Syndicate	c-o W. R. Sweeney, 134 King St. E., Toronto, 2, Ont.	Malartic Tp.
Marclay Mines, Ltd.	c-o Kilmer, Irving & Davis, 10 Adelaide St. E., Toronto, Ont.	Boischatel Tp.
McCuaig Rouyn Mines Syndicate, Ltd.	c-o H. S. Bryant, 65 Ainslie Road, Montreal W.	Rouyn Tp.
Mineral Explorations, Ltd.	1210 Bank of Hamilton Bld'g, Toronto, Ont.	Montbray Tp.
Monargo Mines, Ltd	217 Bay St., Toronto, Ont.	Montbray & Rouyn Tps.
Montreal Exploration Co., Ltd.	Suite 1009, 120 St. James St., Montreal	Bousquet & Cadillac Tps.

GOLD—Continued

Name of Operator	Address	Location of Mine
Montreal Rouyn Mines, Ltd.	Room 405, Insurance Exchange Bld'g, 190 St. James St., Montreal	Rouyn, Dufresnoy & Boischatel Tps.
National Exploration and Holdings Co.	c-o H. J. Stewart, Rm. 523, 190 St., James St., Montreal	Malartic, Fournière & Guyenne Tps.
Newbec Mines, Limited	c-o Holden & Murdoch, Suite 603, 2-8 King St., Toronto, 2, Ont	Dufresnoy & Rouyn Tps.
Nipissing Mining Co	165 Broadway, New York	Montbray Tp.
Norman Mines, Limited	c-o N. B. Davis, 114 Wellington St., Ottawa, Ont	Bearn & Dalquier Tps.
Norrington Development Co., Ltd.	421-22, 120 St. James St., Montreal	La Sarre Tp.
The Northern Quebec Goldfields & Exploration Co.	Three Rivers	Bousquet & Joannes Tps.
Norwesque Gold Mines, Limited	802 Reford Bld'g, 217 Bay St., Toronto Ont	Cadillac & Malartic Tps.
Notre-Dame Mines, Limited	Rm. 22, 15A Notre-Dame St. W., Montreal	Rouyn, Joannes, Dufresnoy & Montbray Tps.
M. J. O'Brien, Ltd.	816 Ottawa Electric Bld'g, Ottawa, Ont	Cadillac Tp.
Ontabec, Limited	707 Blackburn Bldg., Ottawa, Ont	Rouyn, Dufresnoy & Boischatel Tps.
Osisko Lake Mines, Ltd.	503 Excelsior Life Bld'g, Toronto, Ont.	Rouyn Tp.
The Osisko Rouyn Exploration Co., Ltd.	1154 Beaver Hall Square, Montreal	Rouyn Tp.
Pioneer Mining Corporation, Limited	Suite 52, 302 Bay Street, Toronto, Ont.	Boischatel Tp.
Pontiac Holdings, Ltd.	Box 111, Amos	Desmeloizes & Fournière Tps.
Porcupine Crown Mines, Ltd.	Suite 413, Canadian Pacific Express Bld'g., Montreal	Guyenne Tp.
Porcupine Goldfields Dev. & Finance Co., Ltd.	407 Canada Cement Co. Bldg., Montreal	Fournière & Boischatel Tps.
Powell-Rouyn Gold Mines Co., Ltd.	c-o Harris & Keachie, 26-28 Adelaide St. W., Toronto, Ont	Rouyn Tp.
Power & Mines Corp'n, Ltd.	1130 St. Patrick St., Montreal	
Precambrian Mining Syndicate	533 Phillips Square, Montreal	
Precious Metals Corporation, Ltd.	310, 145 St. James St., Montreal	Rouyn Tp.
Premier Guyenne Mines, Ltd.	Box 41, Taschereau	Guyenne Tp.
The Quebec Prospectors, Ltd.	38 King St. West, Toronto, 2, Ont	Montbray Tp.
Raymont Mines, Ltd.	Hull	
W. A. Read	Rm 929, 250 Park Ave., New York City, N. Y.	Bourlamaque Tp.
Realty & Mines of Rouyn City, Ltd.	c-o Lang & Michener, 347 Bay St., Toronto, 2, Ont	Rouyn Tp.
Auguste Renault	Ville-Marie	Dasserat Tp.
Renfrew Gold Mine Syndicate	c-o T. M. Costello, Renfrew, Ont	Gaboury Tp.
Richardson Mining Syndicate	702 Northern Ontario Bld'g, Toronto, Ont	Rouyn Tp.
Richburn Mining Co., Ltd.	c-o B. H. Porteous & Co., 17 St. John St., Montreal	Clericy Tp.
Rouyn Kennecott Mines, Ltd.	Room 76, 189 St. James St., Montreal	Duprat Tp.
Rouyn Lake Gold Mines Ltd.	c-o P. Bédard, Kapuskasing, Ont.	Rouyn Tp.
Rubec Mines, Ltd.	Room 707, 190 St. James St., Montreal	Montbray Tp.
Ste-Anne's Syndicate	Room 8, 338a St. James St., Montr'l	Obalski & McKenzie Tps.
Servais Gold Mines, Ltd.	Grimsby, Ont	
Siscoe Gold Mines, Limited	Keefer Bld'g, 698 St. Catherine St. W., Montreal	Varsan & Dubuisson Tps.
Société Minière Canadienne	c-o W. Chénier, Ville-Marie	Duhamel Tp.
Sphinx Abitibi Mines Corp'n	80 St. Peter St., Quebec	Barrauté Tp.
Stabell Gold Mines, Limited	228 King St. East, Toronto	Dubuisson Tp.
Stadacona Rouyn Mines, Limited	Room 611, 120 St. James St., Montreal	Rouyn Tp.
Syndicat du Lac Dufault	4350 St. Denis, St., Montreal	Dufresnoy Tp.
Syndicat Minier Inter-Nos, Limitée	c-o J. A. Champoux, Rm. 21, 15A Notre-Dame St., W., Montreal	Clericy Tp.
Le Syndicat Minier de Ville-Marie	Ville-Marie	Rouyn Tp.
Chas. Taylor	66 King St., St. Catherines, Ont	La Reine Tp.
Thompson Cadillac Mining Co., Ltd.	Amos	Cadillac, Rouyn & Malartic Tps.
Tonopah Canadian Mines Co.	570 Bullit Bld'g, Philadelphia, Pa.	Boischatel, Duprat & Montbray Tps.
Toronto Rouyn Syndicate	P. O. Box 103, Rouyn, Que.	Rouyn Tp.

GOLD—Continued

Name of Operator	Address	Location of Mine
Towagmac Exploration Co., Ltd	921 New Birks Bld'g, Montreal	Boischatel Tp.
Twin Contact Gold Syndicate	c-o Ernest Greene, 112-113 Sparks Chambers, Ottawa, Ont	Rouyn Tp.
Twin Lakes Mining, Corp'n	101 Mount Pleasant Road, Toronto, Ont	Boischatel Tp.
Unison Gold Mines, Limited	1119 Castle Bld'g, Montreal, Que	Dubuisson Tp.
United Mining Securities, Ltd	c-o P. A. Masson, Room 2, Sommer Bld'g, Montreal	
Valco Mines Company	8 Sault-au-Matelot St., Quebec	Malartic Tp.
Venus Gold Mines, Limited	104 St. John St., Quebec	Barrauté Tp.
Vickers-Porcupine Mines, Ltd	Suite 401, 34 King St. E., Toronto, 2, Ont	Boischatel & Rouyn Tps.
The Victoria Syndicate, Ltd	Coniston, Ont	Rouyn Tp.
Victory Gold Mines, Limited	36-38 King St. East, Toronto, 2, Ont	Dasserat Tp.
Wigfol Mining Syndicate	c-o F. J. Foley & Co., 4 Hospital St., Montreal	Joannes Tp.
Wiltsey-Coghlan Mines, Ltd	217 Bay St., Toronto, Ont	Rouyn Tp.

GRAPHITE

Name of Operator	Address	Location of Mine
Canadian Graphite Corp'n	1193 Phillips Place, Montreal	Boyer Tp.
Crucible Graphite Co., Ltd	52 Spadina Ave., Toronto, Ont	Buckingham Tp.

IRON AND TITANIC IRON

Name of Operator	Address	Location of Mine
American Titanic Iron Co., Ltd	c-o J. H. Boisvert, Parliament Bld'gs, Quebec	St. Urbain Tp.
Baie St. Paul Titanic Iron Ore Co	J. O. Paré, manager, Baie St. Paul	St. Urbain Tp.
The Loughborough Mining Co., Ltd	Sydenham, Ont	St. Urbain Tp.
Manitou Iron Mining Company	1465 Bleury St., Montreal	Beresford Tp.
Titanium Products Corp'n	c-o C. G. Piché, 43 Ste-Foye Road, Quebec	Bourget Tp.

KAOLIN

Name of Operator	Address	Location of Mine
The Canadian China Clay Co., Ltd	c-o National Trust Co. Ltd., 153 St. James St., Montreal	Amherst Tp.

MAGNESITE

Name of Operator	Address	Location of Mine
International Magnesite Co., Ltd	Calumet	Harrington Tp.
Scottish Canadian Magnesite Co., Ltd. and North American Magnesite Producers, Ltd	Operating jointly: address: Magnesite.	Grenville Tp.

MICA

Name of Operator	Address	Location of Mine
W. Ahearn	538 McLaren St., Ottawa, Ont	Hull Tp.
Thos. H. Argall	Pointe du Lac	Wentworth Tp.
Blackburn Bros., Ltd	Blackburn Bld'g, Ottawa, Ont	Templeton Tp.
Brown Bros.	Cantley	Hull Tp.
Canadian Amber Mica Co.	P. O. Box 246, Station B, Montreal	Portland West Tp.
The Capital Mica Co., Ltd.	Ottawa, Ont	Hull Tp.
Osborn Carman	Farm Point	Hull Tp.
Z. E. Chenier	Rockland, Ont	Grenville Tp.
Isidore Chislock	High Falls	Portland West Tp
S. H. Cross	Farm Point	Hull Tp.
W. C. Cross	Cascades	Hull Tp.
David de Rainville	St. Pierre de Wakefield	Wakefield Tp.
Estate J. Ellard	Wright	Alleyn Tp.
H. T. Flynn	33 Montcalm St., Hull	Cameron Tp.
J. B. Gauthier	Boîte 226, Buckingham	Buckingham Tp.
William Gowan	Holland Mill	Portland West Tp.
Kent Brothers	Kingston, Ont	Hull Tp.
K. Kilbourne	Magnesite	Grenville Tp.
E. M. Lapointe	Notre-Dame de la Salette	Derry Tp.
The Laurentide Mica Co., Ltd	P. O. Box 911, East Pittsburg, Pa	Templeton East Tp.
The Loughborough Mining Co., Ltd	c-o General Electric Co., Schenectady, N. Y.	
A. G. Martin	236 Besserer St., Ottawa	Hull Tp.
Geo. W. McElroy	Davidson's Corners	Templeton Tp.
R. J. McGlashan & Co.	190 Montcalm St., Hull	Wakefield Tp.
Estate Late Alexander McLaurin	c-o John McLaurin, Ste-Rose de Lima.	Templeton Tp.
C. McManiman	Rawdon	Rawdon Tp.
The Mineral Products Co., Ltd	702 Northern Ontario Bld'g., 330 Bay St., Toronto, 2, Ont	
Jos. Morris	Wilson's Corners	Wakefield Tp.
J. B. Nault	Rivière Desert.	Cameron Tp.
O'Brien & Fowler	114 Wellington St., Ottawa, Ont	Villeneuve Tp.
Perkins Mining Co	Pointe Gatineau	Templeton Tp.
Ernest Poulin & Thos. Holmes	Cantley	Hull Tp.
Geo. & Chas. Wallingford Co.	495 Clarence St., Ottawa, Ont	Templeton Tp.

MINERAL WATER

Name of Operator	Address	Location of Mine
Abenakis Springs Co., Ltd	c-o W. E. Watt, Abenakis Springs	St. Francois du Lac
L'Eau Naturelle Purgative de Chambord, Ltée	c-o David Doré, Desbiens, Lake St. John Co.	Metabetchouan.
Alfred Ferland	7976 Drolet St., Montreal	St. Benoit.
Chas. Gurd & Co., Ltd	1016 Bleury St., Montreal	Varennes Tp.
Radnor Water Co.	c-o Hudson's Bay Co., 93 Main St., Winnipeg, Man	Radnor Forges
Cyprien Roy	St. Germain, Kamouraska county	L'Islet Plate.
St. Léon Mineral Water Co.	St. Léon, Maskinongé county	St. Léon

MOLYBDENITE

Name of Operator	Address	Location of Mine
The Height of Land Co	c-o S. P. Wilson, 316 St. James St., Montreal	Preissac Tp.
Indian Lake Molybdenite Co.	c-o G. T. Hamilton, 128 Wellington St., Ottawa, Ont	Masham Tp.
The Molybdenite Reduction Co., Ltd	66 St. James St., Montreal	Lacorne Tp.
St. Maurice Mines Co., Ltd.	1011 Chesnut St., Rm. 520, Philadelphia, Pa., U. S. A.	Preissact Tp.
Henry E. Wood Mining Co.	Quyon	Onslow Tp.

OCHRE AND IRON OXIDE

Name of Operator	Address	Location of Mine
Thos. H. Argall	Pointe du Lac	Pointe du Lac.
Canada Paint Co., Ltd	Red Mill	Red Mill
Montmorency Paint Products Co., Ltd	83 Craig St. W., Montreal	Pelletier Tp.
Paint River Oxide Co	39 St. Paul St., Quebec	Iberville Tp.

PEAT

Name of Operator	Address	Location of Mine
Sim P. Leclerc	Pont Rouge	Pont Rouge

PHOSPHATE

Name of Operator	Address	Location of Mine
Blackburn Bros	711 Blackburn Bld'g., Ottawa, Ont	Templeton Tp.
Capelton Fertilizer Co	Buckingham	
Pierre Carisse	Perkins Mills	Templeton Tp.
J. B. Gauthier	P. O. Box 226, Buckingham	
Kent Bros	Kingston, Ont	Hull Tp.
Edward Watts & Noble	1478 Yonge St., Toronto, Ont	Dodds Lake
Bush Winning	Notre-Dame de la Salette	Portland Tp.

PYRITES

Name of Operator	Address	Location of Mine
Consolidated Copper & Sulphur Co	Capelton	Ascot Tp.

SILICA, ROCK AND SAND

Name of Operator	Address	Location of Mine
Buckingham Mining Co., Ltd	658 Dorchester St., Montreal	Buckingham Tp.
Wm. & J. J. Cameron	Buckingham	Buckingham Tp.
Canada Glass Products, Ltd	193 Main St., Hull	East Templeton
Robert J. Donaldson	Glen Almond	Buckingham Pp.
Euclide Montpetit	Melocheville	Melocheville
O'Brien & Fowler	114 Wellington St., Ottawa, Ont	Derry Tp.
G. Pedneaud	Buckingham	Buckingham Tp.
Silico, Limited	37 Mayor St., Montreal	St. Canut.

SILVER

Name of Operator	Address	Location of Mine
The British Metal Corp'n (Canada), Ltd	Room 706, 263 St. James St., Montreal	Montauban Tp.
Consolidated Copper & Sulphur Co	Capelton	Ascot Tp.
Horne Copper Corporation	802 Royal Bank Bld'g, 2-8 King St. E., Toronto, Ont.	Rouyn Tp.
Jay-Copper Gold Mines, Ltd	Room 76, Canada Life Bld'g, 189 St. James St., Montreal	Dalquier Tp.

TALC

Name of Operator	Address	Location of Mine
Asbestos Corporation, Ltd	Thetford Mines	Thetford Tp.
Albert Blanchette	Arthabaskaville	
Jos. Houle	St. Antoine de Pontbriand	Thetford Tp.
The Megantic Mining Co.	c-o C. V. M. Temple, 175 Spadina Road, Toronto, Ont	Ireland Tp.
N. S. Parker	Eastman	Bolton Tp.
Geo. R. Pibus	Knowlton	Bolton Tp.
Reed Realties, Limited	Rm. 705, 145 St. James St., Montreal	Thetford Tp.
Robertsonville Soapstone & Quarry Co., Ltd	c-o Oliva Cyr, Thetford Mines	Broughton Tp.

ZINC AND LEAD

Name of Operator	Address	Location of Mine
Adanac Mines Exploration, Limited	111 Mountain Hill, Quebec	Montauban Tp.
Alpha Mining Co.	Wright Mine, Temiscamingue	Duhamel Tp.
The British Metal Corporation (Canada), Ltd	Room 706, 263 St. James, St., Montreal	Montauban Tp.
Cascapedia Mine	c-o Dominique Levesque, New Carlisle	Lemieux Tp.
The Consolidated Mining & Smelting Co. of Canada, Ltd	706 Drummond Bld'g, 511 St. Catherine St., Montreal	Bouchette & McKenzie Tps.
Eastern Quebec Lead & Zinc Mines, Ltd.	Room 310, 145 St. James St., Montreal	Montauban Tp.
Federal Zinc and Lead Co., Ltd	Room 620, 511 St. Catherine St. W., Montreal	Lemieux Tp.
Gaspé Mines	c-o Hon. John Hall Kelly, New Carlisle.	Lemieux Tp.
J. H. Imrie & Philip D. Gendreau	Lake George, N. Y., U.S.A.	St. Fabien
Lyall & Beidelman	c-o P. Lyall & Sons, Rm. 602, Drummond Bld'g, Montreal	Lemieux Tp.
Montauban Expl'n Syndicate	109 Mountain Hill, Quebec	Chavigny Tp.
Montauban Metal Corp'n	c-o Maurice Boisvert, 80 St. Peter St., Quebec	Montauban Tp.
New Richmond Mining Co.	New Richmond	Cascapedia River.
North American Mining Co.	New Carlisle	Lemieux Tp.
The Pioneer Mining Corporation, Ltd	Suite 52 Trusts & Guarantee Bld'g., 302 Bay St., Toronto, Ont	Lemieux Tp.
Prospection Minière Ste-Anne	Ste-Anne des Monts, Gaspé County	Christie Tp.
St. Lawrence Zinc and Lead Mines, Ltd.	c-o A. MacKinnon, Pres., Rm. 705, 205 St. James St., Montreal	Montauban Tp.

BRICK

Name of Operator	Address	Location of Plant
Ascot Tile & Brick Co., Ltd	Ascot Corner	Ascot Tp.
La Brique Citadelle, Ltée (Citadel Brick, Ltd.)	14 St. Joseph St., Quebec	Boischatel and L'Islet Station.
La Brique de Chicoutimi, Ltée	8 Tessier St., Chicoutimi West	Chicoutimi City.
La Brique de Scott, Limitée	8 St. Joseph St., Quebec	Scott Junction.
La Briqueterie St-Laurent, Ltée (St. Lawrence Brick Co., Ltd.)	71 St. James St., Montreal	Laprairie.
La Cie de Briques de l'Islet, Ltée	64 de la Gare ,Montmagny	L'Islet Station.
Jos. Gravel	Actonvale	Actonvale.
David T. Hodgins	Box 148, Shawville	Clarendon Tp.
Lennoxville Brick and Tile Co., Ltd	Lennoxville	Lennoxville.
L'Industrielle de St-Tite, Ltée	St. Tite	St. Tite
Emile Longpré	St. Félix de Valois	St. Félix de Valois.
National Brick Co. of Laprairie, Ltd	Canada Cement Bld'g, Montreal	Laprairie & Delson Jct.
Frank Oliver	Ormstown	Ormstown.
Proulx Bros.	Richmond	Cleveland.

CEMENT

Name of Operator	Address	Location of Plant
Canada Cement Company, Limited	Box 290, Station B, Montreal	Montreal East and Hull.
La Cie de Ciment Nationale, Limited	90 St. James St., Montreal	Montreal East.

GRANITE

Name of Operator	Address	Location of Quarry
Jos. Bergeron	No. 18, 1st Street, Shawinigan Falls	Almaville.
Pitre Bergeron	Rang St. Ignace, Chicoutimi West	Rang St. Ignace.
Aug. Bernier	Roberval	Roberval Tp.
Berry and Redicker	Beebe	Stanstead Tp.
David Blackburn	Rang St. Pierre Chicoutimi	Rang St. Pierre.
J. A. Bourbonnais	Vaudreuil	Rigaud.
Brodie's Limited	1070 Bleury St., Montreal	Guenette, Mount Johnson and Graniteville.
Joseph Brunet	663 Côte des Neiges Road, Montreal	Chatham Tp.
La Cité de Grand'Mère	City Hall, Grand'Mère	St. Louis Road, Ste-Flore.
Cloutier Bros	Box 101, Beebe	Stanstead.
Cozzolino, Keating & Co., Reg'd	Jonquières	Arvida.
Delwaide & Goffin	12-16 du Havre St., Chicoutimi	Rang St. Thomas.
Arthur Dumas Cie, Enrg	Rivière-à-Pierre	Bois Tp.
Dumas & St. Pierre	Rivière-à-Pierre	Bois Tp.
William Duncan	R. R. No. 1, Beebe	Stanstead Tp.
Wm. Haselton	Beebe	Stanstead.
Lacasse & Boulais	Box 23, Beebe	Stanstead Tp.
Edouard Leclerc	St. Joachim	St. Joachim.
Robert McIntosh	R. R. No. 1, Beebe	Stanstead Tp.
S.B. Norton	Beebe Jct.	Stanstead Tp.
Thomas Pagé	Chicoutimi	Bagot
Arthur Perron	Rivière-à-Pierre	Bois Tp.
R. M. Reed & Son	R. R. No. 1, Beebe	Graniteville.
Riverin & Riverin	Chicoutimi Centre	Bagot Tp.
Silver Granite Co.	117 Abraham Hill, Quebec	St. Samuel Station.
Stanstead Granite Quarries Co., Ltd	Beebe	Graniteville.
La Ville de Chicoutimi	Chicoutimi	Chicoutimi Tp.
Fortunat Voyer & Frère	Rivière-à-Pierre	Bois Tp.

LIME

Name of Operator	Address	Location of Quarry
Arnaud & Beaudry	16 Ste-Angelique St., Joliette	L'Assomption Avenue.
Adolphe Barron & Frère	St. Dominique de Bagot	St. Dominique de Bagot
Arthur Boivin	Pont Rouge, Portneuf County	Pont Rouge.
Canada Lime, Limited	c-o J. N. Gingras, sec., St. Marc des Carrières	St. Marc des Carrières.
The Dominion Lime Co	East Angus	Lime Ridge.
Colbert Ducharme	Guigues	Guigues Tp.
Octave Héon	St. Louis de France	Rang Ste-Marguerite.
Joseph Lalumière	St. Dominique de Bagot	St. Dominique de Bagot.
Laurentian Stone Co	c-o Wright & Co., 250 Catherine St., Ottawa	Hull Tp.
Limoges, Fils & Cie	552 Poupart St., Montreal	Montreal.
Edouard Naud	St. Marc des Carrières	St. Marc.
Standard Lime Co., Ltd	Joliette	Joliette & St. Marc des Carrières.
Stinson-Reeb Builders Supply Co	230 Dorchester St. W., Montreal	Dandurand & Delorimier Streets, Montreal.

LIMESTONE

Name of Operator	Address	Location of Quarry
The Bathurst Lumber Co., Ltd	Bathurst, N. B	Port Daniel East.
Jos. Pitre Beaudry	Taché St., Joliette	Joliette.
Ulric Boileau	4869 Garnier St., Montreal	Montreal.
Canada Carbide Co., Ltd	Power Bld'g, 83 Craig St. W., Montreal	Stanbridge.
Canada Cement Co., Ltd	Box 290, Station B, Montreal	Hull.
La Carrière Cap St. Martin	c-o Edgard Désormeaux, 2402 rue St. Hubert, Montreal	Cap St. Martin.
Carrière St. Laurent, Ltée	Giffard, Beauport	Giffard
La Carrière de St. Louis de France, Ltée	St. Louis de France, Co. Champlain	St. Louis de France.
Arthur Charron	Village Bélanger	Cap St. Martin.
Chateau Richer Quarry, Ltd	c-o A. A. Baker, Chateau Richer	Chateau Richer.
Cité de Salaberry de Valleyfield	c-o Raphael Bélanger, C. E., Valleyfield	Valleyfield.
La Cie de Calcaire de Chambord, Ltée	Chambord Jct	Chambord Jct.
La Commission du Parc de Maisonneuve (Maisonneuve Park Commission)	c-o J. Crépeau, City Hall, Montreal	Maisonneuve Park.
Aldéric Cousineau	5697 St. Urbain St., Montreal	Montreal.
DeLorimier & Rogers Quarries Co	4901 Iberville St., Montreal	Montreal.
F. X. Deraiche	Port Daniel Est	Gascon West.
Deschambault Quarry Corporation	52 St. Paul St., Quebec	St. Marc des Carrières.
Dominion Lime Co	East Angus	Limie Ridge.
Arthur Dupré	5665 Papineau St., Montreal	Côte St. Michel.
Cyrille Durocher	5383 Notre-Dame St. E., Montreal	Montreal East.
Alphonse Faubert	Bellevue Station, Ville de Léry	De Léry Tp.
Adélard Filion	Lachute	Lachute.
Fuger & Smith, Ltd	Pointe-Claire	Pointe-Claire.
Gustave Gagnon	Village Bélanger	Village Bélanger.
Martin Gagnon	7794 St. André St., Montreal	Villeray.
Olivier Gauthier	St. Marc des Carrières	St. Marc
Gingras & Frère Ltée	St. Marc des Carrières	St. Marc.
J. H. Giroux & Cie Ltée	27 Plaisance St., Trois-Rivières	Deschambault.
La Carrière Gravel, Ltée	Chateau Richer	Chateau Richer.
Kennedy Construction Co., Ltd	310 Shaughnessy Bld'g, Montreal	St. François de Sales and Actonvale.
Emile Lapointe	St. Dominique de Bagot	St. Dominique de Bagot.
Joseph Lapointe	12034 Montée St. Laurent, Montreal	Montée St. Laurent.
The Laurentian Stone Co., Ltd	c-o Wright & Co., Inc., 250 Catherine St., Ottawa, Ont	Hull.
Victor Lecrenier	5110 Chabot St., Montreal	Cap St. Martin.
Maisonneuve Quarry Co., Ltd	4740 Iberville St., Montreal	4415 Rosemont Boulevard.
O. Martineau & Fils, Ltée	371 Marie-Anne St., Montreal	Montréal and St. Marc des Carrières.
Montreal Crushed Stone Co., Ltd	c-o J. E. Vanier, 2020 Union Ave., Montreal	St. Vincent de Paul
Montreal Cut Stone, Ltd	800 Bellechasse St., Montreal	St. François de Sales.
Naud & Darveau	St. Marc des Carrières	St. Marc des Carrières.
Oscar Noël & Cie	41 Leduc St., Hull	Wrightville.
O'Connor Bros	Huntingdon	Godmanchester Tp.
Jos. Pagé	Charlesbourg West	Charlesbourg West.
Damien Paquette	Village Bélanger	Cap St. Martin
Lévis Paquette & Cie	Cap St. Martin	Cap St. Martin.
John Peterson	Hull	Hull.
Quinlan, Robertson & Janin, Ltd	702 Sherbrooke St. West, Montreal	Montreal.
St. Laurent Quarry, Ltd	Cap St. Martin	Cap St. Martin.
Saint Michel Quarry, Limited	St. Michel de Laval	St. Michel de Laval.
La Société Coopérative Agricole de Calcaire de Missisquoi	Bedford	Standbridge Tp.
Standard Lime Co., Ltd	Joliette	St. Paul de Joliette.
Magloire Théorêt	Bellerive, Valleyfield	Nouveau Salaberry-Valleyfield.
Maxime Therrien	Village Bélanger	Cap St. Martin.
Nap. Tremblay	Joffre Avenue, Hull	Hull.
Varin & Barbin	7775 St. Denis St., Montreal	Chemin Côte St. Michle.
The Villeray Quarry Co., Ltd	4740 Iberville St., Montreal	Montreal.
Elzéar Verreault, Ltée	194 du Pont St., Quebec	Giffard.
West End Quarry, Limited	Troie Ave. & Decelles Ave., Montreal	Montreal.

MARBLE

Name of Operator	Address	Location of Quarry
Wallace Sandstone Quarries, Ltd	904 Transportation Bldg., Montreal	Philipsburg.
White Grit Co	Hurdmand Rod, Ottawa, Ont	Portage du Fort.

POTTERY

Name of the Operator	Address	Location of Quarry
W. & D. Bell	1286 St. Vallier St., Quebec	Petite Rivière Road.
La Cie de Briques de L'Islet, Ltée	64 de la Gare, Montmagny	L'Islet Station.
Citadel Brick, Ltd	14 St. Joseph St., Quebec	L'Islet Station.
David T. Hodgins	Shawville	Clarendon Tp.
Montreal Terra Cotta Co., Ltd	511 St. Catherine St. W., Montreal	Lakeside.
National Brick Co. of Laprairie	Canada Cement Bld'g, Montreal	Delson.
Standard Clay Products, Ltd	St. Johns	St. Johns.

SAND

Name of Operator	Address	Location of Quarry
A. Bédard	Pont Rouge	Pont Rouge.
Joseph Bélanger	Ascot Corner	Ascot.
J. A. Benoit	Mont St. Grégoire	Mont Johnson.
Emile Bérard	R. R. No. 2, Mont St. Grégoire	Rang Versailles.
Joseph Bernier	Belœil village	Belœil.
Jos. Blais, Enrg	8 Mont-Marie Ave., Levis	St. Romuald.
Robert Boa	R. R. No. 3, Lachute	Lachûte.
The Bonner Sand & Ballast Co	110 Bridge St., Montreal	South Durham.
Edmond Bourgeois	St. Albert de Warwick	St. Albert.
Delphise Brault	St. Alexandre	St. Alexandre.
F. Xavier Brault	St. Dominique de Bagot	St. Dominique de Bagot.
Eugène Brodeur	St. Hilaire	St. Hilaire.
Brouillet Sand & Gravel Co., Ltd	Rawdon	Ste-Julienne.
Canadian Import Co	83 Dalhousie St., Quebec	River St. Lawrence.
Ed. Cauchon	140, 11th St., Limoilou	Beauport Est.
Gilbert Chartier	Boîte 884, Joliette	Rang du Vieux Moulin.
J. E. Cloutier	100 Cartier St., Chicoutimi	Chicoutimi.
City of Coaticook	Box 150, Coaticook	Coaticook.
The City of Sherbrooke	c-o Thos. Tremblay, C.E. Sherbrooke	Orford Tp.
The City of Montreal	c-o The City Engineer, City Hall, Montreal	St. Félix de Valois.
La Compagnie de Sable, Limitée	3rd Avenue, Limoilou	St. Charles River.
Consolidated Sand Company, Ltd	270 Ottawa St., Montreal	Three Rivers & Lake of Two Mountains.
Albert Côté	St. Fulgence de Chicoutimi	Tremblay Tp.
Elie Côté	Hébertville	Caron Tp.
Henry Dalcourt	St. Félix de Valois	St. Félix de Valois.
François Demers	276 Commercial St., St. Romuald	St. Romuald.
Philias & J. B. Dionne	Coaticook	Coaticook.
J. E. A. Dubuc	Chicoutimi	N. D. de la Terrière.
J. A. Dufresne & Cie	Shawinigan Falls	Almaville.
Phidime Fortin	R. R. No. 2, St. Armand Station	St. Armand Ouest.
Mme J. B. A. Gagné	Boischatel	Boischatel.
Ls P. Gagnon	St. David	St. Télesphore.
Isidore Gauthier	Rivière du Moulin	Rivière du Moulin.
Ildège Granger	Ste-Marie Salomé	Ste-Marie.
Apollinaire Grenier	Beauport	Beauport.
Arsène Guertin	Belœil village	St. Hilaire.
Francis X. Guérin	R. R. No. 2, Ormstown	St. Malachie.
Dr. J. B. F. Houde, (Estate A. B. Hart)	159a Notre-Dame St., Trois-Rivières	Trois Rivières.
The Independent Sand Co	4740 Iberville St., Montreal	Montreal.
Laurentide Co., Ltd	Grand'Mère	Grand'Mère.

SAND—Continued

Name of Operator	Address	Location of Quarry
Jos. Lawrence	St. Félix de Valois	St. Félix de Valois.
Aldabert Leclerc	Belœil village	Rouville Parish.
Pierre Lépine	St. Pierre de Charlesbourg	St. Pierre de Charlesbourg.
Arthur Létourneau	St. Rémi	St. Rémi.
Annie McGuire	Buckingham	Buckingham.
Wm. McNeil	West Brome	West Brome.
J. T. A. Melançon	12 Bord de l'Eau, Grand'Mère	Rang des Hêtres.
Jos. H. Monast	Mont St. Grégoire	Rang Loreau.
Municipal Corporation of Hébertville	Notre-Dame d'Hébertville	Lac Bouchette.
Nelson River Construction Co	Roo 535, Cathcart St., Montreal	Coaticook.
Oka Sand and Gravel Co., Ltd	248 McCord St., Montreal	Lake of Two Mountains.
G. H. Paradis	Hébertville	Caron Tp.
Pitre Paradis	Hébertville	Caron Tp.
Jos. Pednault	Kénogami	Jonquière Tp.
T. Potvin & E. Gagnon	P. O. Box 95, St. Joseph d'Alma	St. Joseph d'Alma.
Luc Poulin	Mont St. Grégoire	Mont St. Grégoire.
Chas. Raymond	Transportation Bldg, Montreal	Ste-Julienne.
Laurent Raymond	140 Brooks St., Sherbrooke	Ascot Tp.
Léonce Rochefort	291 Notre-Dame St., Cap de la Madeleine	Cap de la Madeleine.
Gustave Richard	Ste-Marie Salomée	Ste-Marie.
J. C. L. Rivest	St. Charles Borromée de Joliette	St. Charles Borromée.
Charles Robichaud	Ste-Marie Salomée	Ste-Marie Salomée.
Emile Robitaille & Aldée Lemieux	St. Dominique de Bagot	Bagot.
Ovide Roy	Hébertville	Caron Tp.
Sorel Sand Co., Ltd	82 Montcalm St., St. Joseph de Sorel	Rang du fleuve.
Standard Sand, Ltd	Joliette	St. Félix de Valois.
Napoléon St. Louis	Ste-Ursule	Fontarabie.
Maurice Thibault	40 Fusey St., Cap de la Madeleine	Cap de la Madeleine.
Henri Tremblay	St. Fulgence	Tremblay Tp.
Elzéar Turcotte	19 de Junonville St., Limoilou	St. Charles River.
Jos. Fr. Vézina	Boischatel	Boischatel.
Wright & Co., Inc	250 Catherine St., Ottawa	Hull.

SAND-LIME BRICK

Name of Operator	Address	Location of Plant
Lime Products Co., Ltd	c-o Standard Lime Co., Joliette	Joliette.
Silico, Limited	37 Masson St., Montreal	St. Canut.

SANDSTONE

Name of Operator	Address	Location of Quarry
Jos. Blais Enrg	8 Mont Marie Ave., Levis	Sorosto.
City of Sherbrooke	c-o Thos. Tremblay, Eng., Sherbrooke	Ascot Tp.
Ls. Philippe Gagnon	St. David, Levis County	Levis.
Adolphe Paquet	St. David	St. David.
Joseph Vézina, Enrg	Bergerville	Ste-Foye.

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